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INTRODUCTORY LETTER

To the Honourable Philip T. Kelly,
Minister of Mines.

Sir,—The undersigned has the honour to submit the Sixty-third Annual Report of the Department of Mines, issued in seven parts, as follows:

Part 1

Statistical Review of the Mineral Industry for 1953, by M. G. Arnoldi.
Accidents in 1953, by the Staff of the Mines Inspection Branch.
Classes for Prospectors, 1953–54, by W. D. Harding.

Part 2

Mining Operations in 1953, by D. J. Field.

Part 3

Natural Gas in 1953, by R. B. Harkness.
Petroleum in 1953, by R. B. Harkness.
Logs of Wells for 1953.

Part 4

Geology of Delhi Township, with map No. 1954-1, by K. D. Lawton.

Part 5

Geology of the Emo Area, with map No. 1954-2, by G. L. Fletcher and T. N. Irvine.

Part 6

Geology of Monteagle and Carlow Townships, with map No. 1954-3, by D. F. Hewitt.

Part 7

Geology of Godfrey Township, with map No. 1954-4, by N. Hogg.

All parts, with accompanying geological maps as indicated above, are available on application to the Department.

Respectfully submitted,

H. C. Rickaby,
Deputy Minister of Mines.

Department of Mines,
Toronto, 1954.

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-THIRD ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXIII, PART 1, 1954

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Accidents in 1953 - - - - - - - - - - - - - 66-88

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Statistical Review of the Mineral Industry for 1953

By M. G. Arnoldi

GENERAL SUMMARY

Mineral Production

The total value of all Ontario minerals has been climbing steadily year by year until it has reached a record in 1953 of $474,510,226. This is an increase of 4.65 percent over last year's production value. The grand total for all time now stands at $7,490,504,110.

The metals had a total valuation of $370,926,750, which was 3 percent higher than last year. Gold and silver each dropped in value, mostly owing to strikes at many of the mines in the Porcupine area. Nickel, copper, cobalt, the platinum metals, iron ore, and magnesium and calcium all made gains. The gold mines are still operating under the handicap of a fixed price of $35 (United States funds) per ounce against rising costs. The Emergency Gold Mining Assistance Act was still in force during the year, but this is of greater assistance to the low-grade, or marginal, producers than to the higher-grade mines.

The non-metallic group made an advance of 8.82 percent in value over the previous year and made a record with a total of $25,785,308. Natural gas gained 17.58 percent, petroleum 56.77 percent, and nepheline syenite 41.75 percent.

All items in the structural-materials group advanced in value to a new record of $62,968,946. This was 14.22 percent above the figure for 1952.

The selling value of all clay products amounted to $14,829,222, a gain of 23.83 percent. The demand for construction materials and clay products indicates that the building industry is still expanding.

Altogether the mining industry reported employing 38,915 wage-earners, who were paid a total of $133,250,555 or an average wage of $3,424.

Intensive prospecting took place this year, with a record number of 29,019 claims being recorded. Sudbury district, with its nickel-copper ores, had the highest number. Sault Ste. Marie came next in numbers, and promising deposits of uranium ore were discovered. Base metals were being found in the Manitouwadge area of the Port Arthur mining division, and iron ore and uranium ore finds in eastern Ontario drew prospectors to that district.

SUMMARY OF MINERAL STATISTICS, 1953

Product	Quantity	Value[1]	Wage-earners	Wages
METALLIC				
Gold.....oz.	2,182,435	$ 75,388,307	10,565	$ 30,841,737
Silver.....oz.	5,154,617	4,331,199	(2)	(2)
Copper in matte exported[3].....lb.	20,587,053	5,558,504		
Copper, metallic and in concentrates, exported.....lb.	240,577,600	72,028,936		
Nickel in matte,[3] in speiss, and in ore exported; metallic nickel; and nickel content of oxides and salts.....lb.	287,385,777	160,491,126	18,241	70,655,956
Platinum metals.....oz.	303,563	20,046,390		
Selenium.....lb.	92,698	389,332		
Tellurium.....lb.	4,525	7,919		
Cobalt in metal, oxides, salts, ores, and residues.....lb.	1,602,545	4,013,077	[4] 834	2,586,428
Iron ore[5].....tons	2,832,090	23,137,997	1,650	6,824,644
Calcium and magnesium.....	.....	5,295,840	31	84,816
Lead.....lb.	656,755	84,892	34	22,400
Zinc.....lb.	171,787	20,546		
Tungsten (WO_3).....lb.	48,780	132,685	.....	.....
Total.....	.....	$370,926,750	31,355	$111,015,981
NON-METALLIC				
Arsenic[6].....lb.	1,403,740	$ 56,150	.....	.....
Asbestos.....tons	23,529	3,965,299	236	$ 951,502
Diatomite.....tons	100	12,000	5	3,550
Feldspar, crude and ground.....tons	2,655	28,018	4	4,464
Fluorspar.....tons	876	38,887	14	11,727
Graphite, crude and refined.....tons	3,466	366,528	57	162,414
Gypsum.....tons	334,495	899,630	213	704,515
Mica, amber.....lb.	384,515	7,687	.....	.....
Mica, white.....lb.	81,998	51,481	45	64,653
Mineral waters.....gals.	300	150	.....	.....
Natural gas.....M cu. ft.	9,835,469	11,694,595	1,041	2,898,126
Nepheline syenite.....tons	113,345	1,576,271	107	310,210
Peat moss.....lb.	2,638,420	52,535	10	28,963
Petroleum crude.....bbls.	299,685	1,005,535	104	203,721
Quartzite and quartz.....tons	1,450,770	1,301,048	108	299,139
Silica brick.....M	1,467	313,175	51	178,559

Salt	tons	749,046	3,919,810	241	791,672
Sulphur[7]	tons	37,130	371,300	.....	.....
Talc	tons	13,310	125,209	19	38,416
Total		.....	$ 25,785,308	2,255	$ 6,651,631
Structural Materials					
Cement, Portland	bbls.	7,078,181	$ 18,497,744	631	$ 2,324,946
Hydrated lime	tons	102,418	1,707,096	418	1,230,416
Quicklime	tons	556,644	6,007,156		
Sand and gravel	tons	43,658,099	24,359,496	1,528	4,214,829
Sand-lime products[8]		.....	578,872	101	303,856
Stone: limestone, marble, trap, granite, sandstone, slate	tons	8,818,886	11,818,582	925	2,717,648
Total		.....	$ 62,968,946	3,603	$ 10,791,695
Clay Products					
Brick, face	number	179,547,096	$ 9,199,325		
Brick, common	number	13,601,468	501,959		
Brick, fancy and ornamental	number	7,290	974		
Brick, sewer		.....	11,185		
Tile, drain	number	31,711,873	1,728,011	1,702	$ 4,791,248
Tile, structural, roofing, and floor		.....	1,306,141		
Sewer pipe, copings, flue-linings, etc.		.....	1,674,516		
Pottery and other products		.....	295,365		
Haydite and clay		.....	111,746		
Total		.....	$ 14,829,222	1,702	$ 4,791,248
Grand Total		.....	$474,510,226	38,915	$133,250,555

[1]Canadian funds.
[2]Wage-earners and wages included with figures for silver-cobalt smelters and refineries([4]).
[3]Copper in matte valued at 27 cents per pound, and nickel at 54 cents.
[4]Wage-earners and wages for silver-cobalt smelters and refineries.
[5]The production value of pig iron from Ontario iron ores is no longer included in the above table, but the record of domestic ore smelted in Ontario furnaces may be found on page 44.
[6]Shipments from Ontario sources and not actual production figures.
[7]Tonnage given in sulphur content of sulphuric acid.
[8]No deduction made for lime used in manufacturing.

COMPARATIVE VALUE OF MINERAL PRODUCTION, 1949-53

Product	1949	1950	1951	1952	1953
METALLIC					
Gold (Canadian value)	$ 85,269,362	$ 94,216,874	$ 91,105,477	$ 87,540,620	$ 75,388,307
Silver	1,905,233	3,561,005	4,273,241	5,416,647	4,331,199
Platinum metals	19,885,049	17,822,766	22,490,536	18,475,723	20,046,390
Cobalt[1]	952,469	964,003	1,999,612	3,226,903	4,013,077
Nickel[2]	99,351,785	112,292,202	151,217,865	151,666,687	160,491,126
Copper, metallic and in matte	44,658,786	54,411,033	70,861,788	70,981,618	77,587,440
Selenium	178,026	154,176	267,005	265,128	389,332
Tellurium	15,707	11,419	11,594	9,707	7,919
Iron ore	13,192,781	17,562,059	21,205,152	19,632,551	23,137,997
Lead, in ore	.....	.....	.....	291,979	84,892
Magnesium Calcium	1,041,218	1,545,011	3,618,219	4,812,368	5,295,840
Bismuth	.....	.....	34,048	.....	.....
Zinc	.....	.....	.....	130,630	20,546
Tungsten concentrates (WO_3)	.....	.....	.....	164,886	132,685
Total	$266,450,416	$302,450,548	$367,084,537	$362,615,447	$370,926,750
NON-METALLIC					
Arsenic, white	$ 8,797	$ 16,220	$ 94,406	$ 71,477	$ 56,150
Asbestos	.....	1,493,039	3,773,069	3,862,653	3,965,299
Beryllium ore	.....	7,882	.....	.....	.....
Diatomite	.....	.....	.....	.....	12,000
Feldspar, crude and ground	43,610	49,619	125,727	37,628	28,018
Fluorspar	187,875	262,643	223,398	38,465	38,887
Garnet rock	.....	240	.....	.....	.....
Graphite, crude and refined	212,496	390,815	231,167	255,732	366,528
Gypsum	871,467	875,217	672,276	1,060,429	899,630
Mica, amber	21,651	28,299	3,904	4,618	7,687
Mica, white	9,905	128,161	310,530	106,943	51,481
Mineral water	410	440	450	440	150
Natural gas	8,826,634	8,890,532	9,962,553	9,946,024	11,694,595
Nepheline syenite	623,002	842,886	1,114,943	1,111,950	1,576,271
Peat fuel	560	580	300	300	.....

Peat moss	210,008	206,625	72,557	69,013	52,535
Petroleum, crude	901,143	892,335	677,905	641,400	1,005,535
Phosphate		712	94		
Quartz crystals			1,407	11,287	
Quartzite and quartz	1,020,411	1,027,791	1,496,404	1,495,245	1,301,048
Silica brick	148,258	174,372	204,831	246,108	313,175
Salt	3,477,583	4,639,867	4,789,990	4,401,780	3,919,810
Sulphur[3]	126,300	131,540	156,050	183,460	371,300
Talc and soapstone	160,757	182,048	160,540	149,711	125,209
Total	$ 16,850,867	$ 20,241,863	$ 24,072,501	$ 23,694,663	$ 25,785,308
STRUCTURAL MATERIALS					
Cement, Portland	$ 9,155,613	$ 10,953,896	$ 12,494,677	$ 14,142,060	$ 18,497,744
Lime, hydrated and quicklime	5,569,550	6,030,228	6,921,916	6,921,062	7,714,252
Sand and gravel	11,214,136	15,553,186	19,905,293	23,240,203	24,359,496
Sand-lime products[4]	444,218	729,328	714,528	520,619	578,872
Stone: limestone, granite, etc.	7,380,457	7,843,124	10,396,650	10,303,173	11,818,582
Total	$ 33,763,974	$ 41,109,762	$ 50,433,064	$ 55,127,117	$ 62,968,946
CLAY PRODUCTS					
Brick, face	$ 4,311,743	$ 5,277,280	$ 6,214,362	$ 7,102,104	$ 9,199,325
Brick, common	312,063	417,195	429,702	484,274	501,959
Brick, fancy and ornamental	604	510	1,179	726	974
Brick, sewer	24,868	16,352	19,768	5,687	11,185
Tile, drain	963,635	1,085,567	1,243,891	1,506,992	1,728,011
Tile, structural, roofing, and floor	867,511	1,165,915	1,210,981	1,166,075	1,306,141
Sewer pipe, copings, flue-linings, etc.	786,878	1,197,901	1,124,201	1,321,499	1,674,516
Pottery and other products	162,764	112,457	114,720	280,224	295,365
Haydite and clay	5,373	77,086	125,537	107,619	111,746
Total	$ 7,435,439	$ 9,323,263	$ 10,484,341	$ 11,975,200	$ 14,829,222
GRAND TOTAL	$324,500,696	$373,215,436	$452,074,443	$453,412,427	$474,510,226

[1]Cobalt in oxide, metallic cobalt, and cobalt content of residues marketed.
[2]Nickel in matte, oxide, and metallic nickel.
[3]Value of sulphuric acid produced.
[4]No deduction made for lime consumed in manufacturing.

TOTAL MINERAL PRODUCTION

Year	Exchange equalization or discount	Metallics	Non-metallics	Structural materials	Clay products	Total
Before 1891[1]		$ 9,520,269				$ 9,520,269
1891-99		9,072,635		$44,790,920		53,863,555
1900		2,565,286		6,733,338		9,298,624
1901		5,016,734		6,814,352		11,831,086
1902		6,257,499		7,134,135		13,391,634
1903		5,242,575		7,628,018		12,870,593
1904		4,906,677		6,665,970		11,572,647
1905		10,201,010		7,653,286		17,854,296
1906		13,353,080		9,035,303		22,388,383
1907		14,550,835	$ 3,020,537	$ 3,876,275	$ 3,571,726	25,019,373
1908		16,754,986	2,629,749	3,396,406	2,856,476	25,637,617
1909		22,928,496	2,825,751	4,028,206	3,198,922	32,981,375
1910		28,161,678	3,141,658	4,380,000	3,630,559	39,313,895
1911		29,102,867	3,674,926	4,935,609	4,263,395	41,976,797
1912		34,799,734	4,009,643	4,701,170	4,831,056	48,341,603
1913		37,507,935	4,296,450	5,866,775	5,561,151	53,232,311
1914		33,345,291	4,339,703	4,505,368	4,105,597	46,295,959
1915		44,109,679	4,655,250	3,609,371	1,871,379	54,245,679
1916		55,002,918	4,982,140	3,734,065	1,584,699	65,303,822
1917		56,831,857	7,702,942	4,962,284	2,596,749	72,093,832
1918		66,178,059	7,815,062	4,297,401	2,018,450	80,308,972
1919		41,590,759	6,308,182	7,208,413	3,776,562	58,883,916
1920	$ 1,376,275	48,281,553	8,141,796	11,921,019	4,735,154	74,455,797
1921	1,359,636	28,777,581	6,636,217	13,967,386	5,183,125	55,923,945
1922	208,621	40,290,157	7,591,913	13,640,166	6,944,218	68,675,075
1923	280,196	44,076,660	8,511,786	13,139,757	6,269,140	72,277,539
1924	196,750	52,130,314	7,555,283	12,398,465	5,137,865	77,418,677
1925	-2,838	62,495,472	7,488,034	12,451,174	5,148,626	87,580,468
1926	-595	59,218,297	7,842,632	12,681,308	5,356,469	85,098,111
1927		62,631,255	7,638,605	14,160,552	5,853,035	90,283,447
1928	2,811	71,267,003	7,822,641	14,815,814	6,177,664	100,085,933
1929	157,456	83,967,446	8,621,427	18,541,687	6,830,162	118,118,178
1930	36,703	83,356,365	8,492,263	16,571,626	5,221,214	113,678,171
1931	1,926,221	72,452,544	7,642,308	11,995,556	3,552,799	97,569,428
1932	6,134,157	63,997,017	7,361,897	7,295,917	1,690,505	86,479,493
1933	16,486,437	78,877,928	7,094,636	6,335,977	1,024,579	109,819,557
1934	29,287,439	99,985,594	7,553,571	7,766,563	1,261,006	145,854,173
1935	32,169,797	110,718,768	7,766,657	7,555,508	1,370,225	159,580,955
1936	34,139,926	131,091,593	8,933,036	8,931,899	1,573,936	184,670,390
1937	37,028,708	167,814,485	10,055,177	13,241,244	2,033,845	230,173,459
1938	42,070,230	155,835,230	9,949,317	10,012,203	2,083,496	219,950,476
1939	48,322,783	161,208,555	11,470,739	10,705,629	2,341,617	234,049,323
1940	58,154,794	176,072,441	12,514,093	13,950,607	2,513,884	263,205,819
1941	56,925,914	181,989,098	12,349,030	15,462,605	3,087,616	269,814,263
1942	49,280,883	183,359,295	12,406,382	13,767,041	2,549,487	261,363,088
1943	37,751,307	168,494,248	12,502,624	12,708,296	2,453,829	233,910,304
1944	30,874,701	155,066,073	11,075,707	13,391,477	2,347,396	212,755,354
1945	28,975,884	159,234,509	10,909,496	14,481,105	3,107,189	216,708,183
1946	28,762,356	127,729,390	10,205,701	20,187,881	4,321,499	191,206,827
1947	27,785,522	179,873,883	11,909,819	25,186,051	5,278,438	250,033,713
1948	30,044,272	215,624,013	14,550,912	29,030,823	6,563,754	295,824,498
1949	36,597,022	229,853,394	16,850,867	33,763,974	7,435,439	324,500,696
1950	42,935,140	259,605,408	20,241,863	41,109,762	9,323,263	373,215,436
1951	40,183,893	326,900,644	24,072,501	50,433,064	10,484,341	452,074,443
1952		362,615,447	23,694,663	55,127,117	11,975,200	453,412,427
1953		370,926,750	25,785,308	62,968,946	14,829,222	474,510,226
Total	$719,452,401	$5,322,829,993		$1,448,221,716		$7,490,504,110

[1]Prior to 1891, when the Ontario Bureau (now Department) of Mines was established, it is estimated that metals to a value of $9,520,269 were produced. No estimate has been made of the output of non-metallics up to 1891.

Metal Production

The aggregate metal production of Ontario mines from the earliest records up to the end of 1953 was valued at $6,042,282,394. The value of production in 1953, amounting to $370,926,750, was 78.17 percent of the total value of Ontario's mining industry.

METAL PRODUCTION TO DECEMBER 31, 1953

Metal or product	To December 31, 1952	1953	To December 31, 1953
Gold	$1,464,631,349	$ 75,388,307	$1,540,019,656
Exchange equalization	719,452,719	.....	719,452,719
Nickel, including nickel oxides and salts	1,754,568,017	160,491,126	1,915,059,143
Silver	303,923,430	4,331,199	308,254,629
Copper[1]	868,198,938	77,587,440	945,786,378
Pig iron, from domestic ore	98,257,508	.....	98,257,508
Cobalt[2]	43,373,455	4,013,077	47,386,532
Platinum metals	274,295,955	20,046,390	294,342,345
Iron ore[3]	112,614,287	23,137,997	135,752,284
Lead	5,270,558	84,892	5,355,450
Zinc, in ore and concentrates	1,125,523	20,546	1,146,069
Molybdenum	224,110	.....	224,110
Bismuth	263,613	.....	263,613
Selenium	4,141,276	389,332	4,530,608
Tellurium	251,664	7,919	259,583
Chromite	55,090	.....	55,090
Tungsten, in concentrates	675,653	132,685	808,338
Magnesium Calcium	20,023,233	5,295,840	25,319,073
Barium	9,266	.....	9,266
Total	$5,671,355,644	$370,926,750	$6,042,282,394

[1]Includes small quantities of copper sulphate.
[2]Includes metal, oxide, salts, and cobalt content of residues exported.
[3]Value of ore shipped to all points.

Dividends.—During 1953, dividends were paid by 26 gold, 2 nickel-copper, and 1 silver-cobalt mining companies. Investment or holding companies, of which there are several, have been excluded in the case of gold and nickel-copper companies but not in the case of silver-cobalt companies.

DIVIDENDS PAID BY METAL-MINING COMPANIES TO DECEMBER 31, 1953

Industry	To end of 1952	1953	To end of 1953
Gold	$ 595,381,969	$14,242,485	$ 609,624,454
Nickel-copper	710,981,571	38,054,482	749,036,053
Silver-cobalt	104,010,118	270,900	104,281,018
Total	$1,410,373,658	$52,567,867	$1,462,941,525

Metal Prices and Exchange

The following table is a computation of the average exchange rate of the United States dollar in Canadian funds, the pound sterling in Canadian funds, the price of silver and copper on the New York market, and the price of gold in Canadian dollars per fine ounce.

Month	Average exchange rate, U.S. dollars in Canadian funds	Pound sterling in Canadian funds	Silver, cents per ounce		Copper, cents per pound, New York export, U.S. funds	Gold in Canadian dollars per fine ounce
			New York market, U.S. funds	In Canadian funds		
1952						
January	1.005	2.795	88.000	88.900	27.425	35.190
February	1.009	2.784	88.000	88.375	27.425	35.032
March	1.024	2.786	88.000	88.031	27.425	34.850
April	0.981	2.755	88.000	86.719	27.425	34.340
May	0.984	2.755	85.405	84.600	27.908	34.432
June	0.979	2.727	82.750	81.437	34.586	34.261
July	0.969	2.702	82.886	80.675	34.815	33.926
August	0.961	2.681	83.250	80.346	34.904	33.648
September	0.960	2.671	83.250	80.187	34.824	33.594
October	0.964	2.694	83.250	80.475	34.751	33.750
November	0.973	2.735	83.250	81.469	34.681	34.171
December	0.971	2.724	83.250	81.032	34.780	33.971
Average [1] (12 months)	0.982	2.734	84.941	83 520	31.746	34.263
1953						
January	0.9705	2.7305	84.500	81.090	34.780	33.966
February	0.9773	2.7555	85.250	83.531	34.783	34.204
March	0.9833	2.7692	85.250	84.125	34.451	34.441
April	0.9837	2.7713	85.250	84.100	32.863	34.425
May	0.9941	2.7980	85.250	85.062	29.710	34.791
June	0.9944	2.7982	85.250	85.296	29.699	34.799
July	0.9918	2.7929	85.250	84.875	29.482	34.719
August	0.9883	2.7825	85.250	84.562	29.254	34.590
September	0.9843	2.7524	85.250	84.312	28.688	34.452
October	0.9825	2.7576	85.250	84.200	28.522	34.393
November	0.9777	2.7489	85.250	83.719	28.848	34.221
December	0.9731	2.7352	85.250	83.275	29.061	34.055
Average [1] (12 months)	0.9834	2.7660	85.187	84.012	30.845	34.421

[1] Computed from daily quotations.

Prospecting

The number of mining claims staked during the year was 29,019. This was an increase from the 16,009 reported for the previous year. The Sudbury division led in recording the largest number, followed by Sault Ste. Marie, Port Arthur, and Eastern Ontario, in that order.

MINING CLAIMS RECORDED AND CANCELLED IN ONTARIO, 1907–53

Year	Number recorded	Number cancelled [1]	Year	Number recorded	Number cancelled	Year	Number recorded	Number cancelled
1907	13,996		1923	6,092	2,328	1939	6,772	9,086
1908	4,634		1924	5,222	2,804	1940	4,667	7,242
1909	9,746		1925	4,751	2,460	1941	4,254	10,514
1910	5,792		1926	13,496	5,322	1942	3,593	9,028
1911	9,001	361	1927	15,554	5,537	1943	5,232	3,057
1912	3,104		1928	15,046	3,662	1944	12,527	2,376
1913	4,320	442	1929	8,207	8,090	1945	16,362	3,657
1914	1,913	7,913	1930	3,886	8,887	1946	23,763	6,003
1915	2,519	1,093	1931	5,779	10,885	1947	12,913	18,116
1916	2,470	1,911	1932	4,945	15,425	1948	9,029	13,932
1917	1,936	602	1933	8,077	4,813	1949	14,420	11,829
1918	1,534	304	1934	16,888	5,041	1950	14,233	17,735
1919	2,918	1,481	1935	9,460	9,240	1951	13,403	9,265
1920	2,160	2,203	1936	17,280	6,653	1952	16,009	13,789
1921	2,459	1,791	1937	15,292	11,445	1953	29,019	18,178
1922	5,686	1,490	1938	9,047	8,978			

[1] Data on claims cancelled are not available for 1907, 1908, 1909, 1910, and 1912. These figures include cancellations of claims in Eastern Ontario and Parry Sound district for the years 1951–53 only.

The following table shows the number of miners' licences issued and renewed, and the number of mining claims recorded and cancelled, in each mining division, for the 1953.

MINER'S LICENCES AND MINING CLAIMS, 1953

Mining division	Miners' licences		Mining claims	
	Issued	Renewed	Recorded	Cancelled
Eastern Ontario	.....	.....	2,582	482
Fort Frances	122	96	729	588
Kenora	150	158	621	1,754
Larder Lake	194	347	618	1,619
Montreal River	60	130	738	944
Parry Sound	.....	.....	1,359	87
Patricia[1]	154	94	704	1,434
Porcupine	180	175	285	748
Port Arthur and Kowkash	429	289	2,586	3,634
Red Lake	92	113	1,127	855
Sault Ste Marie	892	200	6,504	468
Sudbury	1,444	569	10,128	4,108
Timiskaming	235	239	1,038	1,457
At Toronto	1,261	1,723	.....	.....
Total	5,213	4,133	29,019	18,178

[1]In January, 1950, a recording office was opened at Red Lake, and a new Patricia mining division was established with a recording office at Sioux Lookout.

MINING CLAIMS RECORDED IN THE DIFFERENT MINING DIVISIONS, 1907 AND 1947–53

Mining division	1907	1947	1948	1949	1950	1951	1952	1953
Eastern Ontario	.....	.....	.....	.....	.....	421	494	2,582
Fort Frances	.....	186	304	193	206	400	373	729
Kenora	.....	449	406	999	918	1,609	993	621
Larder Lake	3,813	1,927	818	1,747	1,186	1,237	846	618
Montreal River	866	809	512	481	668	975	578	738
Parry Sound[1]	102	.....	.....	.....	.....	208	167	1,359
Patricia[2]	.....	.....	.....	.....	3,112	624	285	704
Porcupine	.....	1,067	418	441	729	366	541	285
Port Arthur and Kowkash[3]	317	1,624	1,098	1,416	2,199	2,047	3,563	2,586
Red Lake	.....	1,519	345	1,018	785	801	931	1,127
Sault Ste. Marie	291	489	1,573	3,774	911	1,111	1,500	6,504
Sudbury	456	3,199	1,442	3,121	2,104	2,213	4,481	10,128
Timiskaming	7,860	799	1,094	622	1,011	1,391	1,257	1,038
At Toronto	.....	780	1,019	608	404	.....	.....	.....
Total	13,996	12,848	9,029	14,420	14,233	13,403	16,009	29,019

[1]The office at Parry Sound was closed in 1921, and records are now kept at the Ontario Department of Mines, Toronto. Since 1951, the records for Parry Sound and Eastern Ontario have been kept separately.

[2]In January, 1950, a recording office was opened at Red Lake, and a new Patricia mining division established with a recording office at Sioux Lookout.

[3]In 1945 the records for Kowkash were transferred to Port Arthur, and their figures are combined.

Diamond-Drilling

The diamond-drilling companies that operated in Ontario during 1953 reported drilling 1,565,751 feet. There were 856 men employed, who were paid a total of $2,326,868 in salaries and wages. For all their operations, in Ontario as well as other provinces, they purchased borts to the value of $990,745, and carbons worth $11,607. Ready-set bits cost them $874,785.

METALLIC MINERALS

Gold

General

The total value of the gold production in Ontario for 1953 amounted to $75,388,307. The gold mines alone accounted for $74,012,123 of this, and the balance of $1,376,184 came from the nickel-copper industry and from copper-gold-silver and silver-lead-zinc ores. Owing mostly to the strikes in the Porcupine camp that began in August, the value of the production from the gold mines dropped from $83,036,012 for the previous year to $74,012,123. The average grade of ore milled by the industry was $8.59, and the average price paid by the Royal Canadian Mint was $34.42 per troy ounce of gold. The gold mines also produced 355,550 ounces of silver, worth $299,501.

During the year the Buffalo Ankerite mine and the Paymaster mine in the Porcupine camp ceased operations. In the Kirkland Lake area the Toburn mine closed down as did the Matachewan Consolidated mine in the Matachewan area.

Dividends paid by the gold-mining industry totalled $14,242,485 as compared with $15,463,263 in the previous year.

The gold mines employed 1,148 salaried personnel, who received $5,189,683 in salaries, and 10,565 wage-earners, who were paid a total of $30,841,737. Fuel and electricity costs amounted to $3,733,583, and $13,662,228 was paid out for process supplies. The gold-mining companies spent $389,625 for further exploration in Ontario and, altogether, $594,020 for exploration in Ontario and outside of the province.

Only 6 non-producing gold mines reported any activity during the year, and they paid a total of 39 employees $107,276 in salaries and wages. Their expenses included $9,310 paid out for fuel and electricity and $84,196 for process supplies.

Production

The following tables show the annual production by mines in each area, the production by areas in 1953, and the total gold production from 1886 to the end of 1953.

PORCUPINE GOLD BELT, PRODUCTION, 1910–53[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Amca	1937	.....	$ 1,298	.....	$ 1,298
Amalgamated Goldfields	1923, 1926, 1928, 1934	500	$ 1,966	500	$ 1,966
Aunor	1940–50	1,770,187	$ 21,781,021		
	1951	175,977	2,413,346		
	1952	178,827	2,698,488		
	1953	139,759	1,889,590	2,264,750	$ 28,782,445
Bonetal	1941–51	352,254	$ 1,921,134	352,254	$ 1,921,134
Bonwhit	1951	8,068	$ 113,735		
	1952	67,009	902,615		
	1953	63,762	673,878	138,839	$ 1,690,228

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table III in pocket.

PORCUPINE GOLD BELT, PRODUCTION, 1910–53—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Broulan Reef	1939–50	1,284,734	$ 11,038,128		
	1951	169,120	1,919,449		
	1952	137,666	1,261,242		
	1953	82,520	741,505	1,674,040	$ 14,960,324
Buffalo Ankerite	1926–50	4,713,947	$ 32,343,973		
	1951	118,995	927,620		
	1952	117,795	649,180		
	1953	1,125	108,290	4,951,862	$ 34,029,063
Canusa	1927, 1928, 1933, 1935	315	$ 14,840	315	$ 14,840
Clifton	1914, 1922–24	.....	$ 30,575	.....	$ 30,575
Concordia	1935	230	$ 580	230	$ 580
Coniaurum	1928–50	3,178,850	$ 26,989,733		
	1951	126,295	1,178,866		
	1952	129,325	1,018,762		
	1953	89,952	815,562	3,524,422	$ 30,002,923
Consolidated West Dome Lake	1915–20, 1924–27, 1929, 1930	188,488	$ 1,120,306	188,488	$ 1,120,306
Davidson	1918–20	9,371	$ 53,914	9,371	$ 53,914
Delnite	1937–50	1,609,889	$ 12,443,355		
	1951	139,278	1,493,931		
	1952	158,794	1,802,159		
	1953	106,027	1,063,087	2,013,988	$ 16,802,532
De Santis	1926, 1933, 1939–42	196,928	$ 1,366,707	196,928	$ 1,366,707
Devon	1940	2,333	$ 1,632	2,333	$ 1,632
Dome	1910–50	17,883,267	$172,293,194		
	1951	688,000	6,135,843		
	1952	687,400	5,803,685		
	1953	687,300	5,869,641	19,945,967	$ 190,102,363
Faymar	1940–42	119,181	$ 853,292	119,181	$ 853,292
Gillies–Lake Porcupine	1929–31, 1935–37	54,502	$ 462,482	54,502	$ 462,482
Gold Reef	1915, 1917	128	$ 2,135	128	$ 2,135
Goldhawk	1947	636	$ 1,862	636	$ 1,862
Hallnor	1938–50	1,502,531	$ 24,805,114		
	1951	138,424	1,817,719		
	1952	134,236	1,869,107		
	1953	69,385	900,344	1,844,576	$ 29,392,284
N. A. Hermiston	1946	.....	$ 1,056	.....	$ 1,056
Hill Gold	1918	25	$ 635	25	$ 635
Hollinger	1910–50	49,620,460	$411,211,442		
	1951	933,081	8,981,784		
	1952	1,068,778	10,405,207		
	1953	751,690	6,865,339	52,374,009	$ 437,463,772

PORCUPINE GOLD BELT, PRODUCTION, 1910–53—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Hoyle	1941–44, 1946–49	725,494	$ 2,689,438	725,494	$ 2,689,438
J. Huddlestone and P. Clyne	1923, 1925	.....	$ 3,257	.....	$ 3,257
Hughes	1926	.....	$ 30	.....	$ 30
Hugh-Pam	1948	1,207	$ 1,586		
	1949	6,255	12,168		
	1950	8,298	93,817		
	1951	7,740	51,752		
	1952	26,053	280,610		
	1953	42,625	345,079	92,178	$ 785,012
Mace	1911, 1912, 1914–18, 1923–39, 1941	1,565,218	$ 9,827,448	1,565,218	$ 9,827,448
McIntyre	1912–50	20,281,481	$196,489,575		
	1951	754,470	7,662,620		
	1952	760,230	7,255,921		
	1953	574,090	5,540,353	22,370,271	$ 216,948,469
McLaren-Porcupine	1933–35, 1937	876	$ 6,819	876	$ 6,819
Marbuan	1926–35	317,769	$ 1,154,663	317,769	$ 1,454,663
Moneta	1938–43	314,829	$ 5,589,356	314,829	$ 5,589,356
Munro Croesus	1915–18, 1923, 1931, 1932, 1934–36, 1948	5,333	$ 326,894	5,333	$ 326,894
Nakhodas	1940–42, 1944	44,028	$ 252,792	44,028	$ 252,792
Naybob	1932, 1933, 1935, 1937–43, 1948	247,146	$ 1,843,425	247,146	$ 1,843,425
Newray	1913–15, 1917, 1918	14,804	$ 184,001	14,804	$ 184,001
Night Hawk Peninsular	1924–27, 1940, 1944	99,688	$ 580,462	99,688	$ 580,462
Northcrown	1913–18, 1920, 1921	226,180	$ 2,893,730	226,180	$ 2,893,730
Northern Turnbull	1934	30	$ 172	30	$ 172
Pamour	1936–50	6,926,801	$ 29,423,758		
	1951	581,746	2,053,929		
	1952	611,270	1,936,097		
	1953	627,398	2,016,615	8,747,215	$ 35,430,399
Paymaster	1922, 1926–28, 1934–50	2,814,656	$ 21,060,221		
	1951	174,416	1,391,177		
	1952	174,454	1,361,208		
	1953	154,246	1,376,512	3,317,772	$ 25,189,118

PORCUPINE GOLD BELT, PRODUCTION, 1910–53—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Porcupine Lake	1937–40, 1944	10,821	$ 50,100	10,821	$ 50,100
Porcupine Pet	1914, 1915	.....	$ 10,551	.....	$ 10,551
Porphyry Hill	1913, 1915	46	$ 6,236	46	$ 6,236
Preston East Dome	1938–50	2,685,179	$ 25,863,508		
	1951	233,516	2,233,200		
	1952	239,500	2,343,095		
	1953	128,720	1,457,084	3,286,915	$ 31,896,887
Ross	1936–50	1,144,885	$ 8,968,227		
	1951	112,006	779,430		
	1952	110,331	774,191		
	1953	113,361	764,603	1,480,583	$ 11,286,451
Schumacher	1915–18	112,124	$ 564,984	112,124	$ 564,984
J. Spence	1932	155	$ 2,738	155	$ 2,738
Tommy Burns	1917	21	$ 289	21	$ 289
Miscellaneous	1925, 1927–38, 1942–46, 1948–52	68	$ 616,261	68	$ 616,261
Totals	1910–45	98,686,956	$845,980,271		
	1946	3,952,840	33,303,325		
	1947	3,925,751	32,923,648		
	1948	4,356,812	35,135,980		
	1949	4,501,091	38,047,087		
	1950	4,582,185	41,943,114		
	1951	4,397,645	39,373,609		
	1952	4,601,668	40,365,229		
	1953	3,631,960	30,428,067	132,636,908	$1,137,500,330

KIRKLAND LAKE GOLD BELT, PRODUCTION, 1910–53[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Baldwin Kirkland	1929, 1938	81	$ 1,247	81	$ 1,247
Bidgood Kirkland	1934–49, 1951	586,367	$ 5,917,133	586,367	$ 5,917,133
Bourkes Syndicate	1918, 1936–38	1,298	$ 8,935	1,298	$ 8,935
Gold Pyramid	1911	175	$ 650	175	$ 650
Golden Summit	1936, 1937, 1945	737	$ 3,738	737	$ 3,738
Kirkland Golden Gate	1913, 1933, 1935–44, 1947	101,503	$ 1,051,162	101,503	$ 1,051,162
Kirkland Lake Gold	1919–50	1,693,557	$ 20,065,519		
	1951	124,944	1,549,739		
	1952	120,543	1,540,202		
	1953	112,616	1,489,067	2,545,408	$ 31,812,115

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table II in pocket.

KIRKLAND LAKE GOLD BELT, PRODUCTION, 1910–53—*Continued*

Mine	Years	Quantity tons	Value	Total quantity, tons	Total value
Lake Shore	1918–50	13,717,665	$227,029,333		
	1951	359,489	5,125,030		
	1952	263,595	3,094,159		
	1953	236,669	3,108,034	14,577,418	$ 238,356,556
Macassa	1933–50	1,779,389	$ 28,096,315		
	1951	135,440	1,648,999		
	1952	139,660	1,533,857		
	1953	144,175	1,603,308	2,198,664	$ 32,882,479
Moffat Hall	1934–35	16,388	$ 166,569	16,388	$ 166,569
Morris Kirkland	1936–38, 1940–42	127,253	$ 621,544	127,253	$ 621,544
Ontario-Kirkland	1922	6,496	$ 10,082	6,496	$ 10,082
Swastika	1910, 1911, 1913	2,190	$ 11,457	2,190	$ 11,457
Sylvanite	1927–50	3,345,231	$ 39,213,702		
	1951	171,017	1,722,843		
	1952	171,868	1,866,401		
	1953	170,032	1,864,941	3,858,148	$ 44,667,887
Teck-Hughes	1917–50	6,842,884	$ 87,447,129		
	1951	197,860	1,823,513		
	1952	218,930	1,445,716		
	1953	228,425	1,341,450	7,488,099	$ 92,057,808
Toburn	1913–18, 1922–50	1,097,091	$ 16,475,144		
	1951	40,525	576,107		
	1952	41,300	581,241		
	1953	7,400	106,014	1,186,316	$ 17,738,506
Trout Creek	1931	1	$ 1,662	1	$ 1,662
Upper Canada	1938–50	1,098,581	$ 14,098,759		
	1951	151,568	1,573,070		
	1952	177,468	1,694,416		
	1953	182,883	1,634,415	1,610,500	$ 19,000,660
Wright-Hargreaves	1913, 1921–50	7,356,948	$122,694,986		
	1951	182,210	3,004,993		
	1952	189,770	2,719,091		
	1953	192,390	2,848,599	7,921,318	$ 131,267,669
Miscellaneous	1925, 1928, 1929, 1933, 1934, 1937, 1938, 1941–46, 1952, 1953		$ 131,167		$ 131,167
Totals	1910, 1911, 1913–45	32,307,598	$489,626,817		
	1946	1,077,790	14,916,970		
	1947	1,092,316	15,430,524		
	1948	1,180,044	15,759,921		
	1949	1,288,886	17,361,328		
	1950	1,320,949	17,115,277		
	1951	1,363,053	17,027,072		
	1952	1,323,134	14,475,117		
	1953	1,274,590	13,996,000	42,228,360	$ 615,709,026

LARDER LAKE GOLD AREA, PRODUCTION, 1911–53[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
American Eagle	1911	50	$ 900	50	$ 900
Barry-Hollinger	1918, 1925–36, 1944–46	267,741	$ 1,622,118	267,741	$ 1,622,118
Beaverhouse Lake	1913, 1914, 1919–30, 1934, 1935, 1941–44	131,585	$ 808,080	131,585	$ 808,080
Briscoe-Bryce	1948	.....	$ 45	.....	$ 45
Britcana	1937	21	$ 702	21	$ 702
Caramora Porcupine	1948	.....	$ 1,154	.....	$ 1,154
Cathroy-Larder	1941–44, 1947	22,250	$ 118,750	22,250	$ 118,750
Chesterville	1939–45	1,314,546	$ 6,598,892		
	1946	225,458	1,029,230		
	1947	295,408	1,195,098		
	1948	310,564	1,313,134		
	1949	300,547	1,002,619		
	1950	320,759	770,309		
	1951	313,948	781,552		
	1952	179,209	616,747	3,260,439	$ 13,307,581
Detroit Syndicate	1911	50	$ 200	50	$ 200
Gold Hill	1927, 1928	4,416	$ 13,649	4,416	$ 13,649
Kerr-Addison	1911, 1938–50	9,248,250	$ 67,142,830		
	1951	1,612,707	12,432,241		
	1952	1,649,836	12,565,071		
	1953	1,643,298	11,693,657	14,154,091	$ 103,833,799
Miller Independence	1918, 1935, 1936	36	$ 5,135	36	$ 5,135
New Telluride	1931, 1932, 1937, 1940, 1950	126	$ 2,088	126	$ 2,088
Omega	1913, 1927, 1928, 1936–48	1,615,081	$ 7,788,606	1,615,081	$ 7,788,606
Raven River	1937–39	40,514	$ 266,441	40,514	$ 266,441
Totals	1911, 1913, 1914, 1918–45	7,161,061	$ 46,239,660		
	1946	862,078	5,328,834		
	1947	1,109,513	6,593,108		
	1948	1,200,275	7,154,415		
	1949	1,860,742	11,382,022		
	1950	1,903,733	12,981,941		
	1951	1,926,655	13,213,793		
	1952	1,829,045	13,181,818		
	1953	1,643,298	11,693,657	19,496,400	$ 127,769,248

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table I in pocket.

MATACHEWAN AND WEST SHININGTREE GOLD AREAS, PRODUCTION, 1922–53

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Ashley	1932–36, 1946	157,636	$ 1,622,245	157,636	$ 1,622,245
Atlas	1933	12	$ 201	12	$ 201
Matachewan Consolidated	1934–45	1,836,001	$ 7,767,766		
	1946	228,890	894,145		
	1947	250,679	991,282		
	1948	256,252	943,481		
	1949	239,030	788,777		
	1950	246,622	719,179		
	1951	259,092	865,923		
	1952	164,407	510,551		
	1953	50,227	161,938	3,525,200	$ 13,643,042
Ronda	1939	24,592	$ 97,644	24,592	$ 97,644
Tyranite	1939–42	223,810	$ 1,166,640	223,810	$ 1,166,640
White Rock	1922, 1933	17	$ 1,406	17	$ 1,406
Young-Davidson	1934–50	4,583,491	$ 16,334,463		
	1951	307,254	694,218		
	1952	287,265	873,243		
	1953	323,094	923,720	5,501,104	$ 18,825,644
Miscellaneous	1948	. . . . .	$ 14	. . . .	$ 14
Totals	1922, 1932–45	5,470,913	$ 22,483,177		
	1946	431,509	1,564,349		
	1947	503,738	1,838,013		
	1948	506,761	1,725,944		
	1949	563,295	1,805,136		
	1950	564,816	1,910,624		
	1951	566,346	1,560,141		
	1952	451,672	1,383,794		
	1953	373,321	1,085,658	9,432,371	$ 35,356,836

ALGOMA DISTRICT, PRODUCTION, 1893–1953[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Agawa	1939, 1940	8,612	$ 22,397	8,612	$ 22,397
G. Calverley	1952	50	$ 4,400	50	$ 4,400
Cline Lake	1938–42, 1947, 1948	331,842	$ 2,369,053	331,842	$ 2,369,053
Darwin	1902, 1903, 1907, 1908, 1910, 1923, 1925, 1930, 1935–37, 1940, 1943, 1944	54,528	$ 546,852	45,528	$ 546,852
Deep Lake	1936–38, 1943	2,790	$ 57,180	2,790	$ 57,180

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table IV in pocket.

ALGOMA DISTRICT, PRODUCTION, 1893–1952—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
P. Edward	1929, 1933, 1941	46	$ 694	46	$ 694
Edwards	1937	1,573	$ 16,977	1,573	$ 16,977
Golden Reed	1908	3	$ 125	3	$ 125
Havilah	1893, 1894, 1900, 1910, 1911	6,589	$ 26,535	6,589	$ 26,535
Hiawatha	1937, 1939, 1940	1,931	$ 6,826	1,931	$ 6,826
Kremzar	1940	.....	$ 96	.....	$ 96
Magino	1934–39, 1942, 1952 1953	116,627	$ 300,467 7,867	116,627	$ 308,334
Minto	1929–39, 1942, 1944	184,600	$ 1,140,457	184,600	$ 1,140,457
Norgold	1926, 1932, 1936–38, 1940	23,211	$ 84,576	23,211	$ 84,576
Norwalk	1904, 1910	820	$ 1,412	820	$ 1,412
Parkhill	1904, 1929, 1931–38, 1940, 1942–44	125,778	$ 1,691,795	125,778	$ 1,691,795
Shenango	1936, 1937, 1945	.....	$ 2,457	.....	$ 2,457
S. B. Smith	1935, 1936	9,228	$ 60,251	9,228	$ 60,251
Soo Mining and Prospecting Syndicate	1933	60	$ 282	60	$ 282
Stanley	1936	1,963	$ 2,936	1,963	$ 2,936
Ranson	1939	774	$ 5,938	774	$ 5,938
Regnery	1937, 1940–43, 1945	13,479	$ 124,353	13,479	$ 124,353
G. L. White	1936	.....	$ 1,124	.....	$ 1,124
Totals	1893, 1894, 1900, 1902–4, 1907, 1908, 1910, 1911, 1923, 1925, 1926, 1929–45, 1947, 1948, 1952 1953	875,504	$ 6,467,183 7,867	875,504	$ 6,475,050

SUDBURY DISTRICT, PRODUCTION, 1897–1953[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
A. Alkins, claims	1945	.....	$ 148	.....	$ 148
Bousquet	1936–38, 1945, 1948	17,129	$ 164,823	17,129	$ 164,823
Crystal	1897, 1898, 1908	730	$ 4,998	730	$ 4,998
Curtin Prospecting Syndicate	1952 1953	.....	$ 640 543	.....	$ 1,183
Ensign	1905–7, 1944, 1945, 1948	8,590	$ 56,290	8,590	$ 56,290
Gomak	1936	1,387	$ 3,446	1,387	$ 3,446
Greenray	1951	.....	$ 1,616	.....	$ 1,616
Halcrow Swayze	1935	211	$ 1,372	211	$ 1,372
Jerome	1941–43	335,060	$ 2,195,651	335,060	$ 2,195,651
Kenty	1947	.....	$ 42	.....	$ 42
Lebel Oro	1910, 1911, 1913–16, 1932, 1934, 1937–39	221,070	$ 1,352,164	221,070	$ 1,352,164
Mac-Auer	1935	45	$ 293	45	$ 293
McMillan	1934–37	60,139	$ 370,672	60,139	$ 370,672
New Golden Rose	1937–41, 1943, 1944	144,237	$ 1,666,563	144,237	$ 1,666,563
Pileggi Mining Syndicate	1947, 1948	.....	$ 2,386	.....	$ 2,386
Renabie	1947 1948 1949 1950 1951 1952 1953	25,743 100,072 155,049 157,948 88,736 169,674 168,243	$ 166,798 843,083 1,193,450 1,411,611 873,040 1,406,672 1,429,696	865,465	$ 7,324,350
Tionaga	1938, 1939	6,653	$ 81,059	6,653	$ 81,059
C. T. Young	1932	10	$ 725	10	$ 725
Miscellaneous	1948	.....	$ 49	.....	$ 49
Totals	1897, 1898, 1905–8, 1910, 1911, 1913–16, 1932, 1934–50, 1951 1952 1953	1,234,073 88,736 169,674 168,243	$ 9,515,623 874,656 1,407,312 1,430,239	1,660,726	$ 13,227,830

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, p. 20.

RAINY RIVER DISTRICT, PRODUCTION, 1895–1953[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Barker	1898	70	$ 490	70	$ 490
Big Turtle River	1929	19	$ 245	19	$ 245
Central Canada	1934	350	$ 742	350	$ 742
Russell Cone	1948, 1949, 1951, 1952	.....	$ 3,778	.....	$ 3,778
Elizabeth	1912	50	$ 400	50	$ 400
Foley	1897, 1898, 1933–35	5,568	$ 52,658	5,568	$ 52,658
Gold Winner	1900	15	$ 70	15	$ 70
Golden Crescent (A.D. 2)	1897	192	$ 1,543	192	$ 1,543
Golden Star	1898–1901, 1934, 1938, 1941	19,345	$ 170,616	19,345	$ 170,616
Hammond Reef	1897	977	$ 3,857	977	$ 3,857
Harold Lake	1895, 1896	1,131	$ 11,236	1,131	$ 11,236
Independence (Bennett tp.)	1898	125	$ 1,906	125	$ 1,906
Lucky Coon	1899, 1935, 1936	10	$ 249	10	$ 249
Manitou	1896	12	$ 413	12	$ 413
Olive	1897–1900, 1937, 1941, 1942	7,255	$ 80,636	7,255	$ 80,636
Saundary	1934	13	$ 435	13	$ 435
W. E. Stone	1919, 1920	2	$ 319	2	$ 319
Sunbeam	1904	650	$ 4,875	650	$ 4,875
Upper Seine (Sawbill)	1897–99, 1940, 1941	5,368	$ 21,785	5,368	$ 21,785
White Lilly	1933	65	$ 53	65	$ 53
Miscellaneous[2]	1935	.....	$ 263	.....	$ 263
Total	1895–1952	41,217	$ 356,569	41,217	$ 356,569

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, p. 18.
[2]Mint sundries, etc.

THUNDER BAY DISTRICT, PRODUCTION, 1897–1953[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
R. Anderson	1943	.....	$ 116	.....	$ 116
Ardeen	1932–36, 1942	143,724	$ 962,326	143,724	$ 962,326
Bankfield Consolidated	1937–42, 1944–47	231,009	$ 2,424,545	231,009	$ 2,424,545
Brenbar	1941, 1949	46	$ 5,160	46	$ 5,160
Cook Lake	1937	32	$ 918	32	$ 918
Mary J. Coveney	1924	.....	$ 114	.....	$ 114
Elmos	1942	3,947	$ 39,168	3,947	$ 39,168
Empress	1897	1,100	$ 2,378	1,100	$ 2,378
Gold Range	1941	.....	$ 668	.....	$ 668
Hard Rock	1938–51	1,458,375	$ 10,057,426	1,458,375	$ 10,057,426
Harkness-Hays	1920, 1929, 1932, 1935, 1936	78	$ 5,879	78	$ 5,879
Jellicoe	1939–41, 1947, 1948	16,948	$ 231,014	16,948	$ 231,014
Leitch	1936–50	400,382	$ 11,508,072		
	1951	29,988	918,893		
	1952	36,276	1,006,535		
	1953	38,614	1,107,417	505,260	$ 14,540,917
Little Long Lac	1934–50	1,496,134	$ 19,515,108		
	1951	101,731	991,319		
	1952	99,607	806,347		
	1953	83,044	795,881	1,780,516	$ 22,108,655
MacLeod-Cockshutt	1938–50	2,363,814	$ 21,378,806		
	1951	366,547	2,574,598		
	1952	411,777	2,365,504		
	1953	453,732	1,988,114	3,595,870	$ 28,307,022
J. B. McMartin	1934, 1935	3,525	$ 86,756	3,525	$ 86,576
Magnet Consolidated	1938–43	201,206	$ 4,037,464		
	1946–52	158,706	1,693,171	359,912	$ 5,730,635
Maloney Sturgeon	1937	1	$ 2,549	1	$ 2,549
Maylac	1946, 1947	1,518	$ 28,079	1,518	$ 28,079
Northern Empire	1934–41, 1949	425,866	$ 5,380,514	425,866	$ 5,380,514

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table V in pocket.

THUNDER BAY DISTRICT, PRODUCTION, 1897–1952—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
North Shores	1923, 1929, 1932, 1933, 1935–37, 1941	3,808	$ 73,716	3,808	$ 73,716
W. Pauloski	1951	.....	$ 5,802	.....	$ 5,802
A. Pilon and M. Richards	1921	30	$ 1,122	30	$ 1,122
St. Anthony	1905–7, 1911–13, 1917, 1918, 1920, 1921, 1929, 1930, 1934–41	331,069	$ 2,165,292	331,069	$ 2,165,292
Sand River	1937–42	157,870	$ 1,863,840	157,870	$ 1,863,840
Schreiber Pyramid	1937	150	$ 2,680	150	$ 2,680
Sturgeon River	1936–42	145,123	$ 2,728,905	145,123	$ 2,728,905
Talmora Long Lac	1948	2,687	$ 14,000	2,687	$ 14,000
Tashota	1931, 1935–38, 1940, 1941	51,234	$ 441,644	51,234	$ 441,644
Theresa	1935, 1938, 1941, 1943, 1945, 1950	7,436	$ 35,024		
	1951	2,013	36,365		
	1952	13,181	64,894		
	1953	3,490	30,938	23,320	$ 167,221
Tombill	1938–42	190,622	$ 2,589,984	190,622	$ 2,589,984
M. C. Williams	1940	20	$ 500	20	$ 500
Miscellaneous	1942, 1948	.....	$ 3,125	.....	$ 3,125
Totals	1897, 1905–7, 1911–13, 1917, 1918, 1920, 1921, 1923, 1924, 1929–45	5,333,654	$ 65,542,912		
	1946	384,521	3,905,263		
	1947	439,918	4,110,057		
	1948	409,736	3,936,131		
	1949	466,571	4,266,290		
	1950	627,771	4,984,327		
	1951	634,568	5,059,187		
	1952	560,841	4,246,153		
	1953	578,880	3,922,350	9,436,460	$ 99,972,670

KENORA DISTRICT, PRODUCTION, 1885–1953[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Baden-Powell	1902–5	163	$ 4,952	163	$ 4,952
Big Master	1902, 1903, 1905, 1942, 1943	14,470	$ 75,115	14,470	$ 75,115
Black Jack	1893	50	$ 300	50	$ 300
Britannia	1899	20	$ 110	20	$ 110
Cameron Island (Damascus)	1898, 1906, 1934–36	1,287	$ 163,871	1,287	$ 163,871
Camp Bay	1904–6	1,417	$ 7,559	1,417	$ 7,559
Cedar Island (Cornucopia)	1896, 1932, 1935, 1936	17,050	$ 174,146	17,050	$ 174,146
Champion (Bad)	1900, 1925, 1926	231	$ 2,220	231	$ 2,220
Clark	1935	87	$ 1,250	87	$ 1,250
Combined	1904	37	$ 220	37	$ 220
J. G. Cross	1937	.....	$ 107	.....	$ 107
Crown Point	1900	150	$ 900	150	$ 900
Darkwater	1936, 1937	13	$ 1,086	13	$ 1,086
Eldorado	1904	30	$ 251	30	$ 251
Elora	1936, 1937, 1939	13,766	$ 49,017	13,766	$ 49,017
Empire	1908	300	$ 1,800	300	$ 1,800
Glass Reef	1900	.....	$ 171	.....	$ 171
Gold Hill	1886, 1893	220	$ 19,610	220	$ 19,610
Gold Panner	1900	100	$ 900	100	$ 900
Gold Rock	1929	300	$ 726	300	$ 726
Grace	1902, 1907, 1908	415	$ 865	415	$ 865
Kenricia	1939, 1940	22,344	$ 97,518	22,344	$ 97,518
Laurentian	1906–9	19,950	$ 141,140	19,950	$ 141,140
Lunward	1948	.....	$ 32	.....	$ 32

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, p. 21.

KENORA DISTRICT, PRODUCTION, 1885–1953—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Martin Kenty	1947	.....	$ 42	.....	$ 42
Mikado	1896–1902, 1910, 1911, 1931	57,813	$ 421,070	57,813	$ 421,070
Minerva	1885	28	$ 1,372	28	$ 1,372
Olympia	1906, 1911 1912, 1915	1,598	$ 4,782	1,598	$ 4,782
Quarry Island	1899	176	$ 1,063	176	$ 1,063
Regina	1895–99, 1902, 1904, 1905, 1936, 1941–43	36,828	$ 229,552	36,828	$ 299,552
Royal Sovereign	1902	.....	$ 122	.....	$ 122
Rush Bay (Golden Horn)	1904, 1906, 1907	615	$ 1,120	615	$ 1,120
Sakoose (Golden Whale)	1899–1901	8,028	$ 58,758	8,028	$ 58,758
Sandybeach Lake	1941, 1942	.....	$ 478	.....	$ 478
Straw Lake Beach	1938–41	33,662	$ 429,477	33,662	$ 429,477
Sultana	1894–1902, 1904–6, 1949	77,481	$ 431,138	77,481	$ 431,138
Treasure	1898	34	$ 529	34	$ 529
Twentieth Century	1902, 1903	8,688	$ 43,586	8,688	$ 43,586
Van Houten	1940, 1945, 1947	800	$ 9,269	800	$ 9,269
Vermilion Lake (Botham)	1930, 1935	43	$ 575	43	$ 575
Wabigoon–Contact Bay	1905, 1916–18, 1920, 1923, 1929	1,839	$ 7,936	1,839	$ 7,936
Wendigo	1900, 1936–43, 1951	206,054	$ 2,510,076	206,054	$ 2,510,076
Miscellaneous[1]	1940–42	476	$ 10,851	476	$ 10,851
Total	1885–1951	526,563	$ 4,975,662	526,563	$ 4,975,662

[1]Mint sundries, etc.

PATRICIA PORTION OF KENORA DISTRICT, PRODUCTION, 1911–53[1]

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Berens River	1939–48	560,607	$ 8,801,845	560,607	$ 8,801,845
Bobjo	1929	....	$ 11,510	....	$ 11,510
Campbell Red Lake	1949	71,317	$ 884,014		
	1950	139,742	2,234,322		
	1951	173,143	2,562,874		
	1952	178,930	2,863,202		
	1953	181,026	3,083,279	744,158	$ 11,627,691
Car Lake Syndicate	1929, 1936	307	$ 5,809	307	$ 5,809
Central Patricia	1934–51	1,729,248	$ 22,920,236	1,729,248	$ 22,920,236
Cochenour Willans	1939–50	667,642	$ 10,611,698		
	1951	70,531	1,312,202		
	1952	67,361	1,244,456		
	1953	61,680	947,227	867,214	$ 14,115,583
W. D. Cooper and P. A. Barry	1935, 1936	.....	$ 5,591	.....	$ 5,591
Gold Eagle	1937–42	180,095	$ 1,496,844	180,095	$ 1,496,844
Hasaga	1938–45	761,803	$ 4,824,649		
	1946	82,427	299,101		
	1947	61,171	303,801		
	1948	135,212	780,853		
	1949	142,129	701,059		
	1950	143,035	598,610		
	1951	133,191	533,928		
	1952	56,314	204,397	1,515,282	$ 8,246,398
Howey	1930–41, 1945	4,630,779	$ 13,249,096		
	1952	.....	4,254	4,630,779	$ 13,253,350
Hudson Patricia	1936, 1937	11,228	$ 65,166	11,228	$ 65,166
J-M Consolidated	1934–40, 1947, 1948	105,357	$ 972,275	105,357	$ 972,275
N. McDonald	1924	.....	$ 126	.....	$ 126
R. McDonald	1923	.....	$ 124	.....	$ 124
McKenzie Red Lake	1935–50	1,129,758	$ 13,151,264		
	1951	80,828	873,083		
	1952	83,288	739,010		
	1953	75,070	748,099	1,368,944	$ 15,511,456
McMarmac Red Lake	1940–44, 1947, 1948	152,978	$ 1,762,760	152,978	$ 1,762,760
Madsen Red Lake	1938–50	1,925,549	$ 17,046,167		
	1951	302,227	2,282,931		
	1952	304,251	2,316,155		
	1953	285,018	2,857,742	2,817,045	$ 24,502,995

[1]For historical data on the various mines, see Vol. LVIII, 1949, pt. 1, Table VI in pocket.

PATRICIA PORTION OF KENORA DISTRICT, PRODUCTION, 1911–53—*Continued*

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
New Dickenson	1948	1,465	$ 5,194		
	1949	43,522	293,352		
	1950	46,234	788,443		
	1951	90,572	1,374,497		
	1952	102,442	1,551,161		
	1953	125,606	1,881,818	409,841	$ 5,894,465
New Jason	1934, 1936–42	152,661	$ 2,251,974		
	1946	9,956	77,931		
	1947	18,532	199,920		
	1949	13,509	241,185		
	1950	38,654	493,476		
	1951	36,441	468,215		
	1952	6,820	74,192	276,573	$ 3,806,893
Pickle Crow	1935–50	1,525,783	$ 30,036,172		
	1951	105,645	1,690,082		
	1952	108,275	1,407,074		
	1953	85,821	1,453,117	1,825,524	$ 34,586,445
Red Crest	1935, 1936	591	$ 9,721	591	$ 9,721
Red Lake Gold Shore	1936, 1937, 1939	86,333	$ 747,577	86,333	$ 747,577
G. A. Rowan	1933	.....	$ 368	.....	$ 368
Sachigo River	1938–42	46,416	$ 1,957,084	46,416	$ 1,957,084
G. Singleton	1933	.....	$ 137	.....	$ 137
Sol D'Or	1933–36	458	$ 8,770	458	$ 8,770
Starratt Olsen	1948	33,501	$ 148,545		
	1949	108,030	814,189		
	1950	136,801	1,202,286		
	1951	151,187	912,853		
	1952	155,690	901,468		
	1953	159,139	774,608	744,348	$ 4,753,952
J. Tingley	1911	30	$ 57	30	$ 57
Uchi	1939–43	757,074	$ 4,391,733	757,074	$ 4,391,733
Miscellaneous[1]	1949, 1950	.....	$ 2,600		
	1953	.....	1,552	.....	$ 4,152
Totals	1911, 1923, 1924, 1929–45	11,480,689	$100,336,317		
	1946	555,745	6,244,038		
	1947	579,963	5,864,292		
	1948	784,843	8,001,217		
	1949	1,032,683	10,226,231		
	1950	1,131,209	12,825,918		
	1951	1,228,567	12,910,286		
	1952	1,063,371	11,305,369		
	1953	973,360	11,747,442	18,830,430	$ 179,461,110

[1]Mint sundries, etc.

SOUTHEASTERN ONTARIO, PRODUCTION, 1891–1953

Mine	Years	Quantity, tons	Value	Total quantity, tons	Total value
Atlas Arsenic	1900,1902, 1903	6,114	$ 44,667	6,114	$ 44,667
Bannockburn	1895	....	$ 58	....	$ 58
Big Dipper	1907, 1909	52	$ 340	52	$ 340
Boerth	1900	. . .. ..	$ 208	....	$ 208
Cleveland	1908	239	$ 5,475	239	$ 5,475
Cobalt Frontenac	1919, 1922	.....	$ 1,364	.....	$ 1,364
Cook Land	1901, 1902, 1904	1,483	$ 6,989	1,483	$ 6,989
Cordova (Belmont)	1892, 1893 1898–1903 1912–15, 1917 1939, 1940	560 70,185 16,491 33,434	$ 5,450 289,517 45,480 134,101	120,670	$ 474,548
Craig	1905, 1906	1,850	$ 5,760	1,850	$ 5,760
Crescent	1891, 1892	1,700	$ 6,780	1,700	$ 6,780
Deloro (Canadian Goldfields)	1897–1902	39,143	$ 213,973	39,143	$ 213,973
Gatling Pearce	1893	.....	$ 1,918	.....	$ 1,918
Gilmour	1909, 1910	550	$ 3,669	550	$ 3,669
Ledyard	1893, 1894	55	$ 236	55	$ 236
Little Doris	1898	400	$ 2,500	400	$ 2,500
Old Diamond (Mayboro)	1941	300	$ 2,310	300	$ 2,310
Sophia	1900	1,500	$ 850	1,500	$ 850
Sovereign	1900	262	$ 861	262	$ 861
Star of the East	1905, 1907	976	$ 1,941	976	$ 1,941
Miscellaneous[1]	1937	.....	$ 238	.....	$ 238
Total	1891–1941	175,294	$ 774,685	175,294	$ 774,685

[1] Mint sundries, etc.

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1953

Area	Years	Quantity, tons	Value	Total quantity, tons	Total value
Southeastern Ontario	1891–95, 1897–1910, 1912–15, 1919, 1922, 1939–41	175,294	$ 774,685	175,294	$ 774,685

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1952—*Continued*

Area	Years	Quantity, tons	Value	Total quantity, tons	Total value
Larder Lake area	1911, 1913, 1914, 1918–21, 1923–45	7,161,061	$ 46,239,660		
	1946	862,078	5,328,834		
	1947	1,109,513	6,593,108		
	1948	1,200,275	7,154,415		
	1949	1,860,742	11,382,022		
	1950	1,903,733	12,981,941		
	1951	1,926,655	13,213,793		
	1952	1,829,045	13,181,818		
	1953	1,643,298	11,693,657	19,496,400	$ 127,769,248
Kirkland Lake belt	1910, 1911, 1913–45	32,307,598	$489,626,817		
	1946	1,077,790	14,916,970		
	1947	1,092,316	15,430,524		
	1948	1,180,044	15,759,921		
	1949	1,288,886	17,361,328		
	1950	1,320,949	17,115,277		
	1951	1,363,953	17,027,072		
	1952	1,323,134	14,475,117		
	1953	1,274,590	13,996,000	42,228,360	$ 615,709,026
Porcupine belt	1910–45	98,686,956	$845,980,271		
	1946	3,952,840	33,303,325		
	1947	3,925,751	32,923,648		
	1948	4,356,812	35,135,980		
	1949	4,501,091	38,047,087		
	1950	4,582,185	41,943,114		
	1951	4,397,645	39,373,609		
	1952	4,601,668	40,365,229		
	1953	3,631,960	30,428,067	132,636,908	$ 1,137,500,330
Matachewan area	1922, 1932–45	5,470,913	$ 22,483,177		
	1946	431,509	1,564,349		
	1947	503,738	1,838,013		
	1948	506,761	1,725,944		
	1949	563,295	1,805,136		
	1950	564,816	1,910,624		
	1951	566,346	1,560,141		
	1952	451,672	1,383,794		
	1953	373,321	1,085,658	9,432,371	$ 35,356,836
Sudbury district	1897, 1898, 1905–8, 1910, 1911, 1913–16, 1932, 1934–45	795,261	$ 5,891,892		
	1947	25,743	168,456		
	1948	100,072	850,214		
	1949	155,049	1,193,450		
	1950	157,948	1,411,611		
	1951	88,736	874,656		
	1952	169,674	1,407,312		
	1953	168,243	1,430,239	1,660,726	$ 13,227,830

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1953—*Continued*

Area	Years	Quantity, tons	Value	Total quantity, tons	Total value
Algoma district	1893, 1894, 1900, 1902–4, 1907, 1908, 1910, 1911, 1923, 1925, 1926, 1929–45	875,454	$ 6,457,727		
	1947	.....	2,700		
	1948	.....	642		
	1952	50	1,371		
	1953	.....	7,867	875,504	$ 6,475,050
Thunder Bay district	1897, 1905–7, 1911–13, 1917, 1918, 1920, 1921, 1923, 1924, 1929–45	5,333,654	$ 65,542,912		
	1946	384,521	3,905,263		
	1947	439,918	4,110,057		
	1948	409,736	3,936,131		
	1949	466,571	4,266,290		
	1950	627,771	4,984,327		
	1951	634,568	5,059,187		
	1952	560,841	4,246,153		
	1953	578,880	3,922,350	9,436,460	$ 99,972,670
Rainy River district	1895–1901, 1904, 1913, 1919, 1920, 1929, 1933–38, 1940–42	41,217	$ 352,791		
	1948	.....	356		
	1949	.....	1,035		
	1951	.....	1,016		
	1952	.....	1,371	41,217	$ 356,569
Kenora district	1915–18, 1920, 1923, 1926, 1929–45	525,763	$ 4,964,743		
	1947	800	8,227		
	1948	.....	32		
	1949	.....	2,335		
	1951	.....	325	526,563	$ 4,975,662
Patricia portion of Kenora district	1911, 1923, 1924, 1929–45	11,480,689	$100,336,317		
	1946	555,745	6,244,038		
	1947	579,963	5,864,292		
	1948	784,843	8,001,217		
	1949	1,032,683	10,226,231		
	1950	1,131,209	12,825,918		
	1951	1,228,567	12,910,286		
	1952	1,063,371	11,305,369		
	1953	973,360	11,747,442	18,830,430	$ 179,461,110

GOLD PRODUCTION BY AREAS, ONTARIO'S GOLD-MINING INDUSTRY, 1885–1953—*Continued*

Area	Years	Quantity, tons	Value	Total quantity, tons	Total value
Miscellaneous	1899–1902, 1923, 1926, 1935–43	955	$ 85,488		
	1948	.....	2,287		
	1949	.....	115		
	1953	.....	344	955	$ 88,234
Totals	1885, 1886, 1891–1945	162,854,815	$1,588,736,480		
	1946	7,264,483	65,262,779		
	1947	7,677,742	66,939,025		
	1948	8,538,543	72,567,139		
	1949	9,868,317	84,285,029		
	1950	10,288,611	93,172,812		
	1951	10,205,570	90,020,085		
	1952	9,999,455	86,372,277		
	1953	8,643,652	74,311,624	235,341,188	$ 2,221,667,250

Dividends

The following tables show the yearly dividends and bonuses paid by gold-mining companies, the yearly dividends and bonuses paid according to areas, and the total dividends and bonuses paid to December 31, 1953.

PORCUPINE BELT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1912–53

Mine	Years	Value	Total
Aunor	1941–50	$ 3,860,000.00	
	1951	440,000.00	
	1952	360,000.00	
	1953	320,000.00	$ 4,980,000.00
Broulan Reef	1940–45, 1949, 1950	$ 1,622,572.83	
	1951	481,118.35	
	1952	536,502.78	
	1953	178,834.26	$ 2,819,028.22
Buffalo Ankerite	1933–41, 1943–45	$ 2,763,008.68	$ 2,763,008.68
Coniaurum	1932, 1937–50	$ 3,905,607.25	
	1951	110,669.72	
	1952	55,334.86	$ 4,071,611.83
Delnite	1940–43, 1949, 1950	$ 804,267.09	
	1951	119,150.68	
	1952	119,150.68	
	1953	119,150.68	$ 1,161,719.13
Dome	1915–17, 1920–50	$ 70,065,880.45	
	1951	1,460,001.00	
	1952	1,362,667.60	
	1953	1,362,667.60	$ 74,251,216.65
Hallnor	1939–50	$ 9,120,000.00	
	1951	520,000.00	
	1952	560,000.00	
	1953	440,000.00	$ 10,640,000.00
Hollinger	1912–50	$127,258,000.00	
	1951	885,600.00	
	1952	1,180,800.00	
	1953	1,180,800.00	$130,505,200.00

PORCUPINE BELT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1912–53—*Continued*

Mine	Years	Value	Total
McIntyre	1917–50	$ 50,623,471.43	
	1951	2,405,970.00	
	1952	2,397,990.00	
	1953	2,394,000.00	$ 57,821,431.43
Moneta	1938–47	$ 1,526,316.00	$ 1,526,316.00
Naybob	1941	$ 190,912.36	$ 190,912.36
Pamour	1938–46, 1949, 1950	$ 4,250,000.00	
	1951	200,000.00	
	1952	150,000.00	
	1953	150,000.00	$ 4,750,000.00
Paymaster	1938–46, 1949	$ 949,198.10	$ 949,198.10
Porcupine Crown	1914–17	$ 840,000.00	840,000.00
Preston East Dome	1940–50	$ 4,965,000.00	
	1951	180,000.00	
	1952	240,000.00	
	1953	240,000.00	$ 5,625,000.00
Rea	1915	$ 12,000.00	$ 12,000.00
Vipond	1927	$ 67,500.00	$ 67,500.00
Totals	1912–50	$282,823,734.19	
	1951	6,802,509.75	
	1952	6,962,445.92	
	1953	6,385,452.54	$302,974,142.40

LARDER LAKE AREA, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1940–53

Mine	Years	Value	Total
Chesterville	1940–43, 1947–49	$ 876,457.30	$ 876,457.30
Kerr-Addison	1940–50	$ 18,164,355.84	
	1951	3,784,240.80	
	1952	3,784,240.80	
	1953	3,784,240.80	$ 29,517,078.24
Totals	1940–50	$ 19,040,813.14	
	1951	3,784,240.80	
	1952	3,784,240.80	
	1953	3,784,240.80	$ 30,393,535.54

MATACHEWAN AREA, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1939–53

Mine	Years	Value	Total
Matachewan Consolidated	1940, 1946–49	$ 498,475.04	$ 498,475.04
Young-Davidson	1939–46, 1948–52	$ 475,232.40	
	1953	15,841.08	$ 491,073.48
Totals	1939–44, 1946–52	$ 973,707.44	
	1953	15,841.08	$ 989,548.52

KIRKLAND LAKE BELT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1915–53

Mine	Years	Value	Total
Kirkland Lake Gold	1934–50	$ 5,318,817.16	
	1951	159,800.97	
	1952	159,800.97	
	1953	53,266.99	$ 5,691,686.09
Lake Shore	1918–50	$101,460,000.00	
	1951	700,000.00	
	1952	600,000.00	
	1953	200,000.00	$102,960,000.00
Macassa	1934–47, 1949, 1950	$ 8,013,313.66	
	1951	321,368.16	
	1952	294,587.48	
	1953	214,245.44	$ 8,843,514.74
Sylvanite	1930–50	$ 10,112,967.50	
	1951	395,940.00	
	1952	263,960.00	
	1953	329,950.00	$ 11,102,817.50
Teck-Hughes	1926–50	$ 44,536,296.32	
	1951	721,071.60	
	1952	721,071.60	
	1953	721,071.60	$ 46,699,511.12
Tough-Oakes	1915, 1916	$ 398,625.00	$ 398,625.00
Toburn	1934–46	$ 2,349,500.00	$ 2,349,500.00
Upper Canada	1940–50	$ 2,307,241.83	
	1951	163,744.56	
	1952	163,744.47	
	1953	130,993.08	$ 2,765,723.94
Wright-Hargreaves	1922–28, 1930–50	$ 48,097,500.00	
	1951	715,000.00	
	1952	660,000.00	
	1953	770,000.00	$ 50,242,500.00
Totals	1915, 1916, 1918–50	$222,594,261.47	
	1951	3,176,925.29	
	1952	2,863,164.52	
	1953	2,419,527.11	$231,053,878.39

ALGOMA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1941–53

Mine	Year	Value	Total
Cline Lake	1941	$ 64,200.20	$ 64,200.20
Total	1941	$ 64,200.20	$ 64,200.20

KENORA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1940–53

Mine	Years	Value	Total
Wendigo	1940–42, 1944, 1945	$ 686,440.24	$ 686,440.24
Total	1940–42, 1944, 1945	$ 686,440.24	$ 686,440.24

THUNDER BAY DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1935–53

Mine	Years	Value	Total
Hard Rock	1939–43	$ 926,922.94	$ 926,922.94
Leitch	1937–50	$ 2,852,154.95	
	1951	233,000.40	
	1952	233,000.40	
	1953	203,875.35	$ 3,522,031.10
Little Long Lac	1936–46	$ 3,976,965.00	
	1951	110,460.00	
	1952	110,460.00	
	1953	55,230.00	$ 4,253,115.00
MacLeod-Cockshutt	1940–44, 1949, 1950	$ 1,713,394.00	
	1951	286,249.00	
	1952	429,373.50	
	1953	286,249.00	$ 2,715,265.50
Magnet	1940–43	$ 855,000.00	$ 855,000.00
Northern Empire	1935, 1937–43, 1946, 1948–50	$ 1,720,000.00	
	1951	48,000.00	
	1952	100,000.00	$ 1,868,000.00
Sturgeon River	1940–42	$ 219,980.64	$ 219,980.64
Tombill	1939–42	$ 454,000.00	$ 454,000.00
Totals	1935–50	$ 12,718,417.53	
	1951	677,709.40	
	1952	872,833.90	
	1953	545,354.35	$ 14,814,315.18

PATRICIA PORTION OF KENORA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1934–53

Mine	Years	Value	Total
Berens River	1941–42, 1946	$ 520,000.00	$ 520,000.00
Campbell Red Lake	1952	$ 199,975.00	
	1953	199,975.00	$ 399,950.00
Central Patricia	1936–47, 1949	$ 4,700,000.00	$ 4,700,000.00
Cochenour Willans	1940–44, 1946–50	$ 1,893,959.20	
	1951	355,398.60	
	1952	236,932.40	
	1953	118,466.20	$ 2,604,756.40
Gold Eagle	1942	$ 237,450.51	$ 237,450.51
Howey	1934–45, 1947–50	$ 2,760,000.00	
	1953	40,000.00	$ 2,800,000.00
Madsen Red Lake	1940–50	$ 2,483,464.88	
	1951	349,952.80	
	1952	104,985.84	
	1953	419,943.36	$ 3,358,346.88
McKenzie Red Lake	1936–44, 1949, 1950	$ 2,978,249.89	
	1951	88,200.00	$ 3,066,449.89
McMarmac Red Lake	1943	$ 82,000.20	$ 82,000.00

PATRICIA PORTION OF KENORA DISTRICT, DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES, 1934-53—*Continued*

Mine	Years	Value	Total
New Jason	1941	$ 119,960.20	$ 119,960.20
Pickle Crow	1936–50	$ 9,818,425.00	
	1951	313,685.00	
	1952	313,685.00	
	1953	313,685.00	$ 10,759,480.00
Totals	1934–50	$ 25,468,509.88	
	1951	1,107,236.40	
	1952	980,578.24	
	1953	1,092,069.56	$ 28,648,394.08

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES BY AREAS, 1912–53

Year	Porcupine	Kirkland Lake and Larder Lake	Northwestern Ontario	Total
1912	$ 270,000.00			$ 270,000.00
1913	1,170,000.00			1,170,000.00
1914	1,410,000.00			1,410,000.00
1915	2,212,000.00	$ 132,875.00		2,344,875.00
1916	4,326,000.00	265,750.00		4,591,750.00
1917	1,699,542.45			1,699,542.45
1918	1,773,042.45	100,000.00		1,873,042.45
1919	2,086,028.30	100,000.00		2,186,028.30
1920	3,176,928.45	80,000.00		3,256,928.45
1921	4,222,990.20	120,000.00		4,342,990.20
1922	4,938,013.56	492,500.00		5,430,513.56
1923	5,186,271.54	366,250.00		5,552,521.54
1924	5,887,722.00	586,250.00		6,473,972.00
1925	7,083,842.06	1,150,000.00		8,233,842.06
1926	8,510,673.23	2,368,464.40		10,879,137.63
1927	8,453,572.73	3,351,071.60		11,804,644.33
1928	7,164,113.29	5,685,286.40		12,849,399.69
1929	4,955,599.54	5,066,286.40		10,021,855.94
1930	5,195,427.51	5,938,276.40		11,133,703.91
1931	5,227,596.87	8,875,123.60		14,102,720.47
1932	6,145,412.60	10,011,761.40		16,157,174.00
1933	7,572,357.79	10,561,761.40		18,134,119.19
1934	11,931,487.01	13,930,381.29	$ 500,000.00	26,361,868.30
1935	9,946,024.58	14,584,641.49	420,500.00	24,951,166.07
1936	11,021,671.80	16,989,799.66	1,652,900.00	29,664,371.46
1937	12,169,515.61	20,259,963.51	2,714,950.00	35,144,429.12
1938	12,769,209.68	16,299,276.70	3,095,650.10	32,164,136.48
1939	14,201,733.86	15,940,988.92	3,661,785.52	33,804,508.30
1940	15,790,180.65	13,923,696.12	5,127,737.80	34,841,614.57
1941	16,502,343.41	14,134,988.75	4,913,538.85	35,550,871.01
1942	12,274,518.21	9,385,700.83	4,279,842.81	25,940,061.85
1943	11,797,596.96	8,296,861.08	2,447,702.39	22,542,160.43
1944	10,234,169.02	6,983,162.18	2,326,896.93	19,544,228.13
1945	9,494,013.19	5,974,189.44	1,226,213.78	16,694,416.41
1946	8,571,576.05	5,756,141.70	1,338,060.84	15,665,778.59
1947	6,858,213.02	4,813,753.15	1,287,447.29	12,959,413.46
1948	6,519,774.95	4,657,360.65	1,138,036.12	12,315,171.72
1949	6,791,356.14	6,639,665.72	1,552,460.32	14,983,482.18
1950	7,283,215.48	7,812,846.82	2,180,029.30	17,276,091.60
1951	6,802,509.75	6,961,166.09	1,832,469.04	15,596,144.88
1952	6,962,445.92	6,647,405.32	1,853,412.14	15,463,263.38
1953	6,385,452.54	6,203,767.91	1,653,264.99	14,242,485.44
Total	$302,974,142.40	$261,447,413.93	$45,202,898.22	$609,624,454.55

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES TO DECEMBER 31, 1953

Name of company	Date of incorporation	Authorized capital, dollars or shares	Dividends and bonuses paid to end of 1952	Dividends and bonuses paid during 1953	Rate per share, 1953	Total dividends and bonuses paid to Dec. 31, 1953	Date when last dividend or bonus was paid
Aunor Gold Mines, Ltd.	May 19, 1939	$2,000,000	$ 4,660,000.00	$ 320,000.00	16c.	$ 4,980,000.00	Dec. 1, 1953
Berens River Mines, Ltd.	July 2, 1936	$2,000,000	520,000.00			520,000.00	Dec. 23, 1946
Broulan Porcupine Mines, Ltd.	Mar. 18, 1936	$3,000,000	1,360,472.53			1,360,472.53	Apr. 2, 1951
Broulan Reef Mines, Ltd.	June 30, 1951	$5,500,000	845,248.38	178,834.26	3c.	1,024,082.64	Apr. 10, 1953
Buffalo Ankerite Gold Mines, Ltd.	Oct. 5, 1932	$1,000,000	2,763,008.68			2,763,008.68	Jan. 11, 1945
Campbell Red Lake Mines, Ltd.	July 18, 1944	$4,000,000	199,975.00	199,975.00	5c.	399,950.00	July 28, 1953
Central Patricia Gold Mines, Ltd.	Apr. 20, 1931	$2,500,000	4,700,000.00			4,700,000.00	June 30, 1952
Chesterville Larder Lake Gold Mining Co., Ltd.	Mar. 20, 1907	$2,000,000	876,457.30			876,457.30	May 16, 1949
Cline Lake Gold Mines, Ltd.	Aug. 5, 1936	$2,000,000	64,200.20			64,200.20	Feb. 28, 1941
Cochenour Willans Gold Mines, Ltd.	Apr. 19, 1936	$3,000,000	2,486,290.20	118,466.20	4c.	2,604,756.40	July 10, 1953
Coniaurum Mines, Ltd.	July 4, 1929	3,000,000	4,071,611.83			4,071,611.83	May 19, 1952
Consolidated Howey Gold Mines, Ltd.	Mar. 12, 1926	$2,000,000	2,760,000.00	40,000.00	2c.	2,800,000.00	Apr. 1, 1953
Delnite Mines, Ltd.	Oct. 23, 1934	$3,000,000	1,042,568.45	119,150.68	4c.	1,161,719.13	Oct. 1, 1953
Dome Mines, Ltd.	July 7, 1923	$2,000,000	72,888,549.05	1,362,667.60	70c.	74,251,216.65	Oct. 30, 1953
Gold Eagle Gold Mines, Ltd.	Feb. 13, 1934	$3,000,000	237,450.51			237,450.51	Oct. 21, 1942
Hallnor Mines, Ltd.	Apr. 6, 1936	$2,000,000	10,200,000.00	440,000.00	22c.	10,640,000.00	Dec. 1, 1953
Hard Rock Gold Mines, Ltd.	Jan. 6, 1934	$3,000,000	926,922.94			926,922.94	June 21, 1943
Hollinger Consolidated Gold Mines, Ltd.	May 25, 1916	$25,000,000	129,324,400.00	1,180,800.00	24c.	130,505,200.00	Dec. 29, 1953
Kerr-Addison Gold Mines, Ltd.	Nov. 19, 1915	$5,000,000	5,638,419.10	3,784,240.80	80c.	29,517,078.24	Dec. 30, 1953
Kirkland Lake Gold Mining Co. Ltd.	Nov. 19, 1915	$5,000,000	5,638,419.10	53,266.99	1c.	5,691,686.09	Oct. 31, 1953
Lake Shore Mines, Ltd.	Feb. 25, 1914	$2,000,000	102,760,000.00	200,000.00	10c.	102,960,000.00	Dec. 15, 1953
Leitch Gold Mines, Ltd.	July 23, 1935	$3,000,000	3,318,155.75	203,875.35	7c.	3,522,031.10	Nov. 14, 1953
Little Long Lac Gold Mines, Ltd.	Jan. 26, 1933	2,000,000	4,197,885.00	55,230.00	3c.	4,253,115.00	June 12, 1953
Macassa Mines, Ltd.	Apr. 12, 1926	$3,000,000	8,629,269.30	214,245.44	8c.	8,843,514.74	Dec. 15, 1953
McIntyre Porcupine Mines, Ltd.	Mar. 16, 1911	$4,000,000	55,427,431.43	2,394,000.00	$3.00	57,821,431.43	Dec. 1, 1953
McKenzie Red Lake Gold Mines, Ltd.	Feb. 1, 1933	$3,000,000	3,066,449.89			3,066,449.89	Dec. 7, 1951

DIVIDENDS AND BONUSES PAID BY GOLD-MINING COMPANIES TO DECEMBER 31, 1953—*Continued*

Name of company	Date of incorporation	Authorized capital, dollars or shares	Dividends and bonuses paid to end of 1952	Dividends and bonuses paid during 1953	Rate per share, 1953	Total dividends and bonuses paid to Dec. 31, 1953	Date when last dividend or bonus was paid
MacLeod-Cockshutt Gold Mines, Ltd.	Sept. 22, 1933	$3,000,000	2,429,016.50	286,249.00	10c.	2,715,265.50	Dec. 1, 1953
McMarmac Red Lake Gold Mines, Ltd.	July 21, 1939	$3,000,000	82,000.20	.....	.....	82,000.20	May 10, 1943
Madsen Red Lake Gold Mines, Ltd.	Mar. 8, 1935	$3,000,000	2,938,403.52	419,943.36	3c.	3,358,346.88	Dec. 23, 1953
Magnet Consolidated Mines, Ltd.	Apr. 23, 1936	$3,000,000	855,000.00	.....	.....	855,000.00	Dec. 10, 1943
Matachewan Consolidated Mines, Ltd.	July 10, 1933	4,000,000	498,475.04	.....	.....	498,475.04	June 14, 1949
Moneta Porcupine Mines, Ltd.	Oct. 14, 1910	$3,000,000	1,526,316.00	.....	.....	1,526,316.00	Dec. 15, 1947
Naybob Gold Mines, Ltd.	Jan. 3, 1934	$5,000,000	190,912.36	.....	.....	190,912.36	Oct. 15, 1941
New Jason Mines, Ltd.	Nov. 9, 1938	$3,000,000	119,960.20	.....	.....	119,960.20	Dec. 30, 1941
Northern Empire Mines, Co., Ltd.	July 28, 1932	$500,000	1,868,000.00	.....	.....	1,868,000.00	June 30, 1952
Pamour Porcupine Mines, Ltd.	Mar. 7, 1934	5,000,000	4,600,000.00	150,000.00	3c.	4,750,000.00	Dec. 15, 1953
Paymaster Consolidated Mines, Ltd.	Feb. 15, 1930	$9,000,000	949,198.10	.....	.....	949,198.10	Nov. 15, 1949
Pickle Crow Gold Mines, Ltd.	Jan. 8, 1934	$3,500,000	10,445,795.00	313,685.00	10c.	10,759,480.00	June 30, 1953
Porcupine Crown Mines, Ltd.	May 25, 1913	$2,000,000	840,000.00	.....	.....	840,000.00	July 15, 1917
Porcupine Reef Gold Mines, Ltd.	Oct. 4, 1935	$4,000,000	434,473.05	.....	.....	434,473.05	Apr. 2, 1951
Preston East Dome Mines, Ltd.	Jan. 7, 1911	$3,000,000	5,385,000.00	240,000.00	8c.	5,625,000.00	July 15, 1953
Rea Consolidated Gold Mines, Ltd.	Apr. 5, 1911	$1,000,000	12,000.00	.....	.....	12,000.00	1915
Sturgeon River Gold Mines, Ltd.	Aug. 22, 1934	$3,000,000	219,980.64	.....	.....	219,980.64	Apr. 30, 1942
Sylvanite Gold Mines, Ltd.	June 13, 1913	$3,300,000	10,772,867.50	329,950.00	10c.	11,102,817.50	July 2, 1953
Teck-Hughes Gold Mines, Ltd., The	Mar. 2, 1923	$5,000,000	45,978,439.52	721,071.60	15c.	46,699,511.12	Oct. 1, 1953
Toburn Gold Mines, Ltd.	Jan. 24, 1931	$2,000,000	2,349,500.00	.....	.....	2,349,500.00	Nov. 22, 1946
Tombill Gold Mines, Ltd.	Oct. 7, 1935	$2,000,000	454,000.00	.....	.....	454,000.00	Dec. 23, 1942
Tough-Oakes Gold Mines, Ltd.	July 15, 1913	$3,000,000	398,625.00	.....	.....	398,625.00	Dec. 27, 1916
Upper Canada Mines, Ltd.	Apr. 4, 1929	$3,500,000	2,634,730.86	130,993.08	4c.	2,765,723.94	Dec. 29, 1953
Vipond Consolidated Mines, Ltd.	July 17, 1922	$2,500,000	67,500.00	.....	.....	67,500.00	Apr. 15, 1927
Wendigo Gold Mines, Ltd.	Oct. 5, 1933	$2,000,000	686,440.24	.....	.....	686,440.24	May 1, 1945
Wright-Hargreaves Mines, Ltd.	June 16, 1916	5,500,000	49,472,500.00	770,000.00	14c.	50,242,500.00	Oct. 1, 1953
Young-Davidson Mines, Ltd.	Apr. 8, 1926	$3,000,000	475,232.40	15,841.08	1c.	491,073.48	May 15, 1953
Total	.....	.....	$595,381,969.11	$ 14,242,485.44	.....	$609,624,454.55	.....

Labour Statistics

The following figures summarize labour statistics for the gold-mining industry, as reported to the Ontario Department of Mines:

AVERAGE YEARLY WAGE, GOLD-MINING INDUSTRY, 1952 AND 1953

Area or district	1952			1953		
	Number of wage-earners	Wages paid	Average wages per annum	Number of wage-earners	Wages paid	Average wages per annum
Porcupine belt	6,430	$20,327,115	$3,161	5,523	$15,959,211	$2,890
Kirkland Lake area	2,384	7,401,749	3,105	2,251	6,930,778	3,079
Larder Lake area	872	2,847,528	3,266	839	2,679,809	3,194
Matachewan area	248	835,814	3,370	173	545,205	3,151
Sudbury district	142	407,086	2,867	145	421,552	2,907
Algoma district	.....	.....	.....	.....	.....	.....
Thunder Bay district	543	1,716,022	3,160	437	1,414,410	3,237
Patricia portion	1,302	4,073,350	3,129	1,197	3,890,772	3,250
Kenora and Rainy River districts	.....	.....	.....	.....	.....	.....
Southeastern Ontario	.....	.....	.....	.....	.....	.....
Operating but non-producing	71	234,788	3,307	27	73,247	2,713
Total	11,992	$37,843,452	$3,156	10,592	$31,914,984	$3,013

World Output

The figures for the output by the leading gold-producing countries from 1949 to 1953, inclusive, in the following table are from the Year Book of the American Bureau of Metal Statistics, 1953.

OUTPUT BY THE LEADING GOLD-PRODUCING COUNTRIES, 1949–53

Country	[1]1949	[1]1950	[1]1951	[1]1952	1953
NORTH AMERICA:	fine ounces	fine ounces	fine ounces	fine ounces	fine ounces
Canada	4,123,518	4,441,227	4,392,751	4,471,725	4,068,516
Mexico	405,540	408,112	393,420	459,391	458,808
United States	1,996,435	2,375,130	1,996,493	1,937,818	1,990,149
Total North America	6,525,493	7,224,469	6,782,664	6,868,934	6,517,473
CENTRAL AMERICA AND WEST INDIES	242,000	180,000	150,000	125,000	137,800
SOUTH AMERICA:					
Brazil[2]	119,179	131,700	141,397	141,600	115,200
Chile	179,140	185,538	174,864	177,050	130,690
Colombia	359,475	379,412	430,723	422,240	436,045
Ecuador	80,982	83,071	.....	.....	.....
Peru	113,753	147,968	158,270	130,944	128,211
Guiana—British	21,098	13,740	14,689	24,223	20,966
—Dutch	3,794	4,546	6,494	6,134	.....
—French	14,757	12,249	12,056	8,231	.....
Venezuela	61,377	34,462	2,861	4,797	2,730
Other South America	*21,500	*14,000	*16,300	*17,000	.....
Total South America	975,055	1,006,686	957,654	932,219	.....
EUROPE	400,000	400,000	400,000	300,000	.....

OUTPUT BY THE LEADING GOLD-PRODUCING COUNTRIES, 1949–53—*Continued*

Country	1949	1950	1951	1952	1953
AUSTRALIA:					
New South Wales	51,793	51,350	48,910	39,030	26,720
Queensland	76,282	88,249	78,580	85,756	91,477
Victoria	68,426	67,826	66,063	66,777	63,583
Western Australia	648,426	610,333	648,245	727,469	823,331
Tasmania	12,152	15,578	14,446	16,072	15,531
Other Australia	13,979	36,201	39,307	45,331	53,804
Total Australia (Commonwealth)	889,058	869,537	895,551	980,435	1,074,446
New Guinea	93,045	80,099	94,082	127,431	120,568
New Zealand	84,874	76,527	75,115	59,373	37,656
Fiji	104,036	103,412	93,635	95,000	.....
ASIA:					
China	60,000	108,000	100,000	100,000	.....
India	164,151	196,848	226,233	253,264	223,013
Japan	84,492	135,033	177,472	201,392	227,795
Korea[3]	3,418	5,144	1,000	15,657	.....
Philippines Republic	287,844	333,991	393,602	469,408	480,625
Saudi Arabia	66,835	66,202	73,104	69,394	.....
Other Asia	*123,200	*104,800	*128,700	*300,000	.....
Total Asia	789,940	950,018	1,100,111	1,409,115	.....
AFRICA:					
Bechuanaland	256	261	493	1,245	.....
Belgian Congo	333,847	339,408	352,302	368,749	371,011
British West Africa[4]	681,721	695,457	697,434	715,036	735,382
Ethiopia	45,102	43,524	32,938	27,291	.....
French Cameroons	8,931	7,169	5,420	2,604	1,029
French Equatorial Africa	57,259	54,996	52,848	51,504	54,173
Kenya	20,072	24,402	19,765	14,800	9,590
Liberia	14,656	11,025	9,806	949	.....
Madagascar	2,508	1,935	1,961	1,768	1,640
Rhodesia	528,180	511,163	486,907	496,731	501,057
Tanganyika	68,989	65,127	65,583	64,693	69,886
Transvaal, Cape Colony, and Natal	11,708,013	11,663,713	11,516,450	11,818,681	11,939,593
Uganda	871	586	223	181	572
Other Africa	23,800	19,800	23,700	25,000	.....
Total Africa	13,494,205	13,438,566	13,265,830	13,589,232	.....
RUSSIA[5]	7,000,000	8,000,000	9,500,000	9,500,000	.....
TOTAL WORLD	30,597,706	32,329,323	33,314,642	33,986,739	.....

[1]The compilations contain some preliminary data, and conjectural figures (*) have been inserted where necessary.

[2]Beginning in 1945, mined gold only; production of alluvial gold unknown.

[3]South Korea only.

[4]Comprising Gold Coast, Sierra Leone, and Nigeria.

[5]As reported by Director of the Mint.

Maximum Canadian production.....5,345,179 ounces in 1941
Maximum Russian production.....9,500,000 ounces in 1951
Maximum United States production.....5,980,746 ounces in 1941
Maximum Transvaal, Cape Colony, and Natal production.....14,386,361 ounces in 1941
Maximum world production.....40,925,330 ounces in 1940

Gold-Milling Plants

The rated daily capacity of gold-milling plants in Ontario was estimated at 31,318 tons in 1953. The daily operating average reported to the Statistics Branch of the Department totalled 27,158 tons, and the capacity of idle plants was 700 tons.

TONNAGE OF GOLD-MILLING PLANTS IN ONTARIO, 1953

Area and mine	Rated daily capacity	Daily operating average	Idle plants
	tons	tons	tons
LARDER LAKE AREA:			
Kerr-Addison	4,000	4,502	
KIRKLAND LAKE BELT:			
Kirkland Lake Gold	400	308	
Lake Shore	1,500	648	
Macassa	400	395	
Sylvanite	600	465	
Teck-Hughes	600	623	
Toburn	200	50	
Upper Canada	500	501	
Wright-Hargreaves	750	527	
PORCUPINE BELT:			
Aunor	300	488	
Broulan Reef	650	517	
Buffalo Ankerite (2 mills)	1,000	13	
Coniaurum	500	334	
Delnite	520	447	
Dome	1,850	1,909	
Hallnor	400	363	
Hollinger	3,900	3,529	
McIntyre Porcupine	2,400	2,343	
Pamour	1,719	1,719	
Paymaster-Consolidated	600	442	
Preston East Dome	800	667	
Ross (Hollinger)	300	315	
MATACHEWAN AND WEST SHININGTREE AREAS:			
Matachewan Consolidated	1,000	448	
Young-Davidson	1,050	887	
SUDBURY DISTRICT:			
Renabie	450	461	
THUNDER BAY DISTRICT:			
Leitch	120	105	
Little Long Lac	300	227	
MacLeod-Cockshutt	1,500	1,243	
Magnet			150
Theresa	100		
PATRICIA PORTION:			
Campbell Red Lake	400	495	
Central Patricia			400
Cochenour Willans	225	169	
McKenzie Red Lake	240	231	
Madsen Red Lake	800	780	
New Dickenson	344	344	
New Jason			150
Pickle Crow	400	235	
Starratt Olsen	500	428	
Total	31,318	27,158	700

Nickel-Copper and Platinum Metals

The total value of all metals contained in the shipment of 14,982,227 tons of ore from the nickel-copper mines of the Sudbury district in 1953 amounted to $264,402,309, a gain of 7.33 percent over the previous year's value of $246,335,735. Nickel output was 287,303,892 pounds, which is the highest since 1943 when 287,963,545 was obtained. The rise in the price of nickel during the years can be seen when the 1953 value of $160,446,908 is compared with the value of $71,664,379 in 1943. The highest copper production from these mines occurred in 1940 when 347,485,369 pounds, valued at $34,697,281, were shipped. The output of copper in 1953 from the same source was 260,298,570 pounds worth $77,328,132. The total shipment of nickel, which included material contained in silver-cobalt ores and shipped by Deloro, was 287,385,777 pounds, worth $160,491,126. The total shipment of copper from all sources was 261,164,653 pounds valued at $77,587,440. This includes output from New Ryan Lake Mines, Limited, and concentrates from Lake Shore and Wright-Hargreaves gold mines and from silver-cobalt ores.

As well as the precious metals, the nickel-copper ores yield selenium, tellurium, and cobalt. The value of selenium was $389,332, and tellurium $7,919; and the 1,489,921 pounds of cobalt in the form of metal and cobalt oxide amounted to $3,761,963.

General Statistics

The nickel-copper mines of the Sudbury district employed in their mines, smelters, and refineries 2,173 salaried persons, who received $11,294,198 in salaries, and an average of 18,202 wage-earners, who were paid $70,490,242 in wages. Total fuel and electricity costs were $18,303,287, and process supplies $21,635,675.

NICKEL-COPPER MINING AND SMELTING, 1949–53

	1949	1950	1951	1952	1953
	tons	tons	tons	tons	tons
Ore shipped	10,923,823	10,777,859	12,885,455	14,380,684	14,982,227
Ore treated	10,919,950	10,786,506	12,870,547	14,348,126	14,881,098
Copper in blister produced in Ontario	104,000	108,802	120,339	115,699	119,856
Nickel produced in Ontario[1]	80,101	82,816	88,045	88,848	92,806
Matte exported[2]	72,392	60,229	71,973	78,324	77,045
Nickel content of matte exported	48,509	40,775	48,259	51,475	49,626
Copper content of matte exported	8,363	8,395	8,301	9,416	10,294

[1] Previously published figures did not include nickel oxide sinter produced at Copper Cliff.

[2] Prior to 1918, when refining in Canada began at Port Colborne, Ont., all matte was exported. The British America Nickel Corporation commenced refining operations at Deschenes, Que., in 1920, and finally closed down in July, 1924. Every year since, and including 1934, relatively small quantities of revert material were brought back to Canada for treatment. These have been deducted.

Operations at the Mines

International Nickel Company of Canada, Limited.—Development of all underground workings continued during the year, and the open pit at the Frood mine is still being operated. It now appears that this pit will be worked until about 1956. Production of ore from the Stobie section of the Frood-Stobie mine was almost doubled, and regular hoisting operations were begun in the new No. 8 shaft. Extension of the No. 2 shaft at the Garson mine below the 3,200-foot level was completed to a depth of 4,243 feet. At the Levack mine, excavations at the 2,650-foot level for temporary hoist-rooms for sinking to the 4,000-foot

STATISTICAL SYNOPSIS OF THE NICKEL-COPPER INDUSTRY IN ONTARIO, 1951–53

Year	Number of producing companies	Number of plants in Ontario	Dividends paid	Salaried employees		Wage-earners		Selling value of products	
				Number	Salaries	Number	Wages	Kind	Value
1951	2	7 mines[1] 3 smelters 2 refineries	$41,542,262	719 879 287	$ 3,603,544 3,704,135 1,292,753	8,978 5,351 2,297	$30,885,294 17,497,706 7,073,715	Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold (standard) Exchange Silver Platinum metals Selenium and tellurium Cobalt oxide	$ 53,332,994 87,024,046 10,832,942 4,100,743 66,667,608 835,018 653,501 1,066,718 22,490,536 278,599 1,360,190
Total			$41,542,262	1,885	$ 8,600,432	16,626	$55,456,715		$248,642,895
1952	4	12 mines[2] 3 smelters 2 refineries	$41,608,768	791 896 306	$ 4,316,829 4,408,772 1,498,964	9,748 5,667 2,289	$36,310,121 20,403,537 8,089,975	Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold Silver Platinum metals Selenium and tellurium Cobalt oxide	$ 54,357,284 84,269,593 12,999,561 4,802,161 66,040,997 1,497,223 1,028,539 18,475,723 274,835 2,589,819
Total			$41,608,768	1,993	$10,224,565	17,704	$64,803,633		$246,335,735
1953	5	13 mines[1] 3 smelters 2 refineries	$38,054,482	868 992 313	$ 4,952,119 4,776,229 1,565,850	10,132 5,802 2,268	$40,354,953 21,792,505 8,342,784	Nickel in matte Metallic nickel Nickel oxide and salts Copper in matte Converter copper Gold (standard) Silver Platinum metals Selenium and tellurium Cobalt oxide	$ 53,760,841 94,259,028 12,427,039 5,558,504 71,769,628 1,367,645 1,054,020 20,046,390 397,251 3,761,963
Total			$38,054,482	2,173	$11,294,198	18,202	$70,490,242		$264,402,309

[1]Includes the Crean Hill mine of International Nickel Company of Canada, Limited, which was active but non-producing.
[2]Includes the Crean Hill mine of International Nickel Company of Canada, Limited, the Hardy mine of Falconbridge Mines, Limited, and Coldstream Copper Mines, Limited, which were active but non-producing.

level were completed at the No. 3 shaft and started at the No. 2 shaft. Production continued, and development work was extended at the Murray mine. At the Crean Hill mine, which has not begun to produce yet, development work continued.

Falconbridge Nickel Mines, Limited.—The Falconbridge, McKim, and Hardy mines all provided material for production. Shaft-sinking was going forward at the East mine and the Mount Nickel mine. Work was begun in May on the property of the Fecunis Lake mine, and a road was built into the Strathcona property, two miles north of Fecunis Lake, during the summer. This enabled surface work and diamond-drilling to be done, and a cookery and bunk-house were constructed there.

East Rim Nickel Mines, Limited.—Development work continued on all three levels of this mine, and a new crusher-house and mill were built during the year. Concentrates and ore were trucked to Falconbridge for treatment.

Milnet Mines, Limited.—Ore was mined from the 1st and 2nd levels, and development work was done on the 3rd level. The ore was shipped to Falconbridge for treatment.

Nickel Offsets, Limited.—Development from No. 1 shaft continued during the year, and the No. 2 shaft was reopened to the 300-foot level. Shipments of concentrates were made to Falconbridge.

Dividends

The International Nickel Company of Canada, Limited, and Falconbridge Nickel Mines, Limited, the two producing companies, paid dividends amounting to $38,054,482 in 1953. This brings the grand total of dividends paid by these companies to the end of 1953 to $749,036,053, or 50.2 percent of all dividends paid by the metal-producing mines in Ontario since the beginning of operations.

DIVIDENDS PAID BY NICKEL COMPANIES TO END OF 1953[1]

Company	Period	To end of 1952	1953
Canadian Copper Company	1894–1901	$ 1,975,000.00	.....
International Nickel Company — preferred	1906–28	12,299,273.00	.....
International Nickel Company — common	1909–28	65,811,694.00	.....
International Nickel Company of Canada, Limited — preferred	1929–52	46,192,887.80	$ 1,933,898.75
International Nickel Company of Canada, Limited — common	1929–52	540,405,394.76	34,258,697.15
Falconbridge Nickel Mines, Limited	1933–52	18,006,195.22	1,861,886.00
Total	.....	$684,690,444.78	$38,054,481.90
Mond Nickel Company — deferred	1906–14	£ 264,043	.....
Mond Nickel Company — preferred	1904–29	2,556,359	.....
Mond Nickel Company — ordinary	1905–29	2,581,984	.....
Total	.....	£ 5,402,386 or $ 26,291,126	.....
Grand total	.....	$710,981,570.78	$38,054,481.90

[1]For previous historical data, see Vol. LXI, 1952, pt. 1, p. 41.

Production of Precious Metals

Gold, silver, and the metals of the platinum group are recovered in the refining of nickel-copper ores. In 1953, recovery amounted to 39,726 ounces of gold, worth $1,367,645; 1,254,637 ounces of silver, valued at $1,054,020; and a total of 303,563 ounces of platinum metals with an aggregate value of $20-046,390. The average price of platinum for the year was a little higher than in 1952, whereas the price of ruthenium and iridium dropped slightly.

PRECIOUS METALS RECOVERED, 1949–53

	1949	1950	1951	1952	1953
	ounces	ounces	ounces	ounces	ounces
Platinum metals:					
Platinum	153,691	124,453	153,461	122,315	137,545
Palladium	135,594	109,560	126,708	119,568	127,689
Rhodium, ruthenium, and iridium	46,631	39,170	38,197	37,839	38,329
Total ounces	335,916	273,183	318,366	279,722	303,563
Value	$19,885,049	$17,822,766	$22,490,536	$18,475,723	$20,046,390
Gold ounces	35,748	36,264	40,394	43,689	39,726
Silver ounces	1,202,989	1,045,106	1,128,205	1,231,047	1,254,637

Silver-Cobalt

The producing mines in the Cobalt and Gowganda areas shipped 2,819 tons of ore and concentrates, which contained 3,536,364 ounces of silver, valued at $2,970,900, and 112,624 pounds of cobalt, worth $251,114. These ores and concentrates were treated at Deloro Smelting and Refining Company, Limited, Deloro; at Noranda Mines, Limited, Noranda, Quebec; and at Kennametal Incorporated, Latrobe, Penn., U.S.A.

Total production of silver from all sources was 5,154,617 ounces, having a value of $4,331,199. In addition to the output from the silver-cobalt mines, this was made up of silver contained in the nickel-copper ores of the Sudbury district and from the gold mines. Small amounts were reported from the Matarrow operation of Matachewan Consolidated Mines, Limited, a silver-lead-zinc property and from New Ryan Lake Mines, Limited, a copper-gold-silver property, both in the Matachewan area.

The total cobalt production was 1,602,545 pounds, valued at $4,013,077, and was made up of shipments from the silver-cobalt and nickel-copper mines.

Deloro and the silver-cobalt mines report employing 159 salaried personnel, who were paid $461,813 in salaries, and 834 wage-earners, who received $2,586,428. Fuel and electricity costs were $578,667, and process supplies amounted to $859,738.

Cobalt Consolidated Mining Corporation, Limited, worked their Agaunico and Cobalt Lode properties as well as their mill, the former Colonial mill, all year. Dewatering of the workings and further development was done on other properties that were non-producing. Harrison-Hibbert Mines, Limited, operated their mine all year and shipped the concentrates to Deloro and Noranda for treatment. Mensilvo Mines, Limited, were in operation all year and shipped to Deloro and Kennametal Incorporated, Latrobe, Penn., U.S.A. Silver-Miller Mines, Limited, reported that the mine and mill were in operation all year, and that shipments were made to Deloro and Noranda. Development work was done on their Brady Lake, La Rose, and Lawson properties. United Cobalt Mines, Limited, ran its reduction mill from the first of the year to the middle of February, and from June to the end of the year. Approximately 18,822 tons of ore and 452 tons of concentrates were treated for their customers. Castle-Trethewey Mines, Limited, operated the mine all year, and the mill from May. Shipments of concentrates were made to the Deloro and Noranda refineries. Operations were carried out on the property in Mickle township of Cotley Mines, Limited, from May until November. Silver ore and concentrates were shipped to the mill of Siscoe Metals, of Ontario, Limited, and to Deloro. Lost Lake Mines, Limited, a

SHIPMENTS FROM SILVER MINES, SMELTERS, AND REFINERIES, 1904–53

Year	Bismuth		Copper[1]		Lead[1]		Nickel[2]		Cobalt[3]		Arsenic		Silver		Total
	tons		tons		tons		tons		tons		tons		ounces		
1904–1925[4]	[5]25	$ 82,796	669	$231,383	141	$17,623	5,180	$ 927,695	[6]12,227	$16,398,380	55,173	$4,560,796	363,774,234	$226,296,692	$248,515,365
1926	3	6,440	35	5,394	11	1,463	83	30,051	332	1,136,014	2,025	135,549	8,981,557	5,541,009	6,855,920
1927	1	1,003	20	2,940	3	312	100	52,829	440	1,764,534	2,481	197,668	8,883,829	4,970,194	6,989,480
1928	7	5,067	38	15,764	27	2,169	111	57,039	477	1,671,900	2,049	178,149	6,688,454	3,882,570	5,812,658
1929	13	23,413	13	3,098	3	267	115	63,167	464	1,801,915	1,871	154,887	7,970,540	4,239,980	6,286,727
1930	6	6,366	23	5,070	22	1,748	53	27,455	347	1,143,631	1,375	109,928	9,109,885	3,460,247	4,754,445
1931	4	3,532	29	5,438	40	2,529	47	31,650	261	651,179	1,788	135,170	5,415,655	1,546,888	2,376,386
1932	8	7,289	18	2,152	43	1,756	33	17,772	245	587,957	1,212	98,914	5,106,888	1,592,893	2,308,733
1933	4	3,731	19	2,802	20	692	71	41,730	200	576,465	734	56,534	3,939,990	1,387,749	2,069,703
1934	4	3,444	12	.....	10	525	85	47,393	297	592,497	824	56,412	3,268,740	1,531,719	2,231,990
1935	3	6,796	18	2,804	11	706	118	65,784	341	512,705	1,279	75,326	3,625,143	2,326,447	2,990,568
1936	2	3,516	14	3,445	9	450	152	70,600	444	805,580	683	42,491	2,244,435	990,476	1,916,648
1937	3	5,654	23	6,057	15	1,525	82	55,348	253	848,145	695	41,032	1,823,452	806,343	1,764,104
1938	5	9,754	15	2,910	11	748	70	38,768	229	790,913	1,088	56,538	4,316,558	1,865,798	2,765,429
1939	.....	.....	22	4,517	4	16	113	59,362	366	1,213,454	871	52,257	1,496,861	599,405	1,929,011
1940	9	24,620	5	1,093	.....	.....	173	95,069	397	1,235,220	1,047	62,798	1,282,873	491,571	1,910,371
1941	4	10,379	.....	.....	.....	.....	141	84,964	132	255,904	1,444	14,792	573,111	220,369	686,408
1942	1	3,219	.....	.....	.....	.....	12	1,513	42	88,448	702	152,331	854,735	390,554	636,065
1943	.....	.....	7	1,759	.....	.....	24	8,828	88	191,407	204	32,924	143,151	66,257	301,175
1944	.....	.....	.....	64	.....	.....	5	1,726	18	34,106	179	26,922	688,255	295,949	358,767
1945	.....	.....	2	637	.....	.....	28	10,105	55	90,026	112	12,352	481,420	211,427	324,547
1946	.....	.....	6	1,321	.....	.....	16	5,641	38	64,471	163	16,684	290,667	252,836	340,953
1947	.....	.....	6	2,147	.....	.....	17	8,230	221	779,010	.....	.....	481,950	358,561	1,147,948
1948	3	10,724	49	18,925	3	1,099	139	87,936	606	2,189,391	384	55,663	1,009,003	756,092	3,119,830
1949	.....	.....	.....	.....	.....	.....	80	54,589	97	346,208	88	8,797	955,445	709,418	1,119,012
1950	.....	.....	7	3,471	.....	.....	19	17,911	71	302,150	124	16,220	2,945,256	2,380,356	2,720,108
1951	8	34,048	8	4,826	.....	.....	25	27,880	132	639,422	858	94,406	2,959,988	2,798,669	3,599,251
1952	.....	.....	28	15,872	.....	.....	38	40,249	115	637,084	794	71,477	4,845,081	4,046,611	4,811,293
1953	.....	.....	21	12,663	.....	.....	41	44,218	56	251,114	702	56,150	3,536,364	2,970,900	3,335,045
Total	113	$251,791	1,107	$356,552	373	$33,718	7,171	$2,075,502	18,991	$37,599,230	80,949	$6,673,167	457,693,520	$276,987,980	$323,977,940

[1]Copper and lead are recovered from certain silver ores and concentrates shipped to United States refineries.
[2]Nickel metal and metallic contents of all nickel compounds.
[3]Cobalt metal and metallic contents of all cobalt compounds and cobalt contained in ores and speiss residues exported. In 1932, it includes 22,258 pounds worth $10,024 from northwestern Ontario.
[4]Prior to 1914 an estimate based on assays was made of the nickel, cobalt, and arsenic in the ores. Since that date recoveries have been reported.
[5]Recoveries of bismuth from base bullion were not reported prior to 1923.
[6]Includes 460 tons of speiss residues, worth $153,116, shipped in 1922.

wholly-owned subsidiary of Siscoe Metals, took over the property in Nicol township formerly owned by New Morrison Mines, Limited. The ore was milled at Siscoe Metals, and the concentrates shipped to Deloro and Noranda. Siscoe Metals operated their mine and mill throughout the year and milled 78,666 tons of ore. This was made up of freshly mined ore, ore from the surface dump, and tailings.

SILVER PRODUCTION, 1952 AND 1953

Source	1952		1953	
	Fine ounces	Value	Fine ounces	Value
Sales of bullion by the reduction companies, smelters, and mines; Contained in silver-cobalt concentrates and residues exported from Canada; Estimated as recovered from concentrates treated in other provinces	4,845,081	$4,046,611	3,537,324	$2,971,706
In crude gold bullion	408,731	336,265	355,550	299,501
Recovered by nickel-copper refineries	1,231,047	1,028,539	1,254,637	1,054,020
In copper-gold-silver ores	2,917	2,436	5,712	4,799
In silver-lead-zinc ores	3,348	2,796	1,396	1,173
Total	6,491,124	$5,416,647	5,154,619	$4,331,199

Iron Ore, Pig Iron, and Steel

Algoma Ore Properties, Limited, and Steep Rock Iron Mines, Limited, shipped a total of 2,832,090 tons of iron ore and sintered concentrates, valued at $23,137,997, in 1953. This is an increase of 4.22 percent in tons shipped and 17.85 percent in value when compared with 2,717,490 tons, worth $19,632,551, which was the production in 1952.

IRON AND STEEL STATISTICS, 1949–53[1]

Year	Domestic ore smelted[2]	Foreign ore smelted[2]	Limestone for flux (pig iron)	Pig iron produced	Steel made
	tons	tons	tons	tons	tons
1949	228,871	2,827,421	753,762	1,681,600	2,365,201
1950	414,725	2,774,801	574,266	1,804,092	2,526,770
1951	570,412	3,168,571	669,367	2,066,993	2,619,072
1952	705,000	3,442,000	738,000	2,286,000	2,800,000
1953	509,000	3,914,000	824,000	2,572,000	3,264,000

[1]Figures supplied by the Dominion Bureau of Statistics.
[2]In the production of pig iron.

These companies employed 216 salaried personnel, who were paid $1,116,-809, and 1,650 wage-earners, who received $6,824,644 in wages. Fuel and electricity costs were $2,112,428, and process supplies amounted to $1,138,006.

Two non-producing companies had 242 employees to whom was paid a total of $818,076 in salaries and wages. Bethlehem Mines Corporation, the property being at Marmora, Hastings county, was very active all year, stripping the overlaying limestone from the iron orebody and constructing office and plant buildings.

At the Helen mine of Algoma Ore Properties, Limited, the ore is extracted from underground by block-cave method. At the Victoria mine, which lies east of the Helen, the open-pit method of development and mining has been followed, and this ore is sintered with the Helen ore.

During 1953 at Steep Rock Iron Mines, Limited, the initial part of the expansion program was completed. In August the new Hogarth open pit came into commercial production. Previously, the entire production had been taken from the Errington open pit. The Errington No. 1 underground mine, meanwhile, is being prepared for production by block-caving method since the open pit is near exhaustion.

IRON BLAST FURNACES IN OPERATION, 1953

Company	Stacks operating	Furnaces		Location
		Number of stacks	Annual capacity	
			tons	
Algoma Steel Corporation, Ltd.	5	5	1,057,000	Sault Ste. Marie.
Canadian Furnace Co., Ltd.	2	2	223,000	Port Colborne.
Dominion Foundries and Steel, Ltd.	1	1	320,000	Hamilton.
Steel Company of Canada, Ltd.	3	4	1,250,000	Hamilton.

PIG IRON, STEEL, AND FERRO-ALLOY PRODUCERS, 1953

Company	Location	Products
Algoma Steel Corporation, Ltd.	Sault Ste. Marie.	Pig iron, steel
Atlas Steels, Ltd.	Welland	Steel
Burlington Steel Co., Ltd.	Hamilton	Steel
Canadian Carborundum Co., Ltd.	Niagara Falls	Ferro-silicon
Canadian Electric Castings, Ltd.	Orillia	Steel
Canadian Furnace Co., Ltd.	Port Colborne	Pig iron
Chromium Mining and Smelting Corporation, Ltd.	Sault Ste. Marie.	Ferro-alloys
Dominion Foundries and Steel, Ltd.	Hamilton	Pig iron, steel
Electro-Metallurgical Co. of Canada, Ltd.	Welland	Ferro-alloys
Exolon Co., Ltd.	Thorold	Ferro-silicon
Fahralloy Canada, Ltd.	Orillia	Steel
Ford Motor Co. of Canada, Ltd.	Windsor	Steel
Hayward Tyler of Canada, Ltd.	Kitchener	Steel
Lionite Abrasives, Ltd.	Niagara Falls	Ferro-silicon
Norton Co.	Chippawa	Ferro-silicon
Sheepbridge Engineering (Canada) Ltd.	Guelph	Steel
Steel Co. of Canada, Ltd.	Hamilton	Pig iron, steel
Welland Electric Steel Foundry	Welland	Steel
William Kennedy and Sons, Ltd.	Owen Sound	Steel

Lead and Zinc

Matachewan Consolidated Mines, Limited, at their Matarrow operation in Yarrow township produced lead valued at $84,892 and zinc worth $20,546, during 1953. The mine operated in January and employed an average of 34 wage-earners, who were paid a total of $22,400 in wages. Fuel and electricity costs were $5,524, and process supplies $18,000.

Calcium and Magnesium

Dominion Magnesium, Limited, operated their plant at Haley Station, Renfrew county, continuously during the year. The combined production of calcium and magnesium amounted to $5,295,840, or an increase of 10.04 percent over the previous year's value. An average of 31 men were employed and received $84,816 in wages. Fuel and electricity amounted to $419,277, and the cost of process supplies was $10,562.

Tungsten

Hollinger Consolidated Gold Mines, Limited, reported shipping tungsten concentrates valued at $132,685. This is a by-product of their gold mining operations.

NON-METALLIC MINERALS

Arsenic

Deloro Smelting and Refining Company, Limited, at Deloro recovers arsenic as a by-product in the treatment of silver-cobalt ores. The production of arsenic in 1953 was 1,403,740 pounds valued at $56,150, slightly less than for the previous year. In Canada arsenic is used chiefly as a decolourizing agent in the manufacture of glass.

Asbestos

The Canadian Johns-Manville mine in Munro township was the only producer of asbestos in Ontario during the year, the output being valued at $3,965,299, compared with $3,862,653 in 1952. The fibre, being of a coarse texture, is used in the manufacture of asbestos cement products. The company employed 45 salaried personnel, who were paid a total of $164,851, and 236 wage-earners, who received $951,502 in wages. Fuel and electricity costs amounted to $233,984, and process supplies to $185,693.

Diatomite

A small shipment of diatomite was made from a property in the Muskoka district, the value of which was $12,000. This material is used as a filler and absorber in the making of paints, paper, rubber, and cosmetics, but very little has been mined in Ontario, and this is the first reported since 1939.

Feldspar

Feldspar shipments were reported by four producers, two in the Parry Sound area and two in Frontenac county, eastern Ontario. Shipments amounted to 2,655 tons valued at $28,018, compared with 3,622 tons worth $37,628 in 1952. Feldspar is used by the ceramic trade in the manufacture of scouring soaps and cleansers, and by the dental trade in the making of artificial teeth.

Fluorspar

There was only one shipper of fluorspar during the year, Huntingdon Fluorspar Mines, Limited, whose property is in Huntingdon township, eastern Ontario. The production was valued at $38,887, and the shipments were all consigned to Canadian steel mills. The steel industry uses it as a powerful fluxing agent, and it is also used in the manufacture of aluminium fluoride for the aluminium industry. One salaried official and 14 wage-earners were employed and were paid a total of $12,794. Fuel and electricity cost $1,344, and process supplies $3,199.

Graphite

Production of graphite from the Black Donald mine in Renfrew county rose in value to $366,528 from last year's value of $255,732, or 43 percent. This was made up of 281 tons of flake, 235 tons of dust, and 2,950 tons of amorphous grades. Natural graphite is used by the iron and steel industry in the form of crucibles and foundry facings. Graphite is also used as a lubricant, as a conductive filler for dry batteries, in pencils, and as a polishing agent. Considerable quantities have been used more recently as a moderator in atomic piles. The company employed an average of 57 wage-earners, who were paid a total of $162,414. Fuel and electricity costs were $24,711, and process supplies $25,444.

Gypsum

Gypsum, Lime and Alabastine, Canada, Limited, at Caledonia, and Canadian Gypsum Company, Limited, at Hagersville, reported a total production of 334,495 tons of gypsum, valued at $899,630. This was a gain in tons produced, but a drop in value from the previous year. Both these companies mine the rock and then manufacture it into gypsum plasters and wallboards in their own plants. Aside from the manufacturing plants, there were 5 salaried employees, who received a total of $23,467 in salaries, and an average of 213 wage-earners, who were paid $704,515. Fuel and electricity costs were $117,349, and process supplies amounted to $86,943.

GYPSUM SALES, 1949–53

Grade	1949	1950	1951	1952	1953
	tons	tons	tons	tons	tons
Crushed	25,067	16,613	.....	169,308	170,677
Fine-ground	2,967	694	555	109,684	200
Calcined, sold	225	225	18,143	27,153	22,051
Calcined, used in products	174,928	181,782	243,883	251,839	312,444
Total sold or used	203,187	199,314	262,581	278,992	334,495
Total value	$871,467	$875,217	$672,276	$1,060,429	$899,630
Wage-earners[1] ..... number	155	197	180	207	213
Wages paid	$455,018	$515,703	$529,958	$673,234	$704,515

[1]Exclusive of wage-earners employed in the manufacturing division of the Caledonia plant.

Mica

The North Bay Mica Company, Limited, which only operated for part of the year, and one other small producer reported shipping 81,998 pounds of white, or muscovite, mica valued at $51,481. This was a drop of 59 percent in quantity and 52 percent in value from the previous year. Amber mica was shipped by 15 operators, and the total amounted to 384,515 pounds valued at $7,687, which was a little better than last year's production. An average of 45 wage-earners were employed and were paid a total of $64,653 in wages.

SHIPMENTS OF AMBER MICA, 1951–53

Grade	1951		1952		1953	
	Quantity	Value	Quantity	Value	Quantity	Value
	pounds		pounds		pounds	
Ground and rough	.....	.....	.....	.....	7,189	$ 448
Splittings, and knife-trimmed	2,776	$1,719	14,460	$2,554	100,778	2,904
Scrap	227,232	2,185	314,740	2,064	276,548	4,335
Total	230,008	$3,904	329,200	$4,618	384,515	$7,687

Mineral Water

Only one operator, whose spring is in the Ottawa valley, reported any shipments during the year, and the selling value of this amounted to $150.

Natural Gas

Production of natural gas in 1953 reached a total of 9,835,469 M cubic feet and a value of $11,694,595. This is an increase over any year since 1940 when, in the war years, the fields were called upon to produce to their limit. The consumption of gas was 15,956,404 M cubic feet, which exceeds any year since 1917, when in World War I the gas fields were also taxed beyond their capacity. The difference between gas produced and gas distributed, 6,120,935 M cubic feet, was made up by imported natural gas from the United States and a small quantity of liquid petroleum gas. In the past eight years reserves of natural gas have been increased by 150,000,000 M cubic feet.

New natural gas fields were discovered in Lambton county, one in Enniskillen township, and one in Warwick township, which has also a good oil flow. A new small pool was discovered along the Aldborough-Dunwich township line, and an offset well in Ekfrid township, Middlesex county, is also a producer. The remainder of the 151 producing wells drilled were within the limits of known fields. There were in all 288 wells drilled, and 66 of them may be classed as exploratory wells.

The number of domestic consumers is 156,111, an increase of 4,434 over last year. Distributing companies must enlarge their distributing plants in order to keep pace with the growth of municipalities and the demand for natural gas.

NATURAL GAS PRODUCTION BY FIELDS, 1953

County	Field	Quantity
		M cu. ft.
Essex	Kingsville and Leamington	18,874
Kent	Tilbury	1,726,881
	Dover	79,643
	Declute	232,262
	Chatham	86,495
	Camden gore	11,295
	Zone	99,165
Lambton	Dawn	712
	Moore (Kimball-Payne)	4,247,472
	Sombra (Becher)	102,948
Middlesex and Elgin	Mosald	585,371
Elgin	Bayham and Malahide	16,929
Haldimand, Lincoln, Wentworth	Haldimand	1,313,761
Brant	Brant	18,810
Norfolk	Norfolk	517,872
Oxford	Brownsville	19,676
	Norwich	34,032
Welland	Welland	596,771
Private wells		125,500
Total produced		9,835,469
Retail value		$11,694,595
		M cu. ft.
Gas other than natural gas produced in Ontario:		
Imported mixed gas		613,415
Natural gas imported from U.S.A. (Texas panhandle)		5,497,101
Oil gas		1,260
Propane gas		9,159
Total of other gases		6,120,935
Total of all gases distributed		15,956,404

Nepheline Syenite

American Nepheline, Limited, whose mine is at Nephton in Peterborough county, is the sole producer of ceramic-grade nepheline syenite in the western hemisphere. Production for the year amounted to 113,345 tons, valued at $1,576,271, and shipments consisted of glass grade, pottery grade, miscellaneous, and crude. The company employed 29 salaried persons, paying them $142,123 in salaries, and an average of 107 wage-earners, who received $310,210 in wages. Fuel and electricity cost $93,322, and process supplies $25,840.

Nepheline syenite is used widely in the ceramic industry and in the manufacture of glass, floor and wall tile, and refractory cements.

Peat

Atkins and Durbrow (Erie), Limited, with a plant near Port Colborne, and Humar Corporation, Limited, with a plant outside of Dundas, were the two producers of peat during the year. Shipments totalled 2,638,000 pounds, valued at $52,535, and it was used for horticultural purposes. These companies had 3 salaried employees, who were paid a total of $7,333, and an average of 10 wage-earners, who received $28,963 in wages. Fuel and electricity costs were $3,582.

Petroleum

OIL PRODUCTION BY FIELDS, 1946–53

Field	1946	1947	1948	1949	1950	1951	1952	1953
	barrels	barrels	barrels	barrels	barrels	barrels	barrels	barrels
ESSEX COUNTY:								
Tilbury West tp.	.....	.....	609	.....	.....	.....	.....	.....
KENTY COUNTY:								
Dover and Raleigh tps...	4,643	4,545	3,830	3,762	3,714	3,607	2,816	1,362
Bothwell and Thamesville..	18,610	16,025	15,238	17,940	17,067	13,135	12,035	10,227
Harwich tp.....	.....	.....	.....	.....	.....	.....	73	.....
LAMBTON AND MIDDLESEX COUNTIES:								
Sombra tp.....	2,347	20,264	59,846	146,617	140,578	88,651	75,981	62,997
Moore tp.....	259	132	544	301	931	1,683	1,744	2,479
Sarnia tp.....	152	80	124	141	124	144	147	69
Petrolia and Enniskillen tp.	44,343	41,028	40,603	42,632	40,548	39,053	36,330	35,395
Oil Springs.....	27,995	25,683	26,165	25,692	25,310	26,576	26,957	27,067
Plympton.....	28	.....	8	.....	.....	.....	.....	.....
Dawn and Euphemia tps.	238	163	7,312	999	2,281	1,488	2,997	1,246
Brooke tp.....	.....	.....	.....	.....	1,006	746	1,482	.....
Adelaide, Metcalfe, and Warwick tps..	5,400	2,390	2,479	2,010	1,670	1,264	1,345	16,276
Mosa tp.....	17,351	19,165	18,341	18,580	15,494	14,935	15,925	14,290
ELGIN COUNTY:								
Dunwich tp.....	1,621	1,740	1,821	1,929	1,006	1,793	1,923	1,877
Aldborough tp...	.....	.....	.....	.....	.....	4,050	12,043	126,400
BRANT COUNTY:								
Onondaga tp...	89	80	69	67	37	46	16	.....
Total production.....	123,082	131,295	176,989	260,760	250,656	197,171	191,814	299,685
Total value...	$291,719	$349,895	$608,109	$905,143	$892,335	$677,905	$641,400	$1,005,535
Average price.	$2.37	$2.67	$3.44	$3.47	$3.56	$3.43½	$3.35	$3.36

OIL FIELDS AND THEIR PRODUCTION, 1953

County or district	Township or oil field	Number of Wells in Ontario, December 31, 1953										Initial production	Production
		Active	Idle	Abandoned	Reopened	Wells drilled in 1953							
						Dry			Producing				
						Exploratory	Development	Footage	Exploratory	Development	Footage		
												barrels per day	barrels
Essex	Tilbury West tp.		2										
Kent	Bothwell-Thamesville field	102	95	3									10,227
	Chatham tp.	1	1										
	Dover field	5	2										1,302
	Harwich tp.		2										
	Raleigh tp.	1	2	3	1								60
	Romney tp.		2										
Lambton	Brooke tp.		6				1	575					
	Euphemia tp.	7	16				3	1,087		2	602	15	1,246
	Moore tp.:												
	Dundee formation	1	37										33
	Salina-Guelph formation	7	1							2	[1]4,891	25	2,446
	Enniskillen tp.:												
	Petrolia field	378	246	2	1					1	488	1	35,395
	Oil Springs field	629	96	3									27,067
	Plympton tp.		4										
	Sarnia tp.	2	10										69
	Sombra tp.—Becher field	30	6										62,997
	Warwick tp.:												
	Dundee formation	3	23	1						1	400		1,157
	Guelph formation	1	1				3	6,431	1	1	4,089	150	14,836
Manitoulin	Assiginack tp.		2										
Middlesex	Adelaide tp.		6	1									
	Metcalfe tp.	2	9										283
	Mosa tp.	148	56	5		1		429		5	1,920	12	14,290
Elgin	Aldborough tp.	83		1		6	9	7,479		69	29,001	900	126,400
	Dunwich tp.	23	39										1,877
Brant	Onondaga tp.		8										
Total		1,423	672	19	2	7	16	16,001	1	81	36,500	1,103	299,685

[1]These wells produce both oil and gas and have been classified as gas wells.

In 1953 the petroleum industry regained most of its lusty youth, production being greater than in any year since 1910. The oil produced was 299,685 barrels, with a value of $1,005,535, and the average price per barrel was $3.36. The great increase was in the Rodney field in Aldborough township, where 48 percent of the year's oil was produced. There were at the end of 1953, 83 producing oil wells in this field. In Warwick township, one mile northwest of the village of Watford, a "reef" structure was discovered, and one of the largest oil wells since the 1890's was drilled.

There are now 1,423 active and 672 idle oil wells. Total wells drilled in 1953 was 105, of which 23 were dry and 82 producing.

There were 86 oil producers of which 64 were individuals, 13 companies, 6 partnerships, and 3 estates. In addition to the 86 owners, 75 men were employed full time and 35 part time. To these 110 men, $199,000 was paid in wages. Forty-three administrative and office personnel received $136,500 in salaries. Drilling contractors were paid an estimated $137,000.

The completion of the crude-oil pipeline from Alberta to Superior, Wisconsin, on Lake Superior, has given a great impetus to the refining industry, and Canadian crude oil used is now 70 percent of the total. A few years ago it was less than 1 percent. This has had a reverse effect on imports of crude oil and refined products, and a consequent saving of Canadian dollars of $20,504,616.

Two new refineries have been opened, the Sun Oil Company, Limited, at Sarnia and the Riverlake Oils, Limited, at Fort William. Two refined-products lines are in operation from Sarnia to Toronto.

Quartz, Quartzite, and Silica Brick

International Nickel Company of Canada, Limited, and Falconbridge Nickel Mines, Limited, have quarries of their own where silica sand and quartz are mined for use as smelter flux in their respective plants. Electro-Metallurgical Company of Canada, Limited, and Canadian Silica Corporation, Limited, have quarries on Manitoulin Island of white Lorrain quartzite that they ship to steel plants in Canada and the United States. Kingston Silica Mines, Limited, has a quarry of sandstone north of Kingston, and the output from this is used

QUARTZ, QUARTZITE, AND SILICA BRICK, 1949–53

Year	Rock sold or used		Silica brick sold or used		Total value
	Quantity	Value	Quantity	Value	
	tons		M		
1949	1,404,140	$1,020,411	1,194	$148,258	$1,168,669
1950	1,386,833	1,027,791	1,215	174,372	1,010,663
1951	1,545,136	1,496,404	1,217	204,831	1,701,235
1952	1,371,806	1,235,245	1,161	246,108	1,481,353
1953	1,450,770	1,301,048	1,467	313,175	1,614,223

for sand-moulding by the steel industry. A small amount of quartz was shipped by Bathurst Feldspar Mines, Limited, from their quarry near Perth. The total amount of silica sand and quartz shipped during the year was 1,450,770 tons, valued at $1,301,048, only slightly higher than that of the previous year. The industry employed 15 salaried personnel, paying them $73,582, and an average of 108 wage-earners, who received $299,139 in wages. Fuel and electricity costs were $65,508, and process supplies amounted to $130,820.

Silica brick is manufactured by Algoma Steel Corporation, Limited, from the production of their quarry near Sault Ste. Marie. This brick is used by them

in their own steel plant. In 1953, the company used 1,467,000 bricks, valued at $313,175. The brick plant employed an average of 51 wage-earners who were paid $177,559. Fuel and electricity costs amounted to $36,687, and process supplies to $9,153.

Salt

The total salt production for 1953 amounted to 749,046 tons, valued at $3,919,810. This was made up of shipments from six companies that have wells drilled into salt beds at Goderich, Sarnia, Warwick, and Sandwich. These companies had a total of 74 administrative and office employees, who received $250,424 in salaries, and an average of 241 wage-earners, who received $791,672. Fuel and electricity costs amounted to $315,658, and $110,384 was paid out for process supplies.

SALT SOLD OR USED, 1949–53

Schedule	1949	1950	1951	1952	1953
	tons	tons	tons	tons	tons
Fine	167,453	185,292	205,933	208,559	240,556
Coarse	11,437	9,869	7,784	6,995	4,934
Other grades	78,595	96,021	106,269	88,885	45,409
Total	257,485	291,182	319,986	304,439	290,899
Brine (salt equivalent)	349,721	405,400	452,599	452,586	458,147
Total sold or used	607,206	696,582	772,585	757,025	749,046
Value	$3,477,583	$4,639,867	$4,789,990	$4,401,780	$3,919,810
Wage-earners...number	298	266	258	241	241
Wages	$693,748	$652,040	$688,503	$799,228	$791,672

Talc

Canada Talc Industries, Limited, was the only producer to ship talc during the year. This mine is in Hastings county, in the Madoc area, and the total value of production amounted to $125,209, slightly down from the previous year. The company employed 3 salaried people and an average of 19 wage-earners, and the total salaries and wages amounted to $52,137. Fuel and electricity cost $13,401, and $4,791 was spent on process supplies. Fine-meshed talc is used by the ceramic, cosmetic, and pharmaceutical industries, and the coarser grades are used for roofing purposes, in rubber products, and as a polisher.

TALC STATISTICS, 1949–53

Year	Sales		Wage-earners, mine and mill	Wages paid
	Quantity	Value		
	tons		number	
1949	13,600	$160,757	20	$27,836
1950	15,263	182,048	18	27,364
1951	13,651	160,540	19	41,182
1952	12,454	149,711	21	36,983
1953	13,310	125,209	19	38,416

STRUCTURAL MATERIALS

Construction Contracts

The value of Canadian construction contracts awarded in 1953, as reported by *MacLean Building Reports, Limited*, was $2,017,060,700, as compared with $1,812,177,600 in 1952. Ontario contracts were $539,818,600, or 26.76 percent of the total.

VALUE OF CONSTRUCTION CONTRACTS, 1949–53

Classification	1949	1950	1951	1952	1953
Residential	$192,159,200	$233,617,200	$215,932,500	$226,780,100	$191,547,000
Business	102,627,400	157,347,000	206,461,500	204,306,400	157,998,500
Industrial	32,416,900	64,891,800	233,472,300	119,546,900	60,332,900
Engineering	93,895,400	141,305,900	361,560,600	182,134,700	129,940,200
Total	$421,098,900	$597,161,900	$1,017,426,900	$732,768,100	$539,818,600

Cement

The cement industry in Ontario reported production in 1953 of 7,078,181 barrels valued at $18,497,744. This was an increase in value of 30.79 percent above the previous year's value of $14,142,060. Canada Cement Company, Limited, has two plants, one at Belleville and the other at Port Colborne, and St. Mary's Cement Company, Limited, has a plant at St. Mary's. These companies had 42 salaried employees, who were paid a total of $191,904, and an average of 631 wage-earners, who received $2,324,946. Fuel and electricity costs were $3,649,435, and process supplies amounted to $1,068,434.

PORTLAND CEMENT STATISTICS, 1949–53

Year	Operating plants	Sales		
		Quantity	Value	Average price per barrel
	number	barrels[1]		
1949	3	4,592,106	$ 9,142,804	$1.99
1950	3	5,313,521	10,953,896	2.06
1951	3	5,438,101	12,494,677	2.30
1952	3	5,577,025	14,142,060	2.53
1953	3	7,078,181	18,497,744	2.61

[1]350-pound barrel.

Lime

The combined production of lime and hydrated lime amounted to 659,067 tons, having a selling value of $7,714,252, which was 11.46 percent higher than the value of $6,921,062 reported in 1952. The industry was made up of 11 companies and individuals employing 42 people, to whom was paid $159,948 in salaries, and an average of 418 wage-earners, who received $1,230,416 in wages. Cost of fuel and electricity was $2,176,447, and process supplies amounted to $121,795.

LIME STATISTICS, 1949–53

Year	Lime marketed or used						Fuel cost	Wage-earners	Wages
	Hydrated			Quicklime					
	Quantity	Total value	Value per ton	Quantity	Total value	Value per ton			
	tons	$	$	tons	$	$	$	number	$
1949	83,071	1,227,299	14.77	446,915	4,342,251	9.72	1,509,873	364	802,913
1950	91,497	1,347,677	14.72	479,993	4,682,551	9.76	1,598,504	296	718,832
1951	92,387	1,424,614	15.42	527,382	5,497,302	10.42	1,745,415	356	984,166
1952	86,816	1,580,916	18.21	535,463	5,340,146	9.97	1,824,154	377	1,094,388
1953	102,418	1,707,096	16.67	556,644	6,007,156	10.79	2,176,447	418	1,230,416

Distribution of the quicklime and hydrated lime sold in 1953, as reported by the producing companies, was as follows:

Industrial consumption	Quicklime		Hydrated lime	
	Quantity	Value	Quantity	Value
	tons		tons	
Building trades, finishing and masonry	25,561	$ 418,904	81,315	$1,408,565
Agriculture	....	.....	2,190	28,408
Chemical and metallurgical industries:				
Smelters	24,188	263,876	2,809	39,451
Iron and steel	42,772	465,648	256	3,596
Gold-milling	9,504	93,444	3,074	42,978
Pulp and paper	26,765	287,759	965	14,790
Glass	7,218	72,915	...	.....
Sugar	5,450	43,223	.....	.....
Tanneries	1,098	11,100	2,607	36,609
Fertilizers and insecticides	1,692	18,226	.....	.....
Dealers and others	412,381	4,331,886	9,202	132,699
Other chemicals[1]	15	175	.....	.....
Total	556,644	$6,007,156	102,418	$1,707,096

[1]Uses for lime under this heading include the manufacture of alkali, acetate of lime, and calcium carbide, the last-mentioned being used largely for making cyanamid.

Sand and Gravel

The total of sand and gravel production reported by 254 operators amounted to 43,658,099 tons valued at $24,359,496. This was an increase of 4.81 percent above the 1952 production value of $23,240,203 and is an all-time high for this industry. Salaried employees received $651,866, and 1,528 wage-earners were paid $4,214,829. Fuel and electricity costs amounted to $2,019,646, and process supplies to $279,061.

A comparison of sand and gravel production for the years 1952 and 1953 is given in the following table:

OUTPUT OF SAND AND GRAVEL, 1952 AND 1953

Source	1952		1953	
	Quantity	Value	Quantity	Value
	tons		tons	
Private pit operators	19,365,651	$12,757,673	21,244,610	$14,442,150
Dredged from Great Lakes and rivers	1,135,828	1,138,373	1,260,719	1,246,208
Department of Highways	13,450,000	5,221,000	12,487,000	4,859,000
Miscellaneous counties and townships	7,588,962	3,794,481	6,932,244	3,466,122
Estimate for other producers[1]	1,883,296	328,676	1,733,526	346,016
Total	43,423,737	$23,240,203	43,658,099	$24,359,496

[1]Railway ballast.

Sand-Lime Brick

Sand-lime brick was manufactured by two companies during the year, the total value of which was $578,872, a slight increase from $520,619 reported the year before. There were 8 salaried employees and an average of 101 wage-earners, who were paid a total of $339,986 in salaries and wages. The cost of fuel and electricity amounted to $41,074.

Stone

The production of stone, which includes limestone, sandstone, granite and trap, and marble, increased both in quantity and value for the year; a total of 8,818,886 tons, valued at $11,818,582, was reported, compared with 8,217,411 tons worth $10,303,173 in 1952. There were 96 salaried employees, who received $395,685, and 1,132 wage-earners, who were paid $3,057,133. Fuel and electricity costs were $669,243, and process supplies amounted to $1,019,266.

The following table gives a comparison of production for the last three years:

OUTPUT OF STONE, 1951–53

Variety	1951		1952		1953	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons		tons		tons	
Limestone	7,531,536	$ 8,513,829	7,818,958	$ 9,153,307	8,390,852	$10,359,697
Marble	38,113	196,986	30,638	211,105	31,336	262,145
Trap / Granite	487,496	1,485,446	350,724	798,680	381,141	1,045,358
Sandstone	22,942	200,389	17,091	140,081	15,557	151,382
Total	8,080,087	$10,396,650	8,217,411	$10,303,173	8,818,886	$11,818,582

Clay Products

The clay-products industry created another record in 1953 when the 64 operators reported production to the value of $14,829,222, a gain of 43.92 percent over the previous year's value. Altogether, there were 91 salaried employees, who were paid a total of $439,317, and an average of 1,702 wage-earners, who received $4,791,248 in wages. Fuel and electricity costs were $2,455,987, and process supplies $256,469.

The following table shows in detail the quantities and values of the several kinds of clay products made and sold by Ontario producers in 1953:

HEAVY CLAY PRODUCTS MARKETED, 1953

Kind	Quantity	Value
Brick:		
Soft-mud process, face — number	9,096,500	$ 424,179
Soft-mud process, common — number	4,986,000	207,586
Stiff-mud (wire-cut) process, face — number	148,466,284	7,344,082
Stiff-mud (wire-cut) process, common — number	8,615,468	294,373
Dry-press, face — number	21,984,312	1,431,064
Dry-press, common — number	.....	.....
Fancy or ornamental brick (including special shapes, embossed and enamelled brick) — number	7,290	974
Sewer	.....	11,185
Paving brick — number	237,301	18,930
Tile:		
Structural (hollow blocks, including fireproofing and load-bearing tile) — tons	67,989	1,211,229
Roofing tile	.....	.....
Floor tile (quarries) — sq. ft.	182,466	75,982
Drain — number	31,711,873	1,728,011
Sewer pipe (including copings, flue linings)	.....	1,674,516
Pottery (flower pots), from domestic clay	.....	295,365
Haydite and other products	.....	111,458
Blue clay — tons	48	288
Total value	.....	$14,829,222

VALUE OF CLAY PRODUCTS SOLD OR USED, 1949–53

Product	1949	1950	1951	1952	1953
Brick:					
Common and sewer	$ 336,931	$ 433,547	$ 449,470	$ 489,961	$ 513,144
Pressed, fancy, building tile, etc.	5,179,858	6,443,705	7,426,522	8,268,905	10,506,440
Pottery	92,390	110,057	114,720	280,224	295,365
Drain tile	963,635	1,058,567	1,243,891	1,506,992	1,728,011
Sewer pipe	786,878	1,197,901	1,124,201	1,321,499	1,674,516
Haydite and other products; clay	75,747	79,486	125,537	107,619	111,746
Total	$7,435,439	$9,323,263	$10,484,341	$11,975,200	$14,829,222

MISCELLANEOUS STATISTICS

Mining Company Incorporations

A summary of mining companies incorporated and licensed in Ontario from 1949 to 1953, inclusive, follows:

MINING COMPANIES INCORPORATED AND LICENSED, 1949–53

Year	Incorporated				Extra-provincial and mortmain licences	
	Number	Nominal capital	"No par" companies		Number	Capital for use in Ontario
			Number	Shares		
1949	97	279,380,000	23	19,280,500	5	$ 450,000
1950	112	310,012,000	34	38,048,650	3	1,065,000
1951	94	254,958,655	37	56,183,800	5	420,000
1952	126	353,115,000	31	43,969,500	13	2,997,000
1953	148	429,856,000	23	23,970,500	15	1,661,000

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1953

Name of company	Head office	Date of incorporation	Capital
Agnew Lake Uranium Mines, Limited	Toronto	Oct. 19	$ 3,500,000
Albot Gas and Oil, Limited	Toronto	May 5	40,000
Algom Uranium Mines, Limited	Toronto	July 15	6,000,000
Alliance Uranium Mines, Limited	Toronto	Feb. 9	4,000,000
Altomac Uranium Mines, Limited	Toronto	Jan. 15	3,500,000
Anabar Mining & Development Company, Limited	Sault Ste. Marie	Nov. 12	3,500,000
Antinouri Lake Mining Company, Limited	Toronto	Dec. 21	100,000
Anuwon Uranium Mines, Limited	Toronto	Feb. 25	3,500,000
Asbestos Lloyd Mines, Limited	Toronto	May 29	5,000,000
Assembly Mines, Limited	Toronto	July 8	40,000
Astrabrun Mines, Limited	Toronto	July 15	5,000,000
Astwick Mines, Limited	Toronto	July 17	5,000,000
Aucu Telluride of Canada Mines, Limited	Toronto	Feb. 3	5,000,000
Aylen Mines, Limited	Toronto	June 9	3,000,000
Bathwick Mines, Limited	Toronto	Jan. 30	4,000,000
Bayfield Petroleum Company, Limited	Toronto	Apr. 8	1,000,000
Bayranium Mines, Limited	Toronto	Feb. 3	3,000,000
Beaucage Mines, Limited	North Bay	Feb. 18	3,000,000
Beirut Mining Company, Limited	Toronto	Feb. 11	3,000,000
Belcher Iron Ores, Limited	Toronto	Apr. 20	3,000,000
Beresford Mines, Limited	Toronto	May 19	3,000,000
Betts Mining Syndicate, Limited	Toronto	Oct. 2	35,000

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1953—*Continued*

Name of company	Head office	Date of incorporation	Capital
Black Bourgon Mines, Limited	Toronto	Dec. 16	600,000
Bomont Mines, Limited	Toronto	Oct. 20	3,000,000
Bronte Mines, Limited	Toronto	July 30	4,000,000
Burnt River Uranium Mines, Limited	Toronto	Sept. 17	3,000,000
Canadian Manganese Mining Corporation, Limited	Toronto	June 17	3,500,00
Canadian Potash Mine Products, Limited	Toronto	May 7	500,000
Canalask Nickel Mines, Limited	Toronto	June 26	3,500,000
Canuba Manganese Mines, Limited	Toronto	Oct. 8	5,000,000
Caroline Mining Company, Limited[1]	Toronto	Feb. 9	75,000
Casgoran Mines, Limited	Toronto	Apr. 28	3,500,000
Centre Hill Mines, Limited	Toronto	Feb. 4	3,000,000
Centre Lake Uranium Mines, Limited	Toronto	Jan. 28	3,000,000
Cobalt Consolidated Mining Corporation, Limited	Toronto	Jan. 21	3,500,000
Cobil Uranium Mines, Limited	Toronto	Sept. 4	2,500,000
Cobra Lake Uranium Mines, Limited	Toronto	Oct. 27	5,000,000
Condor Ceramic Minerals, Limited	Ottawa	July 20	2,000,000
Corsair Oil & Gas, Limited	Wallaceburg	June 26	500,000
Cotley Mines, Limited	Haileybury	Mar. 5	3,000,000
Crackingstone Mines, Limited	Toronto	Jan. 8	3,000,000
Crestfield Uranium Mines, Limited	Toronto	Jan. 28	4,000,000
Croft Uranium Mines, Limited	Toronto	Sept. 1	3,000,000
Cubar Uranium Mines, Limited	North Bay	Apr. 9	3,000,000
The Cuspana Mining Syndicate, Limited	Toronto	Oct. 22	35,000
Delsohn Bathurst Mines, Limited	Toronto	Aug. 27	3,000,000
Delta Development & Exploration Company, Limited	Toronto	July 6	2,000,000
De Ville Copper Mines, Limited	Toronto	Mar. 18	3,000,000
Dobell Porcupine Mines, Limited	Toronto	July 23	3,000,000
Drillite Explorations, Limited	Toronto	May 7	500,000
Elford Oil & Gas Syndicate, Limited	Toronto	Sept. 4	35,000
Elliot Uranium Mines, Limited	Toronto	Feb. 18	3,000,000
Elmridge Mines, Limited	Toronto	Oct. 16	3,000,000
Emo Nickel Mines, Limited	Toronto	Apr. 7	3,500,000
Fiveland Mines, Limited	Toronto	Jan. 29	5,000,000
Foslake Mines, Limited	Toronto	Mar. 17	4,000,000
Freeshore Asbestos Mines, Limited	Toronto	June 1	3,500,000
Geco Mines, Limited	Toronto	Oct. 16	3,000,000
Genella Exploration, Limited	Toronto	Apr. 28	3,000,000
Global Mine Developers, Limited	Long Branch	June 19	40,000
Gloucester Anomalies Exploration Company, Limited	Toronto	Feb. 18	100,000
Gulch Mines, Limited	Toronto	Dec. 7	5,000,000
Hacker Atompower Mines, Limited	Toronto	Feb. 20	3,000,000
Halet Explorations, Limited[1]	Toronto	Mar. 25	100,000
Harico Mining & Development Company, Limited	Sault Ste. Marie	Sept. 3	500,000
Hercules Uranium Mines, Limited	Toronto	Nov. 25	3,000,000
Huntingdon Fluorspar Mines, Limited[1]	Madoc	June 25	400,000
Ibsen Cobalt Silver Mines, Limited	Toronto	Jan. 21	4,000,000
Jacquet River Mines, Limited	Toronto	Oct. 28	5,000,000
Jamaica International Explorations, Limited	Toronto	Nov. 9	3,000,000
J. A. McFadyen Oil Development, Limited	Toronto	Mar. 18	40,000
Jesko Uranium Mines, Limited	Toronto	July 23	5,000,000
John Blake Sand & Gravel Company, Limited[1]	Toronto	Mar. 9	50,000
Kamis Copper Mines, Limited	Toronto	Apr. 8	3,500,000
Kenilworth Explorations, Limited	Toronto	Aug. 28	3,000,000
Kenshaw Mines, Limited	North Bay	Oct. 13	40,000
Lake Huron Uranium Mines, Limited	Toronto	Nov. 17	1,000,000
Lanark Uranium Mines, Limited	Toronto	Oct. 14	3,000,000
Langis Silver & Cobalt Mining Company, Limited	Toronto	Feb. 18	300,000
Langley Bay Uranium Mines, Limited	Toronto	Feb. 20	3,000,000
Larum Mines, Limited	Toronto	Jan. 26	3,000,000
Loch Lomond Mines, Limited	Toronto	Sept. 18	4,000,000
Lolor Mines, Limited	Toronto	Nov. 12	1,000,000

[1]"No Par" shares issued in addition. See list of companies having shares without nominal or par value. Seven companies are included in both tables.

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1953—*Continued*

Name of company	Head office	Date of incorporation	Capital
Lost Lake Mines, Limited	Cornwall	Aug. 6	20,000
L. & H. Exploration Company, Limited	Toronto	Sept. 4	100,000
MacIsaac Mining and Tunnelling Company, Limited[1]	Sudbury	Apr. 29	60,000
Mackwick Manganese Mines, Limited	Toronto	Nov. 16	4,000,000
Manbay Mining Company, Limited	North Bay	Mar. 3	3,000,000
Maple Bay Copper Mines, Limited	Toronto	Jan. 30	3,500,000
Marian River Uranium Mines, Limited	Toronto	May 21	3,500,000
Marybon Uranium Mines, Limited	Toronto	Mar. 27	3,000,000
Maybrun Mines, Limited	Toronto	Aug. 7	3,500,000
McKee Development Company, Limited[1]	Kingsville	June 5	50,000
Melville Mining Company, Limited	Toronto	Mar. 10	40,000
Menifee Uranium Mines, Limited	Toronto	June 25	3,000,000
Milhol Exploration & Development, Limited	Toronto	Feb. 11	100,000
Mining Futures & Holdings, Limited	Toronto	June 1	3,010,000
Monpre Uranium Exploration, Limited	Toronto	June 10	3,000,000
Montario Exploration, Limited	Toronto	Feb. 25	3,000,000
Monteagle Minerals, Limited	Toronto	May 11	3,000,000
Multi-Minerals, Limited	Toronto	Dec. 1	6,000,000
Newbrun Mines, Limited	Toronto	May 26	3,000,000
Newkirk Mining Corporation, Limited	Toronto	Apr. 15	5,000,000
Nordel Oil & Gas Company, Limited	Delhi	Aug. 28	3,000,000
Norsynco Mining & Exploration, Limited	Toronto	Sept. 15	5,000,000
Nu-Age Uranium Mines, Limited	Toronto	Apr. 13	3,000,000
Orchan Uranium Mines, Limited	Toronto	Mar. 6	3,000,000
Pan-Israeli Petroleum Corporation of Canada, Limited	Toronto	May 21	1,000
Pater Uranium Mines, Limited	Toronto	Aug. 13	3,000,000
Peerless Uranium Mining Corporation, Limited	Toronto	Aug. 11	3,500,000
Peter Oil Development, Limited	Toronto	Apr. 2	40,000
Pickering Uranium Mines, Limited	Toronto	Jan. 20	3,000,000
Pic Nickel Mines, Limited	Toronto	Mar. 6	4,000,000
Picton Uranium Mines, Limited	Toronto	Sept. 4	3,000,000
Pitchgoma Mines, Limited	Toronto	Oct. 23	4,000,000
Pitchvein Mines, Limited	Kirkland Lake	Mar. 6	3,000,000
Plum Uranium & Metal Mining, Limited	Toronto	July 15	100,000
Pluton Uranium Mines, Limited	Toronto	Mar. 9	3,500,000
Poly Ores Mining Company, Limited	Toronto	June 25	3,000,000
Pronto Uranium Mines, Limited	Toronto	June 12	5,000,000
Pylon Uranium Mines, Limited	Toronto	July 31	3,500,000
Quirke Lake Uranium Mines, Limited	Haileybury	Aug. 20	4,000,000
Raft Uranium Mines, Limited	Ottawa	July 10	3,500,000
Rheba Uranium Mining Corporation, Limited	Toronto	Feb. 26	3,500,000
Ruben Mining Syndicate, Limited	North Bay	June 24	35,000
St. Michael Uranium Mines, Limited	Toronto	Feb. 6	3,000,000
Sheroomac Mining Corporation, Limited	Fergus	Feb. 25	5,000,000
Scintilore Mines, Limited	Toronto	Mar. 5	3,000,000
Skyline Uranium & Minerals Corporation, Limited	Toronto	June 30	3,000,000
Spur Mines, Limited	Toronto	Apr. 17	3,000,000
Stancliff Uranium Mines, Limited	Windsor	Apr. 1	3,500,000
Sudrim Mining Company, Limited	Toronto	Apr. 8	50,000
Taman Uranium Mines, Limited	Toronto	Oct. 16	3,000,000
Tara Exploration and Development Company	Toronto	Mar. 18	3,000,000
Tetra Uranium Mines, Limited	Toronto	Mar. 13	2,000,000
Thor Uranium Mines, Limited	Toronto	Oct. 14	3,000,000
Tidelands Copper Mines, Limited	Toronto	Oct. 23	5,000,000
Tomcar Mines, Limited	Toronto	Apr. 8	3,000,000
Transphere Explorations, Limited	Toronto	Jan. 16	3,500,000
United Montauban Mines, Limited	Toronto	Feb. 18	5,000,000
Uranium Ridge Mines, Limited	Toronto	Oct. 26	3,000,000
Urco Mines, Limited	Toronto	Apr. 28	3,000,000
Van Chester Mines, Limited	Haileybury	Sept. 22	3,000,000

[1]"No Par" shares issued in addition. See list of companies having shares without nominal or par value. Seven companies are included in both tables.

MINING COMPANIES WITH SPECIFIED CAPITAL INCORPORATED IN ONTARIO IN 1953—*Continued*

Name of company	Head office	Date of incorporation	Capital
Varro Oil Corporation, Limited[1]	Toronto	Apr. 1	50,000
W. C. Fisher Oil & Minerals, Limited	Toronto	Aug. 21	100,000
West Ferris Uranium Mines, Limited	Toronto	Apr. 2	40,000
Wincore Exploration, Limited	Toronto	Jan. 22	3,500,000
Yukonite Explorations, Limited	Toronto	July 24	4,000,000
Total (148 companies)			$429,856,000

[1]"No Par" shares issued in addition. See list of companies having shares without nominal or par value. Seven companies are included in both tables.

MINING COMPANIES INCORPORATED IN ONTARIO IN 1953 HAVING SHARES WITHOUT NOMINAL OR PAR VALUE

Name of company	Head office	Date of incorporation	Number of shares
Algo-Bruce Mines, Limited	Sault Ste. Marie	Sept. 18	6,000,000
Baraclen Mines, Limited	Toronto	Feb. 9	40,000
Brompton Petroleum, Limited	Toronto	July 13	500
Butt Land Exploration, Limited	Toronto	Sept. 9	100,000
Calcutta Petroleums, Limited	Toronto	Jan. 13	150,000
Caroline Mining Co., Limited[1]	Toronto	Feb. 9	25,000
Evandon Exploration & Holdings, Limited	Toronto	Apr. 10	40,000
Fairburn Uranium Mines, Limited	Toronto	July 24	3,500,000
Five Canucks Exploration, Limited	Toronto	June 1	50,000
Halet Explorations, Limited[1]	Toronto	Mar. 25	10,000
Henwood Mines, Limited	Toronto	Apr. 9	40,000
Huntingdon Fluorspar Mines, Limited[1]	Madoc	June 25	500,000
John Blake Sand & Gravel Company, Limited[1]	Toronto	Mar. 9	50,000
Jule-Du-Mar Oils, Limited	London	Apr. 2	1,000,000
London Canadian General Mining, Limited	Toronto	Sept. 23	1,000,000
MacIsaac Mining and Tunnelling Company, Limited[1]	Sudbury	Apr. 29	15,000
Maree Uranium, Limited	Toronto	Feb. 11	3,000,000
Marker Petroleums, Limited	Toronto	Mar. 5	100,000
McKee Development Company, Limited[1]	Kingsville	June 5	50,000
Norduna Mines, Limited	Toronto	Jan. 22	3,000,000
Palmer Oil Development Company, Limited	Toronto	Mar. 6	5,000,000
Varro Oil Corporation, Limited[1]	Toronto	Apr. 1	100,000
Winmore Uranium Prospectors, Limited	Toronto	June 1	200,000
Total (23 companies)			23,970,500

[1]See also list of companies with specified capital.

INCORPORATED COMPANIES WHOSE NAMES WERE CHANGED DURING 1953

Old name	New name
Barel Duc Mines, Limited	Bar-le-Duc Chibougamau Mines, Limited
Brae-Breest Gold Mines, Limited	Brae-Breest Uranium Mines & Metals, Limited
Bristol Oils, Limited	New Bristol Oils, Limited
Burma Dip Gold Mines, Limited	Eldrich Mines, Limited
B & D Development, Limited	Black Creek Properties, Limited
Cardiff Fluorite Mines, Limited	Cardiff Uranium Mines, Limited
D'Arcy Oil & Gas, Limited	Lariat Exploration & Development, Limited
Dominion Nickel Mining Corporation, Limited	New Dominion Nickel Mines, Limited
Gillies Lake-Porcupine Gold Mines, Limited	Consolidated Gillies Lake Mines, Limited
Glenmac Oil & Gas Company, Limited	Glenmac Petro-Chemical Exploration, Limited
Godden Porcupine Gold Mines, Limited	Godbeau Porcupine Mines, Limited
Golden Arrow Mines, Limited	Consolidated Golden Arrow Mines, Limited
Gothic Gold Mines, Limited	Gothic Mines & Oil, Limited

INCORPORATED COMPANIES WHOSE NAMES WERE CHANGED DURING 1953—*Continued*

Old name	New name
Gui-Por Gold Mines, Limited	Gui-Por Uranium Mines & Metals, Limited
Indore Gold Mines, Limited	Consolidated Indore Uranium Mines, Limited
Isle of Pines Mining Company, Limited	Caribbean Gold Mines, Limited
Joe Indian Mountain Metal Mines, Limited	Indian Mountain Metal Mines, Limited
Kelore Mines, Limited	New Kelore Mines, Limited
Ladulama Gold Mines, Limited	Nudulama Mines, Limited
Lake Surprise Mine, Limited	Le Prix Explorations, Limited
Lingside Gold Mines, Limited	Lingside Copper Mining Company, Limited
Macho River Gold Mines, Limited	Aumacho River Mines, Limited
McLellan Gold Mines, Limited	Dyno Mines, Limited
MacMillan Securities, Limited	MacMillan Prospecting & Development, Limited
Marvel Rouyn Mines, Limited	Marvel Uranium Mines, Limited
Matarrow Lead Mines, Limited	Consolidated Matarrow Mines, Limited
Mylamaque Mines, Limited	New Mylamaque Explorations, Limited
New Norseman Mines, Limited	Norsewick Mines, Limited
Norsewick Mines, Limited	Brunsman Mines, Limited
Orlac Red Lake Mines, Limited	Consolidated Orlac Mines, Limited
Pacemaker Petroleums, Limited	Pacemaker Mines & Oils, Limited
Parbec Malartic Gold Mines, Limited	Parbec Mines, Limited
Parkway Silver Mines, Limited	Parkway Mines, Limited
Partridge Yellowknife Mines, Limited	Partridge Canadian Explorations, Limited
Pegasus Petroleums, Limited	Pegasus Petroleum & Mining Corporation, Limited
Porcupine Peninsular Gold Mines, Limited	Brunhurst Mines, Limited
Quesabe Mines, Limited	Brunston Mining Company, Limited
Randona Quebec Gold Mines, Limited	Larandona Mines, Limited
Ranwick Uranium Mines, Limited	Consolidated Ranwick Uranium Mines, Limited
Red Bark Gold Mines, Limited	Red Bark Mines, Limited
Silver Jackpot Mines, Limited	Jackpot Uranium Mines, Limited
Transphere Explorations, Limited	Toujon Petroleums, Limited
Wingait Gold Mines, Limited	Gaitwin Explorations, Limited

EXTRA-PROVINCIAL COMPANIES AND MORTMAIN LICENCES ISSUED BY ORDER-IN-COUNCIL IN 1953[1]

Name of company	Place of incorporation	Date of licence	Capital for use in Ontario
Albert Metals Corporation, Limited	Province of Quebec.	Dec. 3	$ 100,000
The American Metal Company (Limited)	State of New York.	Dec. 17	350,000
British Columbia Explorers (1953), Limited	Province of British Columbia.	July 8	100,000
Commonwealth Exploration, Limited	Province of Quebec.	Aug. 27	100,000
Eastern Smelting and Refining Company, Limited	Province of Quebec.	Dec. 17	100,000
E. J. Longyear Company	State of Delaware.	Apr. 2	75,000
Indel Company	State of Delaware.	Apr. 2	40,000
Juno Metals Corporation	Province of Quebec.	Jan. 15	100,000
Merrill Petroleums, Limited	Province of Alberta.	Apr. 16	200,000
Mileage Oil Company	State of Minnesota.	Oct. 8	40,000
The Mineral Exploration Corporation, Limited	Province of Quebec.	Oct. 29	200,000
National Explorations, Limited	Province of British Columbia.	Dec. 17	16,000
North Whitney Mines, Limited	Dominion of Canada	Oct. 8	100,000
Old Settlers' Oils, Limited	Province of Alberta.	May 31	100,000
Tri-Zone Oil & Development Company, Limited	Province of Alberta.	Mar. 26	40,000
Total (15 companies)			$1,661,000

[1]When a company is of foreign incorporation, or is incorporated in a province of Canada other than Quebec with which a reciprocity agreement exists, it is necessary for it to take out an extra-provincial licence to do business in Ontario and to declare the amount of capital for use in Ontario.

Mining Revenue and Expenditure

The revenue of the Department of Mines for the fiscal year ending March 31, 1954, was $5,224,540.29 as compared with $5,175,440.85 in the previous year. Expenditures were $1,880,607.00. The following table gives details of the revenue:

REVENUE, APRIL 1, 1953, TO MARCH 31, 1954

ORDINARY:		
Licences and Permits:		
Sand and gravel	$ 915.00	
Unwrought metal sales	98.00	
Refinery	97.00	
Miners	97,034.67	
Gas	2,635.00	
Quarry	994.40	
		$ 101,774.07
Mining Claims:		
Recording fees	$321,969.70	
Abstracts and miscellaneous	20,045.53	
		342,015.23
Rentals:		
Gas leases	$40,737.00	
Mining leases	31,186.58	
Licences of occupation	18,205.29	
		90,128.87
Royalties:		
Sand and gravel	$112,410.93	
Gas and oil	150.00	
		112,560.93
Taxes:		
Acreage	$ 147,369.95	
Profit	3,924,520.63	
Gas	31,796.81	
		4,103,687.39
Laboratories:		
Cable testing	$ 28,946.19	
Chemical and assay	2,312.08	
Sampling and assaying	128,984.70	
		160,242.97
Services:		
Blueprinting	$8,299.28	
Record books	1,863.00	
Sale of gold and silver ores	8,803.27	
Miscellaneous revenue	9,488.79	
		28,454.34
Right to Lease:		
Windy Lake	$220,762.00	
		220,762.00
Reimbursements:		
Sulphur fumes	$643.33	
		643.33
CAPITAL:		
Mining lands sales		64,271.16
Total Revenue		$5,224,540.29

STATEMENT OF MONIES FROM OFFICES OF THE MINING LANDS BRANCH, APRIL 1, 1953, TO MARCH 31, 1954.

Mining Division	Purchase price	Licences of occupation	Mining leases	Blueprints	Recording fees	Miner's licences	Miscellaneous fees	Total
Head office	$ 7,316.50	$1,168.92	$17,447.99	$ 296.72	$ 34,720.00	$54,254.00	$ 3,158.56	$118,362.69
Fort Frances	2,698.36	89.91	.....	175.50	6,478.00	911.00	364.30	10,717.07
Kenora	2,590.09	587.51	328.62	191.50	5,339.00	1,351.82	496.15	10,884.69
Larder Lake	5,545.43	78.71	[1] −57.41	245.25	13,937.00	2,908.00	897.34	23,554.32
Montreal River	717.37	.....	879.77	178.25	7,237.00	854.00	562.05	10,428.44
Patricia	315.40	4.00	.....	37.75	8,152.00	1,760.00	562.29	10,831.44
Porcupine	1,280.87	5.60	.....	140.75	6,369.00	1,766.00	546.80	10,109.02
Port Arthur	1,614.02	220.79	1,824.74	746.00	77,764.00	12,664.00	3,544.89	98,378.44
Red Lake	2,784.51	329.45	.....	149.00	16,857.00	1,402.00	822.57	22,344.53
Sault Ste. Marie	15,250.69	406.37	.....	914.50	50,786.95	6,587.00	2,567.20	76,512.71
Sudbury	21,162.16	1,152.05	60.30	1,544.75	83,556.75	10,545.00	5,545.39	123,566.40
Timiskaming	2,995.76	167.29	286.45	212.25	10,773.00	2,031.85	977.99	17,444.59
Total	$64,271.16	[2]$4,210.60	[2]$20,770.46	[3]$4,832.22	$321,969.70	$97,034.67	$20,045.53	$533,134.34

[1]Amounts received in previous years credited to mining leases, first-year rent, were later transferred to licences of occupation.

[2]The amounts shown for licences of occupation and mining leases are respectively $13,994.69 and $10,416.12 less than shown in the revenue statement on page 61. The difference in both cases are annual rentals collected by the Accounts Branch.

[3]The amount shown for blueprints is $3,467.06 less than shown in the revenue statement on page 61. The difference is the revenue collected from blueprints sold by the Publications office.

PROSPECTING ACTIVITY, PROFIT TAX, AND TOTAL REVENUE, 1949–53

Year	Calendar year				Fiscal year	
	New miners' licences issued	Miners' licences renewed	Total licences and renewals	Mining claims recorded	Profit tax	Total mining revenue
1949	3,247	4,043	7,290	14,420	$2,718,019.76	$3,296,306.76
1950	2,295	3,993	6,288	14,233	3,878,800.39	4,480,178.90
1951	2,386	3,858	6,244	13,403	5,305,045.60	5,949,435.74
1952	2,323	4,747	7,070	13,789	4,286,046.06	5,175,440.85
1953	5,213	4,133	9,346	29,019	3,924,520.63	5,224,540.29

Provincial Assay Office

As an aid in the development of the mineral resources of Ontario, the Government established a Provincial Assay Office in Belleville in 1898. This was for the purpose of making assays of the various ores found in the Province and to assist the prospector in the development of claims. This office is now established in the East Block of the Parliament Buildings, Toronto.

Free assays may be obtained as provided by the Mining Act of Ontario, R.S.O. 1937, Chapter 47, Section 67, as amended 1943, as follows:

> Every licensee who stakes out and records a mining claim shall be given by the recorder two free assay coupons on recording it, and two additional free assay coupons on recording each forty days' work thereafter, and on forwarding or delivering, charges, prepaid, samples from the mining claim to the Provincial Assayer, Toronto, together with the required number of coupons, he shall be entitled to have such samples assayed without charge.

Some assays require one coupon in payment, and some require two or more, as indicated on the coupons now being distributed.

Minerals and rocks not requiring chemical analysis are identified free of charge, and tests for radioactivity are also free. All other work requires a fee, as outlined in the schedule of charges of this department.

Projects and Research

1) A number of samples suspected of containing oil were examined and tested.

2) The laboratory was consulted with regard to certain police actions and carried out assays and other services.

3) Work continued on the study of sedimentary iron-formation rocks in co-operation with the University of Toronto.

4) Twenty-two complete water-analyses determinations were reported to the Geological Branch in connection with studies of underground water in Ontario.

5) A bulk sample of kyanite schist was studied for a private company. The kyanite was separated and estimated.

6) Work was done to assist the Ontario Research Foundation with a problem dealing with flaws and impurities in steel. This involved microscopic and spectrographic work.

7) Spectrographic work was done for the University of Toronto in connection with a problem on the relationship of a number of sulphide and gold deposits to one another.

8) A number of Indian trading beads were analyzed for the Royal Ontario Museum.

The Provincial Assayer and Chemist, D. A. Moddle, reports as follows:

ASSAY RETURNS FOR 1953

Determinations	For coupons	For cash	For the department	Accounts outstanding	Total
Aluminium	3			1	4
Antimony	3		5	1	9
Arsenic	1			1	2
Bismuth	2				2
Cadmium	1				1
Calcium	4	1	7	2	14
Chromium	14	1	8		23
Cobalt	135	12	38	14	199
Columbium	18	9	23		50
Copper	225	55	51	13	344
Fluorine	1	3		5	9
Gold[1]	536	166	72	73	847
Iron	306	30	14	16	366
Lead	37	4	8	3	52
Lithium		1			1
Magnesium	2		7		9
Manganese	35	10	15	3	63
Mercury		7			7
Molybdenum	3	1	1	1	6
Nickel	157	21	57	14	249
Palladium[2]	13	4	2		19
Platinum[2]	38	9	4	8	59
Potassium	2		7	1	10
Phosphorus	55	3	2	4	64
Silicon	68	12	1	6	87
Silver[1]	199	51	34	31	315
Sodium	2			1	3
Sulphur	51	1	5	5	62
Tantalum	20	6	10		36
Thorium	4		1	1	6
Tin	18	5	3	1	27
Titanium	64	9	12	4	89
Tungsten	11	1			12
Vanadium	6	1	1		8
Uranium	101	16	16	24	157
Zinc	49	10	9	6	74
Zirconium	4		8		12
Others	14	1	7	10	32
Totals	2,192	450	428	249	3,319

[1]Fire assays.

[2]Fire assay-spectrographic determinations.

OTHER ANALYTICAL WORK

	1952	1953
Miscellaneous spectrographic analyses	335	663
Routine (28-element) spectrographic analyses	321	630
Radioactivity determinations	316	1,001
Examination and identification of minerals and rocks	493	756
Special mineral examinations involving X-ray and other work	17	65
Complete rock analyses	16	13
Coal analyses	2	1

FEES RECEIVED

Year	Coupons	Cash
1951	3,370	$1,616.03
1952	3,909	1,992.27
1953	4,546	2,101.18

Summary

The number of determinations of all kinds was greater than in previous years, and the nature of the work somewhat different.

Gold assays, once the bulk of the work, fell to a new low.

Uranium was the big concern. The number of radioactivity determinations and uranium analyses were high, and many of these were drill core and channel samples.

The number of complete qualitative spectrographic determinations was doubled over the previous year. This steady increase would appear to justify our policy of pioneering this type of assay.

One feature of the work was the demand for mineralogical information on complicated or little known occurrences, mainly those of uranium. This work was furthered by the X-ray laboratory, which was put into operation. Eighty-three X-ray photographs were made in 1953.

Accidents

By

The Staff of the Mines Inspection Branch

STATISTICAL REVIEW

Introduction

During 1953, at the mines, metallurgical works, quarries, and clay, sand, and gravel pits regulated by The Mining Act, there were 2,690 accidents to employees reported to the Ontario Department of Mines up to January 21, 1954. Thirty-six fatalities from 34 separate accidents, and 2,654 non-fatal accidents, were recorded.

The returns represent a decrease of 43, or 1.6 percent,[1] in the total number of non-fatal accidents, and a decrease of 5 in the number of fatalities from the previous year. There were 32 accidents in which 1 man was killed and 2 accidents in which 2 men were killed.

The report shows a fatality rate of 0.96 persons killed per thousand persons employed, which is a decrease of 0.14 per thousand over the preceding year and 0.47 per thousand lower than the average for the last 25 years. There were 71 non-fatal accidents per thousand persons employed, a decrease of 1 accident, or 1.4 percent, from the rate of 1952, and 6 accidents, or 8.5 percent, lower than the average for the last 25 years. The percentage of non-fatal accidents followed by infection increased from 3.4 in 1952 to 4.5 in 1953.

The total employment figures show an increase of 0.38 percent from 37,261 in 1952 to 37,401 in 1953. This increase was in the face of a decrease from the previous year of approximately 1,400 man-years of employment in the Timmins area mostly owing to a strike stopping work at the majority of the mines for periods of from 3 to 6 months. At the end of the year some of these mines were still closed.

EMPLOYMENT UNDERGROUND AND ON SURFACE AT MINES, 1943-53[2]

Year	Surface		Underground		Total
	Number	Percent	Number	Percent	
1943	7,148	37	12,396	63	19,544
1944	6,914	38	11,184	62	18,098
1945	6,687	39	10,535	61	17,222
1946	7,442	39	11,503	61	18,945
1947	8,111	39	12,653	61	20,764
1948	7,851	37	13,663	63	21,514
1949	7,918	36	13,968	64	21,886
1950	8,372	36	14,591	64	22,963
1951	8,626	37	15,000	63	23,626
1952	8,283	35	15,201	65	23,484
1953	8,401	37	14,415	63	22,816
Average	7,796	37	13,192	63	20,988

[1]According to a check by the Ontario Mining Association, there was an increase in the count of 159 non-fatal compensation accidents in Class V in the year 1952 over the year 1951. This was because of a change in the Compensation Act allowing compensation for a five-day lay-off period in 1952, instead of a seven-day period as in 1951.

[2]These figures do not include contract diamond-drilling.

Summary of Fatal and Non-Fatal Accidents

The following table is a summary for the past 25 years of the number of persons injured per 1,000 employed at mining operations:

ACCIDENTS TO EMPLOYEES IN MINES, METALLURGICAL WORKS, QUARRIES, AND CLAY, SAND, AND GRAVEL PITS, 1929–53

Year	Persons injured			Persons employed at all operations[1]			Persons injured per 1,000 employed	
	Fatally	Non-fatally	Total	Producing operations	Non-producing operations	Total	Fatally	Non-fatally
1929	55	2,389	2,444	17,145	1,849	18,994	2.89	126
1930	56	2,167	2,223	18,217	317	18,534	3.02	117
1931	37	1,813	1,850	17,820	447	18,267	2.03	99
1932	25	1,452	1,477	14,378	431	14,809	1.69	98
1933	25	1,514	1,539	15,080	804	15,884	1.57	95
1934	34	1,913	1,947	19,302	1,254	20,556	1.65	93
1935	36	2,048	2,084	21,444	1,528	22,972	1.57	89
1936	65	2,359	2,424	25,725	2,547	28,272	2.30	83
1937	52	2,721	2,773	28,938	3,220	32,158	1.62	85
1938	62	2,147	2,209	29,434	1,421	30,855	2.01	70
1939	47	2,246	2,293	32,444	897	33,341	1.41	67
1940	42	2,128	2,170	35,137	438	35,575	1.18	60
1941	64	2,240	2,304	35,317	618	35,935	1.78	62
1942	50	2,167	2,217	33,336	431	33,767	1.48	64
1943	36	2,101	2,137	29,083	394	29,477	1.22	71
1944	32	2,238	2,270	28,032	444	28,476	1.12	79
1945	41	2,026	2,067	25,639	1,413	27,052	1.52	75
1946	39	2,483	2,522	25,458	2,691	28,149	1.38	88
1947	35	2,608	2,643	29,965	1,136	31,101	1.13	84
1948	31	2,429	2,460	31,571	1,136	32,707	0.95	74
1949	33	2,341	2,374	32,586	327	32,913	1.00	71
1950	25	2,070	2,095	35,073	481	35,554	0.70	58
1951	34	2,387	2,421	36,178	551	36,729	0.93	65
1952	41	2,697	2,738	36,759	502	37,261	1.10	72
1953[2]	36	2,654	2,690	36,781	620	37,401	0.96	71
Average	41	2,214	2,255	27,634	1,036	28,670	1.43	77

[1]Three hundred 8-hour shifts = 1 man's yearly employment.

[2]Number reported up to January 21, 1954.

Fatal Accidents

A COMPARISON OF FATAL ACCIDENTS BY YEARS, 1949–53

Distribution	1949	1950[1]	1951	1952	1953
Mines, underground	26	16	21	29	18
Mines, surface	2	1	3	3	4
Metallurgical works	2	4	4	1	3
Quarries	0	2	2	1	4
Clay, sand, and gravel pits	0	1	1	1	3
Contract diamond-drilling	0	0	0	1	2
Total	30	24	31	36	34

[1]The 1950 figures are corrected to include an accident that occurred during 1950 resulting in the death of one man in 1951.

FATALITIES ACCORDING TO INDUSTRIES

Gold mines	11
Copper, nickel, and zinc mines	9
Iron mines	2
Silver-cobalt mines	2
Uranium mines	1
Nepheline mines	1
Iron, blast furnaces	1
Nickel-copper smelters	2
Quarries	4
Clay, sand, and gravel pits	3
Total	36

CAUSES OF FATALITIES AT MINES, 1949–53

Cause	1949	1950[1]	1951	1952	1953
	percent	percent	percent	percent	percent
Fall of ground	45	48	44	32	11
Explosives	7	0	7	13	8
On surface	7	4	11	13	23
Rock burst	0	0	0	11	8
Run of ore or rock	7	0	11	8	19
Shaft accidents	0	20	4	5	12
Falls down stope or raise	17	28	15	5	.....
Haulage	3	0	4	5	15
Unclassified	14	0	4	8	4

[1]The 1950 percentages are corrected to include an accident that occurred during 1950 resulting in the death of one man in 1951.

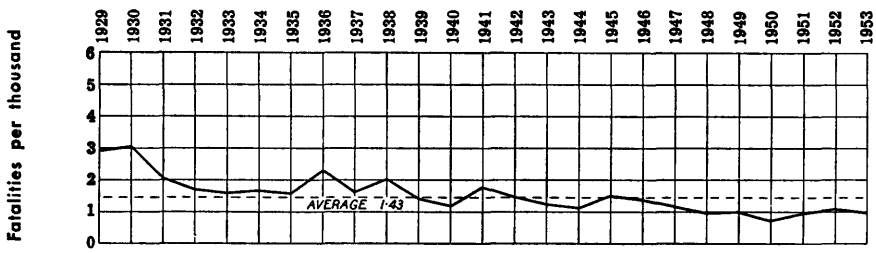
FATALITIES BY MONTHS

Month	Number of accidents	Number of men killed
January	4	4
February	4	4
March	4	4
April	1	2
May	1	1
June	2	2
July	2	2
August	2	2
September	4	5
October	3	3
November	3	3
December	4	4
Total	34	36

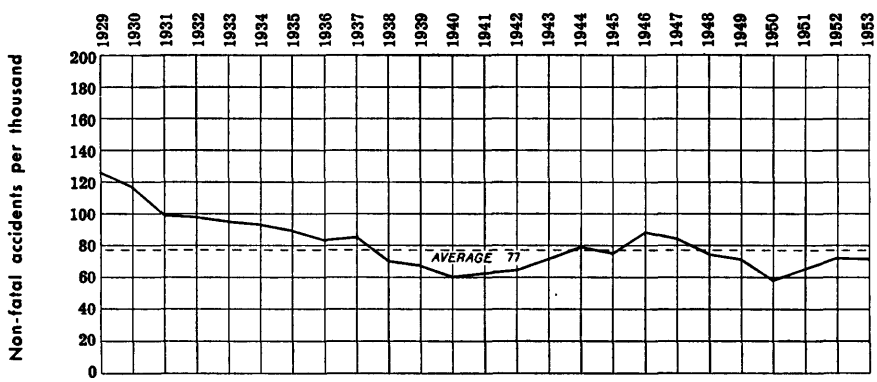
FATALITY RATE PER 1,000 FOR MINES, METALLURGICAL WORKS, QUARRIES, AND CLAY, SAND, AND GRAVEL PITS

	Men employed[1]	Number killed	Rate per thousand
Mines[2]	23,695	26	1.1
Metallurgical works	10,210	3	0.3
Quarries	1,426	4	2.8
Clay, sand, and gravel pits	2,070	3	1.4
Total	37,401	36	0.96

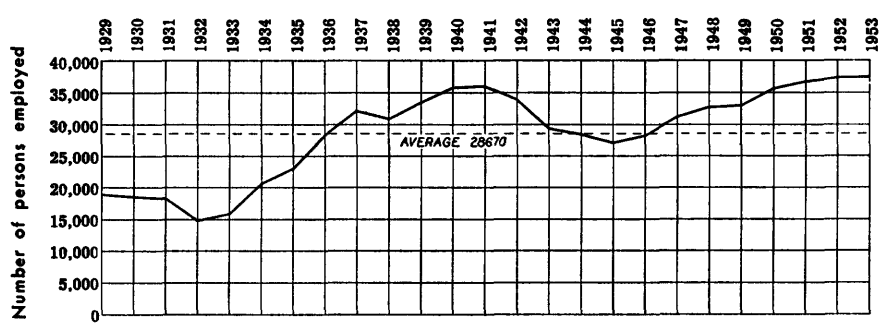
[1]Average number for year.
[2]Includes contract diamond-drilling at mines.



Number of fatalities per thousand persons employed in mining operations, 1929–53.



Number of non-fatal accidents per thousand persons employed in mining operations, 1929–53.



Total number of persons employed in mining operations, 1929–53.

FATALITIES BY AGE GROUPS

17–20	21–25	26–30	31–35	36–40	41–45	46–50	Over 50	Total
3	4	8	5	6	1	4	5	36

Non-Fatal Accidents

Mines

There were 22,816 persons employed at mines in Ontario in 1953. During the year, 1,830 were injured, giving a non-fatal accident rate of 80 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT MINES

Cause	Surface	Underground	Total
Fall of persons	54	135	189
Strain while lifting	21	121	142
Strain while moving	33	104	137
Fall of rock or ore, drilling, scaling, etc.	.....	118	118
Drilling machines	6	98	104
Rock or ore at chute	.....	99	99
Flying objects, drilling, sledging, etc.	15	83	98
Handling materials other than rock or ore	36	57	93
Fall of loose rock or ore	.....	90	90
Handling or tramming mine cars	1	81	82
Crushed between two objects	16	64	80
Falling objects	21	57	78
Hand tools	27	46	73
Running into or striking objects	12	53	65
Roll of broken rock or ore	1	62	63
Mechanical transportation	2	54	56
Nails or splinters	4	37	41
Tugger hoists, scrapers, etc.	.....	35	35
Machinery, general	26	7	33
Handling rock or ore	1	29	30
Mechanical loaders	1	24	25
Burns	14	6	20
Explosives	1	17	18
Cage, skip, or bucket in shaft	1	14	15
Dermatitis	8	5	13
Rock bursts	.....	11	11
Caught by run of rock or fill	.....	10	10
Falls down shaft, winze, or stope	.....	7	7
Natural gas explosion	.....	2	2
Electricity	1	.....	1
Unclassified	1	2	3
Total	303	1,527	1,830

Metallurgical Works

There were 10,210 persons employed at metallurgical works in Ontario in 1953. During the year, 367 were injured, giving a non-fatal accident rate of 36 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT METALLURGICAL WORKS

Strain while lifting or moving	64	Hoisting equipment, hooks, slings, etc.	14
Fall of persons	44	Machinery	11
Burns by slag or metal	38	Running into or striking objects	10
Fallings objects	32	Electricity	8
Handling materials	25	Noxious gases	4
Burns	21	Transportation	4
Hand tools	21	Nails or splinters	2
Loading, unloading, and handling cars	19	Explosives	1
Flying objects, sledging, etc.	17	Unclassified	1
Dermatitis, chemical burns, etc.	16		
Crushed between objects	15	Total	367

Quarries

There were 1,426 persons employed at quarries in Ontario in 1953. During the year, 110 were injured, giving a non-fatal accident rate of 77 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT QUARRIES

Strain while lifting or moving	19	Fall of material from face	4
Fall of persons	16	Burns	3
Machinery	13	Crushed between two objects	3
Fall of material during handling	11	Running into or striking objects	2
Handling materials	11	Nails or splinters	2
Flying objects, sledging, etc.	10	Transportation	2
Falling objects	7		
Hand tools	7	Total	110

Clay, Sand, and Gravel Pits

There were 2,070 persons employed at clay, sand, and gravel pits in Ontario during 1953. During the year, 123 were injured, giving a non-fatal accident rate of 59 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS AT CLAY, SAND, AND GRAVEL PITS

Fall of persons	28	Burns	2
Strain while lifting or moving	28	Fall of material from bank	2
Machinery	24	Fall of material during handling	1
Crushed between two objects	10	Hand tools	1
Handling materials	8	Nails or splinters	1
Fallings objects	7		
Flying objects, sledging, etc.	7	Total	123
Transportation	4		

Contract Diamond-Drilling

There were 879 persons employed in contract diamond-drilling in Ontario in 1953. During the year, 224 were injured, giving a non-fatal accident rate of 255 per 1,000.

CAUSES OF NON-FATAL ACCIDENTS IN DIAMOND-DRILLING

Handling drill rods	38	Flying objects, sledging, etc.	10
Hand tools	30	Handling materials	10
Fall of persons	29	Running into or striking objects	9
Strain while lifting or moving	22	Burns	8
Wire, nails, or splinters	21	Fall of loose rock or ore	3
Caught in moving parts	17	Transportation	3
Crushed between two objects	12		
Falling objects	12	Total	224

Infection

Records show that infection followed in 120 cases out of a total of 2,654 accidents.

ANALYSIS OF ACCIDENTS FOLLOWED BY INFECTION

Location	Number of accidents	Accidents followed by infection	Percent infection
Mines, underground	1,527	48	3.1
Mines, surface	303	19	6.3
Metallurgical works	367	22	6.0
Quarries	110	5	4.5
Clay, sand, and gravel pits	123	3	2.4
Diamond-drilling	224	23	10.3
Total	2,654	120	4.5

Electrical Accidents

ACCIDENTS DUE TO THE USE OF ELECTRICITY AT MINES, METALLURGICAL WORKS, QUARRIES, AND CLAY, SAND, AND GRAVEL PITS, 1944-53

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	Total
Fatal	1	1	.....	.....	1	1	.....	1	1	1	7
Non-fatal	2	1	7	2	2	4	2	8	2	9	39
Total	3	2	7	2	3	5	2	9	3	10	46

Explosives

CAUSES OF ACCIDENTS FROM EXPLOSIVES

Cause	Number of accidents	Persons injured		
		Non-fatally	Fatally	Total
Drilled into missed hole	3	2	1	3
Breaking rock on grizzly	2	2	.....	2
Delayed too long at scene of blast	2	3	.....	3
Fall resulting from blast concussion	2	2	.....	2
Removed powder from bootleg hole	2	2	.....	2
Returned too soon to scene of blast	2	1	1	2
Did not take sufficient cover	1	1	.....	1
Explosion caused by run of muck	1	2	.....	2
Explosion of detonator	1	1	.....	1
Premature explosion due to heat	1	1	.....	1
Scaling in vicinity of missed hole	1	2	.....	2
Total	18	19	2	21

FIRES

Black Donald Graphite, Limited

No. 252

At approximately 10.30 P.M. on January 24, a fire caused by a short-circuit in the 550-volt lines, occurred on the upper floor of the mill.

The fire was extinguished by about 11.45 P.M. Hand extinguishers were used, and no extensive damage resulted. A small area in the corner where two walls joined was charred.

McKenzie Red Lake Gold Mines, Limited

No. 253

A fire occurred between 12 noon and 1 P.M. on December 27, at the McKenzie Red Lake gold mine, on the second floor of the bunkhouse, in the northeast corner of the corner room. As far as can be ascertained, the fire was caused from a cigarette butt while the occupant was out for dinner.

The alarm was sounded at 1 P.M., and the fire crew had the hoses connected and in operation in approximately 10 minutes. By this time smoke was too thick in the bunkhouse to enter, and water was projected through the windows to extinguish the fire.

This bunkhouse is situated 120 feet south of the hoist-room and shaft-house. Two buildings are situated between the bunkhouse and hoist-room. These are the diamond-drill and core building and the warehouse. At no time were any of these buildings threatened.

Coniaurum Mines, Limited

No. 254

At about 8.00 A.M. on April 3, a small fire broke out in the wiring of a battery locomotive on the 4,000-foot level of the No. 2 winze at the Coniaurum mine.

At the beginning of the shift a battery locomotive had been moved from the 3,750-foot to the 4,000-foot level. W. Landry was moving the motor off the cage on to the 4,000-foot level when he noticed smoke coming from underneath the battery box, and a moment later, a small flame appeared. He went to the charging station, a distance of about 25 feet, then returned with a chemical extinguisher and put out the fire.

Examination showed that the power cable from the battery had rubbed against the frame and worn the insulation off at one point causing a short circuit. The fire damage consisted of burned insulation. The motor was repaired and back in service in about half an hour.

Kirkland Lake Gold Mining Company, Limited

No. 255

At 6.35 A.M. on April 23, an underground electrical fire occurred at the 900-foot-level pumping-station at the Kirkland Lake gold mine.

Smoke was detected in the main shaft by men being hoisted to surface. The cagetender, who was at the 2,475-foot level, was immediately notified and on investigating found an accumulation of smoke at the 900-foot station. A mine-rescue crew, wearing Burrells masks, proceeded to the 900-foot station and found the electrical-pump motor apparently on fire. Although no flame was seen, heavy smoke was quite prevalent. The power was immediately shut off, and a two-gallon extinguisher of carbon tetrachloride was used to quench the fire. The fans on the 2,200-foot and 4,100-foot levels were put in reverse at once. The smoke cleared away in approximately 10 minutes. Several carbon monoxide tests were taken on the 900-, 2,200-, and 2,475-foot levels with no showing on the Hoolamite detector. The fans were left running in reverse for approximately two hours. The apparent cause of the fire was a power fluctuation at approximately 6.10 A.M., thus causing a single-phase current on the three-phase power, this is equivalent to a stalled motor under power.

This was a 15-horsepower, 550-volt motor, fused at 60 amperes and protected by a two-leg, thermal-current-overload relay.

A theory proffered by the mine electrical department is that the power fluctuation, witnessed by several persons in the mine by noting the lights go very dim then brighter, caused the induction motor to draw heavy current and blow one of the fuses, but that the voltage recovered before the other fuses blew. The motor then ran single phase. Driving a pump it would put out full-load effort drawing a single-phase overload, heating the windings, and burning the insulation until finally the thermal-current relay opened the starter.

The motor was about 25 years old with cotton insulation; the cotton smouldered giving off much smoke but no flame. A newer motor is replacing the burned-out motor.

American Nepheline, Limited

No. 256

At 3.30 P.M. on May 8, a small fire occurred on surface at the American Nepheline mine.

A wood-stave water tank located south of the machine shop was being dismantled by a contractor. The hydro-electric supply line of 44,000 volts passed south of the tank at a distance of 10–12 feet. Three workmen were engaged in dismantling the water tank. During the removal of one top steel stay band, it slipped from a worker's hand, falling across and shorting the high-tension line. The opposite end of the band fell against the supporting timbers of the tank and caused a fire.

The power was cut off by pulling the main disconnects, located approximately half a mile from the plant. Water was then put on the tank from the closest hydrant and extinguished the fire.

No injury resulted to any personnel due to the short-circuit or to the fire. The supporting timber, the tank bottom, and a portion of the side staves were badly charred.

The tank was completely dismantled on May 11 with the power cut on the main supply line during the removal.

Delnite Mines, Limited

No. 257

A fire, started by lightning, occurred at about 6.40 P.M. on May 21 completely destroying No. 1 shaft headframe at the Delnite mine. The shaft timbers for two sets below the collar were also considerably burned but remained in place.

The No. 1 shaft is the original development shaft, which has served, since 1937, as an inlet for air and lately only as an escapeway. The hoist was removed in 1939.

The shaft has two compartments, 4 feet 8 inches square, consisting of a hoisting compartment and a manway compartment with a counter-balance way. The headframe was 8- by 8-inch British Columbia fir with the centre line of the sheave 37 feet above the collar. The shaft-house was 21 by 11 feet. The headframe and shaft-house were sheeted with corrugated iron.

At the collar, both compartments were covered with a tight, 2- by 8-inch flooring with a trap door in the manway. This covering assisted in preventing air downcasting the shaft. As the shaft is fairly close to the upcast air system served by an exhaust fan, the shaft would be strongly downcast except for the cover at the collar and the doors on the upcast air side on the 125-, 250-, and 375-foot levels. There is also a door on the 125- and 250-foot levels on the downcast air side.

Drainage water in the No. 1 shaft area is pumped across the 375-foot level to a sump at No. 2 shaft. The pump is situated in the station on the 375-foot level with power coming down No. 1 shaft in 550-volt, three-conductor, No. 10 Teck, steel-armoured cable. The shaft also has one 550-volt, three-conductor, No. 12 Teck, steel-armoured cable, which was not in use.

On the evening of May 21, an electrical storm, described by several as being the most severe they had experienced here, passed over this area. At 6.40 P.M. the Sullivan and C.I.R. compressors kicked out and Al. Miller, the electrician, was called from Timmins but did not arrive till 7.28 P.M. The delay was caused by the office telephone line being out of commission. The Sullivan circuit was not damaged, and the compressor was started. The C.I.R. compressor was started after one fuse was replaced. A ground was showing on the 550-volt line, which disappeared when the two power lines entering No. 1 shaft were cut. The exhaust fan in the assay office had stopped, and it was necessary to replace the line from the switch panel in the assay office to the fan.

The circuit breakers in the switch house all remained closed.

At 7.55 P.M. smoke was noticed at No. 1 shaft, and an alarm was turned in.

At 7.58 P.M. stench gas was injected into the compressed-air line at No. 2 shaft. The first load of men arrived from underground at 8.10 P.M., and all men were checked up at 8.51 P.M.

At 8.13 P.M. G. Vary, E. Lawson, and B. Dixon, wearing type N, all-service masks, found some smoke in 201-E drift moving slowly eastward to the upcast fan and at 8.25 P.M. they found some dense smoke in No. 301-E drift moving

slowly eastward to the upcast fan. The ventilation doors Nos. 2 and 3 were found closed. They were not opened.

The downcast air entering south of No. 1 shaft passes through raises and stopes and first enters the No. 2 shaft area at the 1,250-foot level. Men stationed here from 9.05 to 9.35 P.M. did not notice any sign of smoke.

Following the fire alarm, a 2-inch hose reel from No. 1 shaft hoist-room was hooked to the hydrant at the Dyer house, a distance of 400 feet from the No. 1 shaft headframe. Water was turned on about 7 minutes after the two power lines entering No. 1 shaft were cut. As the water pressure was low, a 2½-inch hose reel was hooked to the hydrant at the community building. This pressure was also low, but in the meantime, a pumper arrived from the Timmins Fire Department. The pump in this pumper failed, and a second pumper was sent out from Timmins.

The fire was out about 9.30 P.M. The headframe was demolished and the first two sets below the collar were burned considerably. At 10.00 P.M. the mine rescue crew together with G. Vary, E. B. Weir, and A. K. Graham, went underground and found no evidence of fire or carbon-monoxide.

Work was resumed by the cagetenders in No. 2 shaft on the graveyard shift, and regular work in the mine was resumed next morning.

Examination showed the fuses on the pump at the 375-foot level, No. 1 shaft, were all in good order. The opinion is that the electric storm was the cause of the fire.

Preston East Dome Mines, Limited

No. 258

A fire occurred about 8.20 A.M., May 13, in a storage-battery locomotive on the 18th level near the No. 3 internal shaft collar at the Preston East Dome mine.

At the start of the day shift, a motorman hooked up the battery in the charging-station at No. 3 shaft and found that it started to smoke. He immediately disconnected it and reported the faulty motor to his shift boss, who in turn advised the electricians. The motor was pushed out into the crosscut near No. 3 shaft where it was left for the electricians who were on their way down.

Another motorman, unaware of the condition of the motor, found it blocking the passage for his train. He plugged in the connector and opened the controller; this caused a flash which ignited the insulation on the main leads from the battery to the connector. The fire was immediately extinguished by use of hand fire-extinguishers.

The insulation on the main battery lead was destroyed, and the battery box was slightly charred. This damage caused considerable smoke in the immediate vicinity, which was short-circuited to the return air system by adjustment of the ventilation controls. Preparations were made to remove the men from their working places, but this was not necessary.

Kerr-Addison Gold Mines, Limited

No. 259

A fire occurred May 27 in the collar of old No. 1 shaft located just south of the No. 309-stope glory hole at the Kerr-Addison mine.

The fire apparently started from a spark coming from a fire burning scrap on the north side of the glory hole, and the grass starting to burn around the collar. This fire was noted at 12.45 P.M. on May 27, and hose lines were speedily run out. Since the fire was in a mine workings, the Mine Rescue Station at Kirkland Lake was notified at 12.54 P.M., and the men were evacuated from the mine.

This shaft has not been used for a long time, and there are no hoist conveyances or power lines in it. After the fire was put out, examination showed that

the timber was charred to a depth of 26 feet below the collar. There is no ventilation current in this shaft; in other words it is neutral.

A report was submitted by G. E. Wilson, superintendent of the Kirkland Lake Mine Rescue Station:

P. Oliver, safety engineer at Kerr-Addison, telephoned the Mine Rescue Station on May 27 at 12.54 P.M. and reported a fire in No. 1 shaft near surface.

He was told I was in Matachewan and R. Halsall, relief superintendent, would be notified.

Halsall arrived from Lake Shore at 1.10 P.M. and telephoned P. Oliver. He was asked to stand by for further instructions.

I received word of the fire at 1.10 P.M. and telephoned P. Oliver. They had used the stench signal and were bringing the men out of the mine. Their rescue teams were standing by. I informed him I would return to the rescue station as soon as possible. I arrived at 3.25 P.M.

Halsall was notified at 1.55 P.M. that the fire was out, the 175-foot level had been checked by men using type N masks with a McCaa team standing by. They found everything all right and the men going back to work.

International Nickel Company of Canada, Limited

No. 260

An electrical fire occurred in the motor-generator room on the 1,200-foot level at the Garson mine about 2.30 P.M., June 27.

The room is on the west side of No. 2 shaft crosscut, about 115 feet from No. 2 shaft. It is of steel and concrete construction with rock walls, steel-lagged back, and screen door. Two motor-generator sets in the room supply direct current for charging locomotive batteries. No. 1 set consists of a 75-kilovolt, 150-volt, 500-ampere, compound-wound D.C. generator, direct-coupled to a 125-horsepower, 2,200-volt, 60-cycle, A.C. motor.

Nipper Leader G. Clyke and his partner were on their way to No. 2 shaft when they noticed smoke in No. 2 shaft crosscut. On investigation, they found it coming from the generator of No. 1 motor-generator set. They broke the lock on the screen door and used a one-gallon LaFrance fire gun and a one-quart Pyrene extinguisher on the generator without completely extinguishing the fire. They then reported it by telephone to Topman A. Brethauer.

Brethauer instructed his cagetender by telephone to bring the cage to surface. It arrived there with Foreman G. Quilty, who took a second one-gallon fire gun and one-quart extinguisher down to the motor-generator room, and commenced using them. Meanwhile, Brethauer had notified the shift electrician, who cut off the 2,200-volt power supply to the No. 1 mine circuit. Quilty was then able to extinguish the fire.

Electrician K. Stone and Ventilation Engineer R. Lockhart, wearing Chemox apparatus, then opened the disconnectors in the motor-generator room so that the mine power supply could be restored.

Some mechanical failure apparently occurred in the attachment of the copper risers connecting the commutator segments to the armature coils. The risers came loose, were thrown out of line and hit the brush gear, causing the generator to short-circuit and arc. The field coils and the armature windings were destroyed. Damage was confined to the generator of No. 1 motor-generator set.

International Nickel Company of Canada, Limited

No. 261

Square-set timbers in a sill crosscut being driven through fill in No. 39.5 pillar stope, on the 2,800-foot level of the Frood-Stobie mine, were ignited by the heat of oxidation of sulphides in fill rock on June 9.

This area is inside an isolated block of old square-set stopes where oxidation of sulphides caused outbreaks of fire in 1950 and 1951. All openings that could be reached were then filled with water-borne sand in an endeavour to seal off the block. The hanging-wall zone, however, has continued to emit gases. It was

decided to drive through the block this year to the hanging wall at several locations to provide openings through which to pressure-pack the zone with water-borne sand. A raise was driven from the main north drift on the 2,800-foot level to the 30-foot sill elevation of No. 39.5 pillar stope, where a crosscut was started through the filled square-sets towards the hanging wall. The face of the crosscut was about 115 feet from the footwall and about 50 feet from the hanging wall, when the fire occurred. Work was not then in progress.

About 2.00 P.M. on June 9, smoke with an odour of sulphur dioxide was traced to the raise. A test of the air at the sill elevation showed about 0.1 percent carbon monoxide to be present. A crew wearing Chemox apparatus was sent into the sill crosscut to investigate. They found about ten sets of jackpine timber in the far end glowing with fire.

Fire-hose equipment, including a fog-nozzle, was taken to the scene and put in use while a shiplap brattice was constructed about 20 feet from the footwall. A pipeline for handline fill was laid at the same time. The following day, the air on the footwall side of the brattice was found to be satisfactory, and the construction of a concrete bulkhead was commenced.

Pressure-packing with water-borne sand was begun on June 20 and suspended on June 23, after about 4,000 tons of sand had been pumped into the crosscut and extinguished the fire. Mine production was not interrupted.

Hollinger Consolidated Gold Mines, Limited

No. 262

A small smouldering fire was discovered at No. 20.4 crosscut on the 3,500-foot level at approximately 10.00 A.M., July 17, at the Hollinger Consolidated gold mine.

R. Mitton, sample boss, on his way to No. 177 AW 20.7, east of No. 20.4 crosscut, on the 3,500-foot level, smelled wood smoke after passing No. 20.1 crosscut and saw a slight haze of smoke in the air.

Mitton then proceeded to No. 20.4 crosscut and saw that the last 8-foot length of trolley had fallen to the crosscut floor. In its fall the trolley wire had come to rest on two track ties; the ties, which had been treated, were burning from the bottom. Water lying around the area was bubbling as if boiling.

Mitton went for help and returned with V. Turner. The two men swung the trolley wire and box clear and cut the wire at the last trolley hanger with an axe in order to stop the flow of current.

The ties on which the trolley wire rested were partly immersed in the water lying in the area. The current flowed through the wet ties to the track and track spikes.

The undersides of the ties were charred halfway through on the sections of the ties between the points of contact of the trolley and the track. There was some evidence of electrolytic action on the track.

The wet ties provided a fairly high, resistance-fault circuit. The current flowing in this resistance produced heat to char the ties and boil the water. The current was not high enough to blow the 150-ampere fuse at the trolley control panel servicing the 3,500-foot level.

The Hollinger electrical department is considering removing the jumpers from the main-drift trolley to branch trolleys such as the one above when such branch trolleys are not to be used for a long period of time.

Consideration is also being given to the installation of circuit breakers on the trolley systems with timed elements or relays which will trip relatively low currents sustained for a period of time and yet allow the higher peak currents required by the locomotives for short periods of time.

Algoma Ore Properties, Limited

No. 263

A small electrical fire occurred at 3.00 A.M. on June 16 when a fault in the slusher motor in No. 137 slusher drift ignited grease on windings at the Algoma Ore Properties mine.

Grease from the slusher gear box had migrated to the motor winding through failure of the grease seal.

This 20-horsepower, Canadian General Electric squirrel-cage, slusher motor have been in fairly continuous operation since 7.30 P.M. on June 15.

The definite cause of failure of the motor insulation could not be determined. Motor fuses blew when fault and fire occurred.

The fire was extinguished by the operator using a Pyrene extinguisher.

Leitch Gold Mines, Limited

No. 264

A fire occurred in the air-cooled transformer at the pump station on the 9th level at 11.30 P.M. on July 2 at the Leitch gold mine.

This transformer gave trouble with over-heating on the morning of July 1, but it was thought that it could be kept in service by reducing the load on it. However, it took fire even with a reduced load and blew the fuses on the power circuit supplying it. The fire was noticed at once by the cagetender and was quickly extinguished by a carbon-dioxide fire extinguisher. No damage was done to other equipment or structures.

This transformer is a Westinghouse, type ASL, dry transformer rated 150 kilovolt-ampere, three-phase, 60-cycle, 2,300/575 volts. This type of transformer has a class *B* insulation. The rating of the primary fuses used on this transformer is 65 amperes. The failure of the transformer and the others with which they have had trouble is considered to be due to gradual deterioration of the insulation caused by underground atmosphere. There is no undue accumulation of dust in the transformer, and it was not considered that the air ducts were blocked.

Owing to the trouble they have had with these transformers, they are discontinuing their use. A Pyrnol-cooled transformer has been substituted for the one which failed and a second Pyrnol unit is on order to be used as a spare.

Lake Shore Mines, Limited

No. 265

A fire occurred in the No. 3 shaft-house tool room at approximately 6.15 A.M. on August 12 at the Lake Shore mine. The fire was extinguished with water in less than half an hour by members of the Kirkland Lake Fire Department.

The tool room is located in one corner of No. 3 shaft-house. The office of the underground supervisory staff, the safety director's quarters, and the shift bosses' and captains' change-room are also located in this building. The shaft itself is not used as an operating opening, but it does serve as a downcast airway from surface to the main fresh-air fan on the 800-foot level.

The fire apparently started spontaneously in 80 strips of canvas, each measuring 13 by 26 inches. The strips, after having been dipped in a mixture of linseed oil and turpentine, were placed on a hanger in a metal container to dry. An adjoining wooden cupboard became ignited, and the fire spread to parts of two walls and to the ceiling of the room. The fire was confined to the interior of the room. Some of the supplies and equipment stored in the room were damaged.

Cobalt Consolidated Mining Corporation, Limited

No. 266

On August 14, at 5.15 P.M., lightning struck in the vicinity of the Agaunico mine knocking out the power supply and setting fire to a small pump-house nearby.

The mucking shift, underground at the time, noted the power was off and came to surface via the escapeway to ascertain the trouble. They saw smoke rising in the vicinity of the pump-house and found that the building was a mass of flames.

The mine superintendent was notified. On his arrival, a bucket brigade was organized, and the fire in the remains of the pump-house put out.

It is thought that this fire was caused by a direct stroke of lightning to the pump-house.

International Nickel Company of Canada, Limited

No. 267

A minor electrical fire occurred in the crusher station on the 600-foot level at the Frood-Stobie mine, Stobie section, about 7.10 P.M. on July 23.

A short-circuit developed in an Ohmite resister in the control circuit of a B.H. oil circuit-breaker, causing a small insulation fire.

K. Hoop, maintenance electrician, opened the disconnectors and put out the fire with a carbon-tetrachloride extinguisher.

Milnet Mines, Limited

No. 268

A small fire occurred in the crusher house on September 11 at 7.00 P.M. at the Milnet mine.

Sulphide fines had collected on a 12-inch plank that supports the conveyer-belt skirting. This dust had caught fire and burned with some smoke and a red glow but with no open flame. Charring of the plank over an area, 12 by 15 inches, resulted. The fire was put out immediately with a fire extinguisher.

Due to the location, below the crusher-house floor and 6 feet ahead of the crusher jaws, it was felt that a fire could not have been started by a discarded cigarette but was caused by spontaneous combustion of the sulphide dust.

To prevent similar occurrences, the fines are to be blown off all wood surfaces at regular intervals.

Campbell Red Lake Mines, Limited

No. 269

A minor trammer-battery fire occurred underground on September 19 at the 4-th level station in the No. 1 shaft at the Campbell Red Lake mine.

At 7.30 A.M., on September 19, before the shift went down, two regular cage-tenders, and a helper new to the job, were moving a small Mancha trammer. One of the regular cagetenders and the helper were waiting at the 4th-level station for the trammer to come from another level. When it arrived, the helper moved the trammer off the cage, but he set and left the brake "On," with the controller still in the "Forward" position.

On the next trip past the 4th level the cagetenders noticed smoke, apparently from burning rubber, in the station. They immediately returned to the 4th level and, realizing that the trammer was on fire, pulled the battery plug, then telephoned Mine Captain Alexander. Alexander proceeded immediately to the 4th level where he had no difficulty extinguishing the fire with a carbon-tetrachloride fire extinguisher.

Examination showed that the overheated motor resistor had set the rubber insulation of the main wire on fire. Little damage was done to the motor.

International Nickel Company of Canada, Limited

No. 270

A small fire was caused by electricity at the intersection of the main east drift and No. 2 main crosscut on the 1,600-foot level at the Levack mine about 5.00 A.M. on October 3.

A short-circuit occurred at a trolley-wire insulator when a trolley locomotive went through the intersection, setting fire to the planks guarding the trolley wire.

A. MacDonald and A. Frohlich, the motorman and switchman, put out the fire with a carbon-tetrachloride extinguisher. The insulator was burned off, and the adjacent planks were slightly charred.

Renabie Mines, Limited

No. 271

A fire occurred about 6.00 A.M., November 13, in the old Renabie mine assay office and caused considerable damage to the interior of the furnace room but no damage to the assay-office equipment.

The baker in the cookery rang in the alarm, and the fire was extinguished within 20 minutes. No one had been working in this building since 5.00 P.M. the previous day.

The electric muffle furnace, FH 207, Serial No. C-2029, is set at the end of the day shift so only a short time is necessary to bring the temperature up to 1,800 degrees the following morning, for the 6-hour run.

A week earlier, two new elements were installed in the furnace, and these same elements fused in the morning for a length of 4–6 inches, starting 2½ inches from the end of the elements or at the outside rear wall of the furnace. It is possible that metal from the previously fused elements remelted and shorted the two new elements. After the fire, it was noted that the hole through which one leg of the hairpin-type element passed was filled with fused metal, while the opening for the adjoining element was sufficient to permit sparks or flame to be directed against the partition between the furnace room and the crusher-room. Here a pass-through with a plywood door, 2 feet square, was operated in a slot by a pulley arrangement from the crusher-room. This door is closed during crushing and at night. The partition wall was constructed of 2- by 4-inch studs sheeted on both sides by ¾-inch tongue-and-groove, and again covered with Gyproc on both sides.

Mensilvo Mines, Limited

No. 272

At approximately 2.00 A.M. on December 31 the change-house building at the Mensilvo mine was destroyed by a fire of unknown origin. There was no one in the building at the time.

This was a one-storey frame building about 30 feet by 15 feet covered with Insul-bric siding and heated by a coal-burning, vertical, cylindrical stove.

At the time of the fire the mine was working on a one-shift basis only, and the workmen had not used the building since coming off shift at 4.00 P.M. on December 30.

The fire was first noticed by James Stewart, an operator in the mill. He telephoned the Cobalt Fire Department and, with the assistance of other men on shift in the mill, proceeded to fight the fire with the mine fire-hose.

The change-house is located about 75 feet from the No. 7 shaft headframe. The working clothes of seven miners were destroyed.

Manager W. D. Taylor thought that the fire might have been caused by canvas coal bags coming in contact with the hot stove.

This is the second time the change-house has been destroyed by fire.

Coniaurum Mines, Limited

No. 273

A violent explosion occurred at 8.20 P.M. on September 25 in the compressed-air system of the power plant at the Coniaurum mine near Timmins, Ontario. Extensive property damage resulted. No person suffered injuries.

Compressor Plant Lay-out and Piping.—The Coniaurum compressed-air plant is located in a building 53 by 59 by 25 feet, constructed of structural steel and red tile. The front of this building, the front of the main office, and the south side of the shaft-house lie in a straight line running almost east and west. The clear distance between the compressor building and the office, to the west, is 166 feet. The clear distance between the compressor building and the west wall of the shaft-house building, to the east, is 48 feet. South of the compressor building and the shaft-house there are three buildings, the machine shop, the steel shop, and a warehouse, from west to east respectively, with 70 feet of space between the first two buildings, and 60 feet between the last two buildings. The north ends of these buildings lie in a straight line parallel to the front of the compressor building and 56 feet south of it. Looking eastward down the road between the above two rows of buildings, one sees only the hoist-room building, 40 feet east of the shaft-house building and extending 47 feet farther south.

Compressors.—The compressor building housed three compressors.

No. 1 compressor, situated in the northwest corner of the building, was a CIR-PRE-2 (26 and 16½ inches diameter by 18 inches stroke; capacity, 2,500 cubic feet per minute), 400-horsepower motor. This compressor was running at the time of the explosion.

No. 3 compressor, situated in the southwest corner of the building was a stand-by machine. It was a CIR-PRE-2 (25 and 15¾ inches diameter by 18 inches stroke; capacity, 2,000 cubic feet per minute), 350-horsepower motor. It was not operating when the explosion occurred.

No. 4 compressor, situated in the southeast corner of the building. It was a CIRXVHE-2 (13½ and 19 inches diameter by 14½ inches stroke; capacity, 3,280 cubic feet per minute at 100 pounds per square inch), 600-horsepower motor. This compressor was running at the time of the explosion.

All compressors had a common filter intake situated on the north side of the compressor building. No. 1 compressor discharged into an 8-inch line, which increased to 10 inches where the No. 2 compressor discharge formerly connected. This line increased to 12 inches where the No. 3 compressor discharge joined it. This line passed through the south wall of the compressor building to two receivers. The No. 1 receiver, 5 by 14½ feet, was contained in two concrete cradles less than 2 feet from the south wall of the building. The second receiver was parallel to the No. 1 receiver with a minimum of clearance between them to adjust fittings. The intake to the No. 1 receiver was on the bottom side; the intake to the No. 2 receiver was on the north side. Both receiver intakes were 10-inch pipes. Both of these receivers discharged from the top side; No. 2 receiver discharged through a 5-inch line into the end of a 10-inch "T" over the No. 1 receiver; No. 1 receiver discharged through a 10-inch outlet to the same "T" and from this point the 10-inch line ran down between the No. 1 receiver and the wall of the compressor building to a concrete tunnel leading to the shaft-house. The XVHE-2 compressor discharged through a short 10-inch line to a third receiver, No. 3, situated similarly to No. 1 receiver at the east end of the south wall. This receiver was also 5 feet in diameter by 14 feet in length and discharged through a 10-inch line into the line leading to the shaft from the other two receivers. The 10-inch line to the shaft had two 45-degree elbows just east of

the No. 3 receiver, a 90-degree elbow outside the shaft-house, a 10-inch gate valve inside the shaft-house, around which a 3-inch by-pass was arranged with a 3-inch gate valve, and a "T" fitting at the collar into which the 10-inch line in the shaft was connected. There was an expansion joint in the line a few feet below the collar. New 10-inch victaulic pipe, installed two years ago, extended down the shaft for 550 feet. At this point the new pipe was jointed to old 10-inch pipe by a 45-degree offset. The pipe below this point had been in service for approximately 17 years. It was badly corroded at several points of contact with the shaft timber and was due for changing at an early date. An expansion joint was located approximately 30 feet above the 45-degree offset.

Receiver Construction.—The receivers were constructed from ⅜-inch plate. All three receivers had a single rivetted girth seam with 15/16-inch rivets in 1-inch holes at 2¼-inch pitch.

Blow-off Valves and Fuse Plugs.—The No. 1 receiver was equipped with three, 3-inch safety valves; the No. 2 receiver had one, 2½-inch safety valve; the No. 3 receiver had three, 3-inch safety valves; the No. 1 compressor had one, 1-inch safety valve; the No. 4 compressor had one, 2-inch safety valve.

All the safety valves were set to blow at 110 pounds pressure. Each receiver had one fusible safety plug designed to fuse at 450°F.

Operation and Records.—The compressor plant was operated on a three-shift basis. Operating the compressors was a full-time job for one man. There was no other machinery in the compressor building. Compressor Operator R. Irvine was on duty at the time of the explosion. His shift had commenced at 3.00 P.M. At the moment of the explosion, Irvine was seated at a desk midway between the No. 4 compressor and the electric control panel on the north wall of the building. He had just completed a round of inspection of the compressors.

A record book is kept by the operators in which they record the line pressure on the hour, and any abnormalities. Irvine had recorded the pressure at 8.00 P.M. as 90 pounds. The pressure had been the same throughout the day. This is normal operating pressure.

A pressure graph is also made by a recording pressure gauge. This instrument was out of adjustment; but although it did not record the actual pressure, the readings were at all times relative to the actual pressure and thereby indicated when the compressors were working or unloading. The compressors were unloading at 8.20 P.M. when the meter stopped working. At this point the stylus traced an abrupt rise in pressure. The maximum point could not be determined because the pen became dry of ink due to rapid tracing rate. This time corresponds to the time at which valves were closed underground after blowing smoke from the day shift blasts, and drilling begins.

The safety valves on all the receivers were tested by the operators every two or three days. The drain valves in the bottom of each receiver were blown down daily. The receivers are entered twice a year and scrubbed with caustic cleaner. This was done in May, 1953. Only a thin film of oil is found in the receivers when this is done. The receivers were inspected by the General Accident Insurance Company in August, 1953.

Texaco "Alcaid" oil has been used exclusively in the compressors for some years. The flash point of this oil is given as 385°F. and the fire point is 420°F. This oil was used both for cylinder and crank case lubrication. There was no other oil in the compressor building.

The Explosion.—Indications are that the explosion was momentarily preceded by fire. R. Irvine records that he saw a reddish flash before the air filled with dust. This flash may have been from flame ejected from the 2-inch safety

valve on the No. 4 compressor. This valve showed intense heat effect, and the wall 3 feet away, in line with the discharge side of the valve, was blackened. The No. 4 compressor was undamaged and continued to run until Irvine manually unloaded it and then went to the control panel and opened the circuit breakers controlling the motors of the two compressors. The No. 1 compressor also ran up to this time.

It is conjectural whether a number of explosions occurred or whether one explosion was propagated from the pipeline down in the shaft to the receivers or vice versa. The most damaging explosion was that which took place in the No. 1 and No. 2 receivers. The No. 1 receiver ruptured completely around the girth seam except for approximately 4 inches of metal which held the two halves together. One half, in which there were flanges for two safety valves and the take-off 10-inch line, ruptured longitudinally through this line of weakness and partially tore across the head panel. This receiver came to rest approximately 15 feet south of the cradle in which it rested.

The No. 2 receiver ruptured completely at the girth seam. Four rivets tore through the edge of one plate; all the other rivets sheared. The halves of this receiver were propelled in opposite directions. One half went eastward, struck the north end of the warehouse building and then ricochetted into the southwest corner of the hoist-room building where it broke through the tile wall and came to rest against the hoisting-control panel. The other half of the No. 2 receiver was blown 510 feet to the west. It came to rest at this point without striking or damaging anything.

The No. 3 receiver did not rupture and remained in situ. This receiver, however, did not stand up to subsequent hydrostatic testing.

The pipelines adjacent to the No. 1 and No. 2 receivers were ruptured and thrown. The portion of the discharge line inside the building from the No. 1 compressor was broken at the couplings. The 10-inch main leading to the shaft was broken at all offsets and elbows. The gate valve and "T" at the shaft collar were ruptured. Also a nipple, 30 inches in length, was ripped wide open from end to end along the butt-weld joint. The line was broken at the connection of the old and new pipe, 550 feet below the collar, and the expansion joint at this point was also broken. Some six or seven lengths of the old pipe had holes blown in the walls at definite points of weakness. At these points the pipe was very thin. New pipe was on hand to replace this line, and following the accident, this was completed down to the 1,000-foot level.

A hole, 15 by 20 feet, was blown in the south wall of the compressor building, and the rest of this wall and the south half of the west wall were damaged to such an extent that they had to be torn down. The steel structure was only slightly damaged. Two holes were broken through the roof of the building by flying debris.

The tile wall at the end and side of the projection on the hoist room, housing the hoist panel, was knocked down by half of the No. 2 receiver. The hoist panel was short-circuited but only slightly damaged.

Nearly all the asbestos slate siding on the north end of the machine shop was blown off, the doors were blown in, and all windows broken. No equipment was damaged.

The end of the storehouse was badly damaged from the projected half of the receiver, which struck here before coming to rest in the hoist-room.

Nearly all the windows in the steel shop and the shaft-house building, and some in the warehouse were broken.

A considerable amount of debris was blown into the hoisting compartment next to the manway by the rupture of the pipeline, and manway landings were

broken. The hoisting-signal cable was severed, and the Bishop shaft-telephone circuit was made inoperative from the 400-foot level up to surface.

Condition of Safety Valves, Fuse Plugs, etc., after the Explosion.—In addition to the evidence of fire indicated at the 2-inch valve on the No. 4 compressor, the following points were noted: the three safety valves on the No. 3 receiver showed evidence of heat; there were very definite scales of carbon inside the No. 3 receiver; the inner surfaces of the ruptured receivers showed a thin film of carbon; the safety valves which had been on the No. 1 and the No. 2 receivers did not show any signs of intense heat; none of the fuse plugs in any of the receivers showed evidence of heat; the safety valve on the No. 1 compressor showed no signs of heat.

Both the No. 1 and the No. 4 compressors were examined after the accident. All valves, etc., were found in good order. There was no evidence of overheating in the compressors. No. 3 compressor was not operating at the time of the explosion.

PROSECUTIONS

Regina *vs.* M. Bankoski

Regina *vs.* P. Paquette

A charge was laid against M. Bankoski, a miner employed at the Garson Mine of International Nickel Company of Canada, Limited, as follows:

> That M. Bankoski, at Garson Mine in the township of Garson on or about the 5th day of August in the year A.D. 1953 did, contrary to law, drill within 5 feet of a hole containing explosives, contrary to subsection 73c of Section 162 of the Mining Act. R.S.O., Chapter 236, 1950, and amendments thereto.

A similar charge was laid against his partner, P. Paquette.

The prosecutions were instituted following an investigation of the drilling of a hole in No. 2483 raise. Blasting of the square-up on August 4 had resulted in several "bootlegs," approximately 30 inches deep, along the footwall. One missed hole was also found and blasted during the morning of August 5. Later, after drilling of the new round had commenced, the foreman brought to the attention of the drillers that one hole had been drilled too close to a bootleg.

On the following morning the face was inspected by the safety engineer and foreman. During this inspection, another missed hole was discovered with a drilling bit and clay inserted in the hole, thus covering approximately 18 inches of explosives. Eight holes had been drilled within 5 feet of this missed hole.

Both men pleaded guilty before Magistrate W. J. Golden at Sudbury on August 14. Fines of $25.00 and costs of $6.50 were imposed on each man. The fines and costs were paid.

Regina *vs.* R. Bjarnason

On April 11 R. Bjarnason, a miner at the Helen Mine of Algoma Ore Properties, Limited, drilled two holes, in the face of No. 540 subdrift, within 6 inches of holes which had previously been charged and blasted. These two holes were drilled within the area of the previous cut.

Bjarnason was charged with an offense against Section 162, subsection 73b, Part VIII, of the Mining Act of Ontario. He pleaded guilty, and the case was settled out of court. A fine of $10.00 and costs of $4.00 were imposed and paid.

Regina *vs.* John Carlisle Hill

A charge was laid against John Carlisle Hill, manager of Plator Gralouise Gold Mines, Limited, as follows:

That John Carlisle Hill, being Manager of Plator Gralouise Gold Mines, Limited, did fail to enforce the requirements of Section 162, subsection 253c, Part VIII of the Mining Act of Ontario, in connection with shaft-sinking operations conducted on claim F.F. 3704 from April 25 to May 6, 1953, and that such failure was contrary to Section 161, subsection 4b (*i*) of the said act.

Hill pleaded guilty to the charge before Magistrate F. C. Cornell in Atikokan on July 22. A fine of $100.00 and costs, or 14 days in jail, were imposed. The fine and costs were paid.

The requirements of subsection 253c are in connection with the drum diameter of a hoist; the requirements of Section 161, subsection 4b (*i*), are in connection with the responsibilities of the manager of a mine.

Regina *vs.* Edward David

A charge was laid against Edward David, a smelter labourer at the Falconbridge Nickel Mines, Limited, smelter as follows:

That Edward David at the village of Falconbridge on the 9th day of April, 1953, did unlawfully enter upon the property of the Falconbridge Nickel Company Limited, to wit: the Falconbridge Nickel Mines Smelter Dry, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

David pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on April 11. A fine of $15.00 and costs of $6.00 were imposed and paid.

Regina *vs.* Laurent Lebel

A charge was laid against Laurent Lebel, a pumpman at the Copper Cliff smelter of the International Nickel Company of Canada, Limited, as follows:

That Laurent Lebel at the town of Copper Cliff on the 25th day of December, 1953, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, the Copper Cliff Smelter, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

Lebel pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on December 31. A fine of $10.00 and costs were imposed. The fine and costs, amounting to $16.00, were paid.

Regina *vs.* Gabriel Lebreton

A charge was laid against Gabriel Lebreton, a process labourer at the Copper Cliff smelter of the International Nickel Company of Canada, Limited, as follows:

That Gabriel Lebreton at the town of Copper Cliff on the 21st day of December, 1953, did unlawfully have in his possession a quantity of liquor on the mining property of the International Nickel Company, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

He pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on December 21. A fine of $15.00 and costs were imposed. The fine and costs, amounting to $21.00, were paid.

Regina *vs.* Colin MacDonald

A charge was laid against Colin MacDonald, a shoveller at the Levack mine of the International Nickel Company of Canada, Limited, as follows:

That Colin MacDonald at the town of Levack Mine on the 13 day of July, 1953, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, Levack Mine, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII of the Mining Act of Ontario.

MacDonald pleaded guilty before Magistrate W. J. Golden at Sudbury on July 14. A fine of $25.00 and costs, or twenty days in jail, were imposed. The fine and costs, amounting to $37.50, were paid.

Regina *vs.* Peter McGarry

The following charge was laid against Peter McGarry, an employee of th Nipissing O'Brien Mines, Limited:

That Peter McGarry, on or about the first day of April, 1953, while employed as a drill runner at the Nipissing O'Brien mine in the township of Coleman, in the district of Timiskaming, did unlawfully drill within six inches of a hole that had been charged and blasted, contrary to Part VIII, Section 162, subsection 73b of the Mining Act of Ontario, R.S.O. 1950.

The case was heard before Magistrate S. Atkinson on April 10 in the District Court House in Haileybury. McGarry pleaded guilty and was fined $10.00 and costs of $8.50. The fine and costs were paid.

Regina *vs.* George Morphy

A charge was laid against George Morphy, a sandfill man as the Frood-Stobie mine of the International Nickel Company of Canada, Limited, as follows:

That George Morphy at the town of Frood Mine on the 13th day of May, 1953, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, Frood Mine No. 3 shaft, while under the influence of liquor, contrary to subsection 411 of Section of 162, Part VIII of the Mining Act of Ontario.

Morphy pleaded guilty before Magistrate W. J. Golden at Sudbury on May 14. A fine of $10.00 and costs, or ten days in jail, were imposed. The fine and costs, amounting to $16.00, were paid.

Regina *vs.* Plator Gralouise Gold Mines, Limited

A charge was laid against Plator Gralouise Gold Mines Limited, as follows:

That Plator Gralouise Gold Mines, Limited, being owner of mining claims in the Fort Frances Mining Division, did carry on shaft-sinking operations on claim No. F.F. 3704, from April 25 until May 6, 1953, using a hoist with drum diameter less than 48 times the diameter of the hoisting rope being used, contrary to Section 162, subsection 253c, Part VIII, of the Mining Act of Ontario and that this offense against the Mining Act was committed after having had this section of the Mining Act brought to their attention repeatedly by the District Inspector of Mines in letters of instruction dated March 18, 1953, March 28, 1953, and April 18, 1953.

Representatives of the company pleaded guilty before Magistrate F. C. Cornell at Atikokan on July 22. A fine of $500.00 and costs were imposed. The fine and costs were paid.

Regina *vs.* John Sauriol

A charge was laid against John Sauriol, a shoveller at the Frood-Stobie mine of the International Nickel Company of Canada, Limited, as follows:

That John Sauriol at the town of Frood Mine on the 1st day of June, 1953, did unlawfully enter upon the property of the International Nickel Company of Canada, Limited; to wit, Stobie Mine No. 7 shaft, while under the influence of liquor, contrary to subsection 411 of Section 162, Part VIII, of the Mining Act of Ontario.

Sauriol pleaded guilty before Magistrate W. F. Woodliffe at Sudbury on June 2. A fine of $15.00 and costs, or ten days in jail, were imposed. The fine and costs, amounting to $21.00, were paid.

Regina *vs.* Edwin Walter Shaw

A charge was laid against Edwin Walter Shaw, President of Plator Gralouise Gold Mines Limited, as follows:

That Edwin Walter Shaw, being owner or agent of Plator Gralouise Gold Mines, Limited, did fail to provide the manager of the Plator Gralouise Gold Mines, Limited with the necessary means to comply with the requirements of the Mining Act of Ontario for sinking operations which were conducted on claim F.F. 3704 of the Plator Gralouise property from April 25 till May 6, 1953, contrary to Section 161, subsection 5 of the Mining Act of Ontario, the said requirements having been drawn to the attention of Edwin Walter Shaw by the District Inspector of Mines in a letter of instruction dated March 18, 1953, and acknowledged by Edwin Walter Shaw's letter of reply, dated March 21, 1953.

Shaw pleaded guilty to the charge before Magistrate F. C. Cornell at Atikokan on July 22. A fine of $100.00 and costs, or 14 days in jail, were imposed. The fine and costs were paid.

MINE RESCUE STATIONS

During the year the training of teams in mine rescue and recovery operations was carried out in basic, standard, advanced, and supervisory classes.

Teams of trained personnel available for emergencies, maintained by the mines, are as follows:

Station	Superintendent	Active	Reserve men	Supervisory staff	Apparatus men [1]
Porcupine	A. K. Graham	33		31	18
Kirkland Lake	G. E. Wilson	17		42	33
Cobalt	R. Eveson	9			
Sudbury	G. G. McPhail H. G. Moorhouse	32	18	83	5
Geraldton	John Lang	3		8	18
Steep Rock		3		8	20
Helen		2		6	15
Renabie		2		3	8
Red Lake	C. S. Culbert	9			
Pickle Lake		1			
Total		111	18	181	117

[1]Hoistmen, cagetenders, electricians, mechanics, and other specialists.

The number of men who passed the necessary examinations during the year, and who were granted their Basic Certificates or Approval Seals are as follows:

Station	Basic certificate	Standard seal	Advanced seal	Supervisory seal
Porcupine	25	41	.....	19
Kirkland Lake	27	27	.....	.....
Cobalt	[1]17	46	.....	.....
Sudbury	44	30	17	.....
Geraldton[2]	37	20	9	.....
Red Lake[3]	21	.....	.....	7
Total	171	164	26	26

[1]Modified.
[2]Steep Rock, Helen, and Renabie are included with the figures for Geraldton.
[3]Pickle Lake is included in the figures for Red Lake.

ONTARIO GOVERNMENT CABLE-TESTING LABORATORIES

The following table is a summary of the work accomplished during the year.

SUMMARY OF ROPE TESTS, 1953

Classification	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 1953
Tests for Ontario Mines	55	38	48	48	35	43	53	34	47	51	46	36	534
Special Informative Tests	16	60	45		56	73	34		15	...	37	35	371
Tests for Wire-Rope Manufacturers	29	16	27	21	24	25	20	19	18	10	19	18	246
Tests for Mines outside Ontario	21	46	55	43	38	30	37	37	44	45	39	30	465
Tests for Industries other than Mining			2	3	3	5	1	..		5	5		24
Other tests													
Total	121	160	177	115	156	176	145	90	124	111	146	119	1,640

Classes for Prospectors, 1953–54

By W. D. Harding

Revival of Interest

There was a marked revival of interest in prospectors' classes during the season of 1953–54. The combined registration at all towns was 568. This represents a larger total attendance than has been recorded for any season since that of 1938–39. Prior to World War II, in the 1930's, the classes were well patronized. During most seasons in that decade the combined attendance was more than 1,000. In 1939, owing to World War II, the courses were suspended. They were resumed again in 1945, but since that time, the attendance has not been large.

The increase in attendance during the past season appears to be a reflection of the widespread interest in prospecting that has existed in Ontario in recent months. During 1953 important mineral discoveries have been made in the Blind River, Bancroft, and Manitouwadge areas. By the end of that year more claims had been recorded in Ontario than during any previous year. This activity, coupled with a desire on the part of prospectors and laymen everywhere in Ontario to learn about uranium minerals and the spectacular developments associated with the studies of radioactivity, has inspired larger groups to attend prospectors' classes.

During the 1953–54 season most of the instruction was carried out by W. D. Harding. Local speakers, who were specialists in various fields, were invited to address the class when they were available.

Eight Courses Conducted

Altogether eight courses were conducted by the writer during the past season. These courses were held at the following points: Pembroke, Blind River, Fort Frances, Port Arthur, Sudbury, Hornepayne, Toronto, and Espanola. In accordance with the custom followed in previous years, registrations were accepted only at the afternoon classes when most of the instruction was given. Owing to this method the number of registrations at any class may bear little relationship to the evening attendance. At most towns there were many in regular attendance at the evening classes who, owing to the nature of their occupations, were unable to be present during the day. At every town, therefore, the evening classes were the larger. The details of the attendance at the above mentioned points, together with other information, is given in the following table:

PROSPECTORS' CLASSES, 1953–54

Place	Period of course	Registrations (accepted at) afternoon classes only)	Average daily attendance at afternoon classes	Average daily attendance at evening classes	Total student hours (all classes)	Number with experience in prospecting or mining	Number who attended a previous class
	1953:						
Pembroke (Town Hall)	Nov. 23–28	26	17	44.6	427	12	4
Blind River (Town Hall)	Dec. 7–12	[1] 41	.....	30.8	308	12	8
	1954:						
Fort Frances (Town Hall)	Jan. 6–16	28	22.8	30	153	11	5
Port Arthur (Public Library)	Jan. 18–23	62	46.3	62	866	30	19
Sudbury (Legion Hall)	Jan. 25–30	85	64.8	109.2	1,324	61	15
Hornepayne (Y.M.C.A.)	Feb. 1–5	40	30.8	41.8	579	13	6
Toronto (Mining Building, University of Toronto)	Mar. 1–5	216	150	237.4	2,689	84	26
Espanola (Legion Hall)	Mar. 15–20	70	45.2	[2] 70	822	38	13
Total	.....	568	.....	.....	7,168	261	96

[1] No afternoon classes were held at Blind River. Registration figures apply to evening classes.
[2] Only four evening classes were held.

Particulars of Classes Held

Pembroke

The course at Pembroke was held at the request of Pat Brennan of that town. Mr. Brennan, an accountant formerly associated with one of the mines in northwestern Quebec, organized the attendance and co-operated with the writer in making other necessary arrangements. Class meetings were held in the town hall. There were 36 registrations. The average evening attendance was 44.6

Dr. Leslie Cook, one of the scientists of Atomic Energy, Limited, Chalk River, was invited to address the group on the subject of "Uranium." He demonstrated the cloud chamber experiment, and members of the class were able to see the emanation from a piece of uranium metal. The particles representing alpha, beta, and gamma rays were expelled like small bullets.

The course at Pembroke was attended by Mayor J. J. Carmody and by Ben Hollinger, son of the famous discoverer of the Hollinger gold mine.

The last previous course held at Pembroke was conducted by W. D. Harding in 1936.

Blind River

In view of the recent discoveries of uranium-bearing mineral in the area situated north of Lake Huron and the prolonged staking activity that followed, it was decided to conduct a course at Blind River. Through the courtesy of the town council, the assembly room of the town hall was made available as a lecture room. As the occupations of most of those who wished to attend the course did not conveniently permit them to attend during the day, it was decided to hold evening classes only. Registrations totalled 41. The average daily attendance was 30.8 A course was conducted previously in Blind River in 1938 by C. H. Horwood. Seventeen were registered for the course at that time.

Fort Frances

Arrangements for the course at Fort Frances were made by C. R. Richardson, the local mining recorder. The class meetings were held in the assembly room in the town hall. Most of the 28 who registered for the course attended every class meeting. Several members of the class came from Emo and from other outside points in the Fort Frances area. It was the largest class held in Fort Frances since the season of 1934–35. This interest may be attributed to the fact that there has been a recent revival in prospecting and staking activity in the surrounding area.

Port Arthur

At Port Arthur, as on previous occasions, the classes were conducted in the Public Library. The preparatory arrangements were made by E. G. Pye, the local resident geologist for the Ontario Department of Mines. The attendance was about the same as at the classes conducted at Port Arthur a year previously. A very successful course was held. Almost half of those registered had had some experience in prospecting or mining.

Sudbury

J. R. McGinn, local mining recorder, made the arrangements for the course at Sudbury. Provision was originally made to conduct the classes in one of the offices of the Ontario Department of Highways, adjacent to the mining recorder's office. Later it was found that that location was not available, and they were conducted in the Legion Hall. The change was fortunate as the location originally planned would not have accommodated the large crowd that attended. Eighty-five registered for the course, but on three evenings over 100 were in

attendance. It was the largest course ever held in Sudbury by the Ontario Department of Mines.

At three of the five evening classes special speakers were invited to address the audience. W. L. W. Taylor of Falconbridge Nickel Mines, Limited, spoke on "Mining in Peru." Charles Baycroft, a mining engineer of Sudbury, gave a talk on "Uranium," and H. F. Stewart of International Nickel Company of Canada, Limited, described "Geophysical Prospecting Methods." At one of the afternoon periods J. R. McGinn replied to questions regarding the staking laws of Ontario.

Hornepayne

Upon requests from local prospectors a course was conducted in Hornepayne during the period February 1 to February 5, 1954. This was the third course held in that community by the Ontario Department of Mines. All were held since 1934. Class meetings were conducted in an excellent room in the Y.M.C.A. There were 40 registrations. Some members of the class came daily by train from Oba, about 45 miles east of Hornepayne. A number of the prospectors at the classes had participated in the Manitouwadge staking rush that began in July, 1953. An evening visitor at the class was Cyril Young, well-known Toronto prospector.

Toronto

The Toronto classes were conducted jointly by the Ontario Department of Mines and the Prospectors and Developers Association. The classes were held in the Mining Building of the University of Toronto from March 1 to March 5. There was a large attendance. Only 216 filled out registration cards, but on the opening day, 325 were in attendance. Members of the course were welcomed by the Hon. P. T. Kelly, Minister of Mines for Ontario, and by Mrs. Viola MacMillan on behalf of The Prospectors and Developers Association. Special lecturers were invited to address the class on selected subjects as follows: "Geophysics," by Professor H. S. Scott of McMaster University, Hamilton; "Services Rendered at the Provincial Assay Office," by A. D. Moddle, Provincial Assayer; "Uranium Minerals," by D. H. Gorman, lecturer in mineralogy, University of Toronto; "Uranium Deposits," by Franc Joubin, Consulting Geologist, Toronto; "Staking Regulations in Ontario," by Ralph Scott, mining recorder of the Ontario Department of Mines. An interesting talk was also given by Roy Barker, prospector of Geraldton, who was one of the original stakers in the Manitouwadge area. Mr. Barker described how he found the Geco mine.

At the conclusion of the Toronto course, many members attended the annual convention of the Prospectors and Developers Association which was held in the Royal York Hotel, Toronto, from March 7 to March 10.

Espanola

At the request of local prospectors a course was conducted at Espanola from March 15 to March 20. J. C. Campbell, a prospector of Espanola, co-operated with the writer in making the preliminary arrangements. It was the first prospectors course held in that town by the Department. Class meetings were conducted in the new Legion Hall. Considering the size of Espanola, there was a large attendance. Many of those in the class came from Massey and other outside points. A large number were experienced prospectors. Recent discoveries of radioactive minerals in the Espanola area were probably responsible for the satisfactory attendance. J. R. McGinn, mining recorder at Sudbury, was present at the last class meeting and replied to numerous questions regarding staking regulations.

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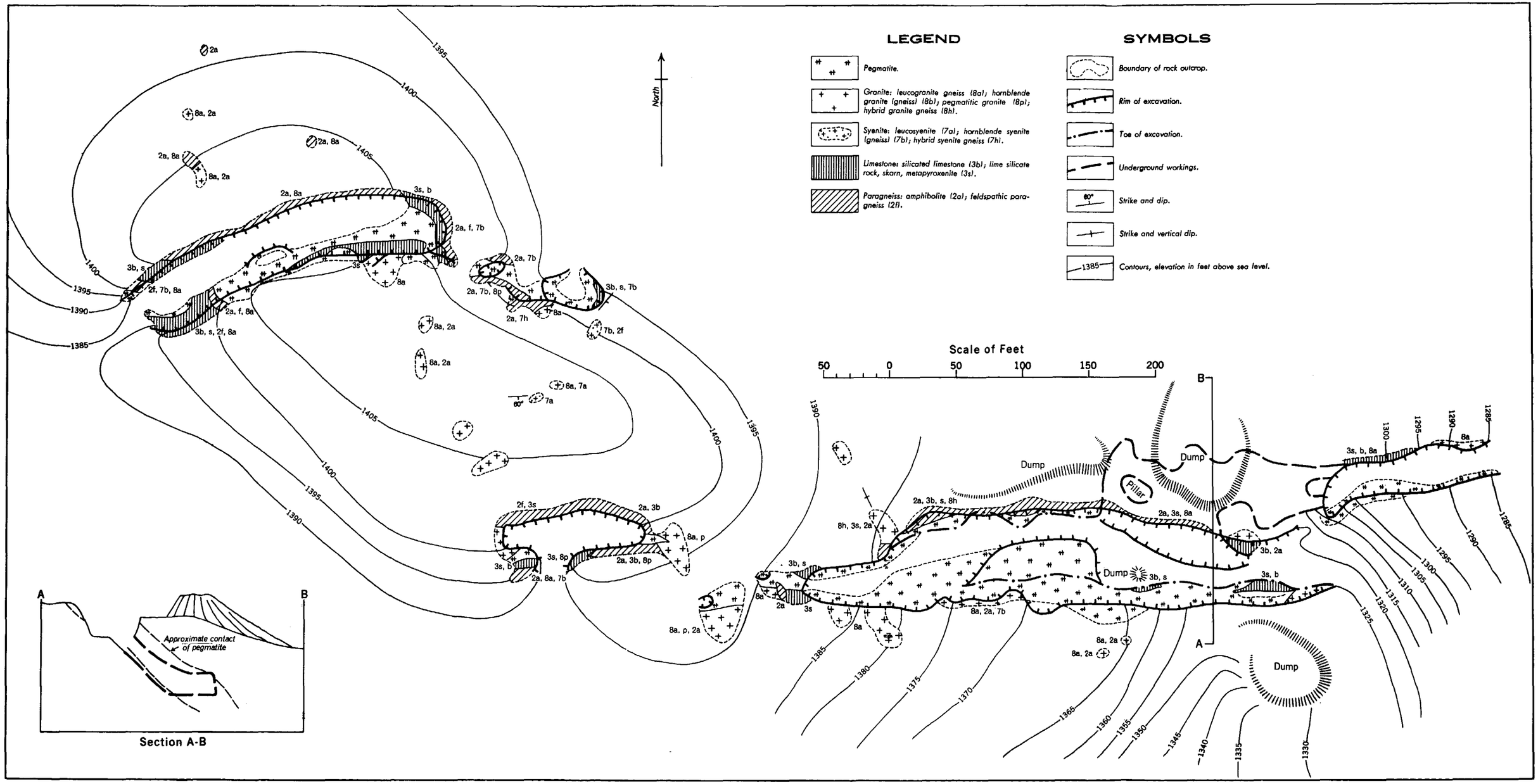
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Mine	Ore raised	Material discarded (sorted)	Ore milled	Bullion produced				Total value of bullion, Canadian funds
				Gold content		Silver content		
				Quantity	Value, Canadian funds	Quantity	Value	
	tons	tons	tons	ounces		ounces		
PORCUPINE BELT								
Aunor	139,759	.....	139,759	54,663.000	$ 1,886,264	3,597	$ 3,326	$ 1,889,590
Bonwhit	63,762	.....	63,762	19,016.538	673,878	.....	.....	673,878
Broulan Reef	82,520	.....	82,520	21,479.700	739,002	2,990	2,503	741,505
Buffalo Ankerite	1,125	.....	1,125	3,157.886	108,094	235	196	108,290
Coniaurum	89,952	.....	89,952	23,534.918	812,277	3,908	3,285	815,562
Delnite	105,483	.....	106,027	30,751.789	1,061,250	2,220	1,837	1,063,087
Dome	687,300	.....	687,300	169,743.000	5,842,231	32,703	27,410	5,869,641
Hallnor	69,385	.....	69,385	25,230.867	898,821	1,815	1,523	900,344
Hollinger	750,148	.....	751,690	198,137.000	6,833,514	37,272	31,825	6,865,339
Hugh-Pam	42,625	.....	42,625	9,734.789	345,079	.....	.....	345,079
McIntyre Porcupine	574,090	.....	574,090	159,664.314	5,512,567	33,031	27,786	5,540,353
Pamour	627,398	36,310	627,398	58,474.000	2,012,459	4,959	4,156	2,016,615
Paymaster Consolidated	154,761	.....	154,246	39,789.795	1,370,025	7,735	6,487	1,376,512
Preston East Dome	128,779	.....	128,720	42,107.326	1,453,150	4,683	3,934	1,457,084
Ross (Hollinger)	113,568	.....	113,361	21,311.000	734,179	35,896	30,424	764,603
Miscellaneous[1]	.....	.....	.....	17.000	585	.....	.....	585
Total	3,630,655	36,310	3,631,960	876,812.922	$30,283,375	171,044	$144,692	$30,428,067
KIRKLAND LAKE AREA								
Kirkland Lake Gold	112,616	.....	112,616	43,173.519	$ 1,485,970	3,695	$ 3,097	$ 1,489,067
Lake Shore	236,669	.....	236,669	90,338.790	3,082,132	31,105	25,902	3,108,034
Macassa	144,175	.....	144,175	46,391.657	1,597,311	7,153	5,997	1,603,308
Sylvanite	170,147	.....	170,032	53,865.208	1,853,542	13,605	11,399	1,864,941
Teck-Hughes	227,355	.....	228,425	38,770.175	1,335,096	7,573	6,354	1,341,450
Toburn	7,400	.....	7,400	3,070.045	105,589	508	425	106,014
Upper Canada	182,883	.....	182,883	46,988.934	1,617,219	20,505	17,196	1,634,415
Wright-Hargreaves	192,390	.....	192,390	82,298.787	2,835,280	15,864	13,319	2,848,599
Miscellaneous	.....	.....	.....	5.000	172	.....	.....	172
Total	1,273,635	.....	1,274,590	404,902.115	$13,912,311	100,008	$ 83,689	$13,996,000
LARDER LAKE AREA								
Kerr-Addison	1,642,008	.....	1,643,298	334,246.834	$11,687,199	7,744	$ 6,458	$11,693,657
Total	1,642,008	.....	1,643,298	334,246.834	$11,687,199	7,744	$ 6,458	$11,693,657
MATACHEWAN AREA								
Matachewan Consolidated	49,577	.....	50,227	4,507.886	$ 159,367	2,691	$ 2,571	$ 161,938
Young-Davidson	323,103	.....	323,094	26,665.000	918,715	5,977	5,005	923,720
Total	372,680	.....	373,321	31,172.886	$ 1,078,082	8,668	$ 7,576	$ 1,085,658
SUDBURY DISTRICT								
Curtin Prospecting Syndicate	.....	.....	.....	15.688	$ 541	3	$ 2	$ 543
Renabie	168,043	.....	168,243	41,248.379	1,418,605	13,235	11,091	1,429,696
Total	168,043	.....	168,243	41,264.067	$ 1,419,146	13,238	$ 11,093	$ 1,430,239
ALGOMA DISTRICT								
Magino (E. M. Hartling)	.....	.....	.....	226.820	$ 7,598	336	$ 269	$ 7,867
Total	.....	.....	.....	226.820	$ 7,598	336	$ 269	$ 7,867
THUNDER BAY DISTRICT								
Leitch	52,589	11,302	38,614	32,159.653	$ 1,106,611	961	$ 806	$ 1,107,417
Little Long Lac	83,044	.....	83,044	23,037.000	794,042	2,194	1,839	795,881
MacLeod-Cockshutt	453,732	.....	453,732	57,617.711	1,982,850	6,279	5,264	1,988,114
Theresa	3,490	.....	3,490	898.072	30,912	41	26	30,938
Total	592,855	11,302	578,880	113,712.436	$ 3,914,415	9,475	$ 7,935	$ 3,922,350
PATRICIA PORTION								
Campbell Red Lake	224,973	43,947	181,026	89,407.047	$ 3,078,233	6,022	$ 5,046	$ 3,083,279
Cochenour Willans	61,680	.....	61,680	27,467.047	946,406	979	821	947,227
McKenzie Red Lake	84,352	9,282	75,070	21,562.603	742,590	6,574	5,509	748,099
Madsen Red Lake	285,180	.....	285,018	82,593.142	2,842,516	18,157	15,226	2,857,742
New Dickenson	126,090	.....	125,606	54,554.271	1,878,853	3,535	2,965	1,881,818
Pickle Crow	90,051	4,235	85,821	42,106.464	1,448,521	5,449	4,596	1,453,117
Starratt Olsen	156,433	.....	159,139	22,377.700	770,985	4,318	3,623	774,608
Miscellaneous[1]	.....	.....	.....	45.000	1,549	3	3	1,552
Total	1,028,759	57,464	973,360	340,113.274	$11,709,653	45,037	$ 37,789	$11,747,442
Miscellaneous[1]	.....	.....	.....	10.000	$ 344	.....	.....	$ 344
Total for gold mines	8,708,635	105,076	8,643,652	2,142,461.354	$74,012,123	355,550	$299,501	$74,311,624
Nickel-copper refining	.....	.....	.....	39,726.000	$ 1,367,645	.....	.....	.....
Copper-gold-silver ores	.....	.....	.....	226.670	7,802	.....	.....	.....
Copper-lead-zinc ores	.....	.....	.....	21.412	737	.....	.....	.....
Total gold output, 1953	.....	.....	.....	2,182,435.436	$75,388,307	.....	.....	.....
CALENDAR YEAR 1952								
Porcupine Belt	4,604,499	400	4,601,668	1,163,345.546	$40,190,714	213,574	$174,515	$40,365,229
Kirkland Lake Area	1,326,712	3,752	1,323,134	417,381.823	14,393,241	98,876	81,876	14,475,117
Larder Lake Area	1,829,003	.....	1,829,045	366,051.628	13,166,105	19,007	15,713	13,181,818
Matachewan Area	450,934	.....	451,672	40,143.902	1,373,436	12,431	10,358	1,383,794
Sudbury District	169,899	.....	169,674	40,837.477	1,397,164	12,228	10,148	1,407,312
Algoma District	50	.....	50	179.334	6,092	26	22	6,114
Thunder Bay District	569,787	8,996	560,841	120,052.032	4,238,160	9,648	7,993	4,246,902
Kenora and Rainy River District	.....	.....	.....	39.893	1,368	4	3	1,371
Patricia Portion	1,081,282	18,698	1,063,371	321,764.432	11,269,732	42,937	35,637	11,305,369
Total for gold mines, 1952	10,032,166	31,846	9,999,455	2,469,796.067	$86,036,012	408,731	$336,265	$86,373,026
Nickel-copper refining	.....	.....	.....	43,689.000	$ 1,497,223	.....	.....	.....
Copper-gold-silver ores	.....	.....	.....	104.820	3,592	.....	.....	.....
Copper-lead-zinc ores	.....	.....	.....	110.682	3,793	.....	.....	.....
Total gold output, 1952	.....	.....	.....	2,513,700.569	$87,540,620	.....	.....	.....

[1]High-grading and recovery from scrapped machinery.



Geological Sketch Map of the MacDonald Feldspar Mine, Monteagle Township.



PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-THIRD ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXIII, PART 2, 1954

Mining Operations in 1953

Compiled by
D. J. FIELD

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Mining Operations in 1953

Compiled by D. J. Field

Only those mines or mining properties that have reported actual mining or development operations in the year 1953 are included in this report.

ASBESTOS

Canadian Johns-Manville Ontario, Limited

Canadian Johns-Manville, Ontario, Limited, was incorporated in March, 1950, with an authorized capitalization of 1,000 shares of $100 par value, all of which have been issued. The company is a wholly owned subsidiary of the Canadian Johns-Manville Company, Limited. The officers and directors are: L. M. Cassidy, chairman of the board; A. R. Fisher, president; H. M. Ball, secretary; Roger Hackney, treasurer; A. Brown, W. R. Wilkinson, K. V. Lindell, K. W. Huffine, all vice-presidents and directors; R. D. Baker, director. The secretary's office is at 22 East Fortieth Street, New York 16, N.Y. The head office and mine office are at Matheson.

The company's main property, known as the Munro mine, is in Munro and Beatty townships, Porcupine area, district of Cochrane.

Operations continued throughout 1953. There is a vertical, two-compartment shaft, sunk in 1951, on the *C* orebody, on claim L.25634, Beatty township, with 2,972 feet of crosscutting on a level at 300 feet. No underground work was done in 1953. About 244,018 tons of overburden were stripped from the *A* orebody, in Munro township. There were 634,087 tons of ore mined from the open pit on the *A* orebody. The mill treated 665,930 tons.

The Warren Lake mining-access road was completed in 1953, making the company's Reeves township property easily accessible.

R. D. Baker was mine manager, employing 295 men.

COPPER

Coldstream Copper Mines, Limited

Coldstream Copper Mines, Limited, was incorporated in November, 1951' with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,465,006 shares have been issued. The officers and directors are: L. J. Moreaux, president; K. A. Davis, vice-president; B. P. Davis, secretary-treasurer; S. T. Douglass, John Allen, J. E. McKeon, and F. A. Best, directors. The head office is at 192 Bay Street, Toronto. The mine address is Kashabowie.

The company holds 4 patented claims (mining locations K.62, K.63, K.64, and K.65) and 40 unpatented claims in the area east of Moss and Ames townships, district of Thunder Bay. The property is about 90 miles west of Fort William and 8½ miles, by road, south of Kashabowie station on the Canadian National railway. It includes the former Tip Top mine.

Previous operators sank an inclined, two-compartment shaft, known as No 1, to a depth of 200 feet from surface and did considerable lateral work. There are also two shallow vertical shafts on the property, sunk during previous operations. The present company has done no development work from these shafts.

Operations in 1953 were carried on from April 1 to June 30. The three-compartment, vertical No. 4 shaft, which was sunk on claim K.65 in 1952, is 351 feet deep. The following table shows the amount of development work done from this shaft:

Level	Drifts		Crosscuts	
	1953	Total	1953	Total
	feet	feet	feet	feet
180-foot	550	745	.....	412
325-foot	114	274	.....	435

Diamond-drilling in 1953 consisted of 47 holes, totalling 10,619 feet, from underground. About 500 feet of surface-trenching, 2 feet deep, was done.

In November and December the property was examined by Moneta Porcupine Mines, Limited, and Buffalo Ankerite Mines, Limited, under an option agreement. At the end of January, 1954, all underground work was suspended, the workings were allowed to flood, and the shaft was bulkheaded.

R. A. Vary was in charge, employing an average of 13 men.

Consolidated Golden Arrow Mines, Limited

Golden Arrow Mines, Limited, was incorporated in December, 1938. In February, 1953, the company was reorganized, and the name was changed to Consolidated Golden Arrow Mines, Limited. The authorized capitalization is 3,000,000 shares of $1 par value, of which 1,257,287 shares have been issued. The head office is at 67 Yonge Street, Toronto. The mine address is c/o F. W. Hughes, Chaput-Hughes.

The company holds claims in Hislop, McCann, and Pacaud townships, district of Timiskaming. The Pacaud township property was formerly known as the Trethewey-Ossian mine.

Operations were carried on at the Trethewey-Ossian mine from March to September, 1953. The vertical, two-compartment shaft was deepened from 140 to 220 feet, and about 180 feet of lateral development work was done on a new level at 200 feet.

A headframe was built, and a single-drum air-hoist was installed. Power was supplied by a diesel-driven compressor.

The shaft-sinking was done by a contractor who employed 10 men from March to June. F. W. Hughes was engineer-in-charge for the mining company.

Kristina Copper Mines, Limited

Kristina Copper Mines, Limited, was incorporated in May, 1952, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 1,700,007 have been issued. The officers and directors are: J. M. Eastman, president; S. T. Bardal, vice-president; D. G. Taylor, secretary-treasurer; Ernest Hawker and Aaron Gold, directors. The head office address is 33 Melinda Street, Toronto. The mine address is Searchmont.

The company's property in township 24, range 11, district of Algoma, was

formerly known as the Superior mine. It was operated between 1903 and 1907 by the Superior Copper Company, which sank several shafts and did considerable development work. The holdings of Kristina Copper Mines, Limited, include the old Nos. 2, 3, 5, and 6 shaft workings, but not Nos. 1 and 4 shafts.

The inclined, two-compartment No. 6 shaft is about 337 feet deep, with three levels at 100-foot intervals. The following table shows the development work done by the former operators:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
1st	510	32	80
2nd	255	.....	.....
3rd	120	.....	.....

The present operators began work in November, 1953. The No. 6 shaft was dewatered to the third level. Eight diamond-drill holes, having a total length of 1,920 feet, were drilled from surface.

A cookery and bunk-house, an office, and a power-house were built.

J. W. Robertson was manager. One man was employed.

New Ryan Lake Mines, Limited

Ryan Lake Mines, Limited, was incorporated in March, 1947. In October, 1951, the name was changed to New Ryan Lake Mines, Limited. The authorized capitalization is 3,500,000 shares of $1 par value, of which 3,229,103 shares have been issued. The officers and directors are: G. S. Welsh, president and manager; H. A. Campbell, vice-president; H. L. Simons, secretary-treasurer; R. D. Cumming and Ethel Welsh, directors. The address of the head office and the mine is Matachewan.

The company's property consists of 10 claims, held under lease in Powell township, Matachewan area, district of Timiskaming.

Mining operations continued throughout 1953. The vertical, two-compartment shaft, on claim M.R.12548, was deepened from 209 to 459 feet, and two new levels were established at 317 and 442 feet below the surface. The following table shows the development work done during 1953 and the total:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
92-foot	.....	1,105	.....	25	.....	326
192-foot	878	1,809	367	579	305	500
317-foot	639	639	232	232	190	190
442-foot	.....	.....	36	36	.....	.....

Thirty-three diamond-drill holes, totalling 2,868 feet, were drilled from underground.

The mill operated from January 1 to June 27, was shut down during the period of shaft-sinking, and operated again from October 12 to December 31.

A total of 27,177 tons of ore was mined. The mill treated 26,747 tons, operating at an average rate of 115 tons per day.

An average of 44 men was employed.

COPPER-LEAD-ZINC

Ontario Pyrites Company, Limited

The Ontario Pyrites Company, Limited, was incorporated in July, 1942, with an authorized capitalization of 6,000,000 shares of no par value, 5,452,483 of which have been issued. The officers and directors are: Thayer Lindsley, president; J. M. Cunningham-Dunlop, vice-president; F. C. Sullivan, secretary-treasurer; A. G. Fulton, and W. S. Morlock, directors. The head office is at 25 King Street West, Toronto. The mine address is R.R.2, Chelmsford.

The company's main holdings are the old Errington property in Creighton township and the Vermillion Lake property in Fairbank township, both in the district of Sudbury.

Errington Mine

There are five vertical shafts on the Errington mine, all sunk during previous operations. The following table shows the number of compartments and depth of each shaft:

Shaft	Number of compartments	Depth
		feet
No. 1	3	619
No. 2	3	1,571
No. 3	3	409
Irwin	1	70
River	1	85

The dewatering of the No. 2 shaft, begun in 1952, was completed in the early summer of 1953, and some crosscutting was done on the 500- and 750-foot levels. No development work was done from the No. 1 shaft in 1953. The No. 1 shaft was shut down at the end of April, and the diesel-driven mining plant was moved to the Vermillion Lake mine.

The following table shows the development work done on the levels from Nos. 1 and 2 shafts:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
300-foot	.....	5,107	.....	4,370	.....	2,002
500-foot	.....	8,879	192	4,016	.....	1,278
750-foot	.....	.....	420	420	.....	.....
1,000-foot	.....	.....	15	15	.....	.....
1,500-foot	.....	4,784	13	1,538	77	77

A small test mill, capable of treating four tons of ore a day, was installed in the No. 1 shaft area.

The electric mining plant installed at No. 2 shaft includes one 60- by 48-inch, double-drum hoist and one 2,800-cubic-foot compressor, both made by Canadian Ingersoll-Rand, and two English Electric transformers, one 2,000 and the other 600 kilovolt-amperes.

Vermillion Lake Mine

Operations at the Vermillion Lake mine continued throughout 1953. The vertical, three-compartment No. 4 shaft, begun in 1952, was sunk a further 480

feet to a depth of 930 feet, and levels were cut at 600, 750, and 900 feet.

The following table shows the total amount of development work done from No. 4 shaft:

Level	Drifts	Crosscuts
	feet	feet
450-foot	.....	49
600-foot	330	389
750-foot	556	257
900-foot	305	11

A building to house the hoist and compressor, a core-house, and a bungalow were erected.

The diesel-driven mining plant from No. 1 shaft was set up at No. 4 shaft, and a 48- by 36-inch Canadian Ingersoll-Rand hoist, and a 145-horsepower, 500-cubic-foot Belliss and Morcom stationary compressor driven by a 145-horsepower caterpillar diesel engine were installed.

Diamond-drilling on the two properties during 1953 consisted of 12 holes, totalling 6,462 feet, from surface, and 176 holes, totalling 52,190 feet, from underground.

An average of 32 men was employed at the two properties, of whom 7 were underground and 25 on the surface. J. C. Kirkland is manager.

FELDSPAR

Leonard Aleck

Leonard Aleck of Madawaska operated for a short time in 1953 and produced about 80 tons of feldspar from an open pit on the south half of lot 17, concession VI, Murchison township, district of Nipissing.

L. R. Bigelow (Bathurst Feldspar Mine)

L. R. Bigelow, R.R.7, Perth, operated the Bathurst Feldspar mine on the south half of lot 16 and the north half of lot 15, Bathurst township, Lanark county, under lease during the latter part of 1953.

Work was started on September 28, and 955 tons of feldspar were produced.

An average of 12 men was employed.

W. B. Cameron (Cameron or Ox Lake Mine)

The Cameron or Ox Lake mine, on the north half of lot 22, concession VII, Murchison township, district of Nipissing, was operated for eight months in 1953. Production of feldspar amounted to 1,500 tons.

A. B. Cameron was in charge, employing an average of five men. The address is Madawaska.

FLUORSPAR

Huntingdon Fluorspar Mines, Limited

Huntingdon Fluorspar Mines, Limited, was incorporated in June, 1953, with an authorized capitalization of 40,000 preferred shares of $10 par value, and 500,000 common shares of no par value. The number of shares issued at Decem-

ber, 31, 1953, was as follows: preferred, 750; common, 100,000. The officers and directors are: W. J. Symon, president and mine manager; Mrs. Alein Symon, vice-president and secretary-treasurer; Mrs. Jane Parker, director. The head office and mine office are at Madoc.

The company holds a lease on the east half of lot 9, concession XIV, Huntingdon township, Hastings county.

Mining operations were carried on from July 1 to November 7, 1953. A headframe, hoist-room, and mill were built. A vertical, two-compartment shaft, known as No. 1, was sunk to a depth of 63 feet, and a level was cut at 50 feet below the collar. About 117 feet of drifting was done, and a vertical escapement raise, called No. 2 shaft, was driven to surface.

A total of 1,600 tons of ore was hoisted. The mill operated from August 1 to November 6, and treated 922 tons of ore.

An average of five men was employed, of whom two were underground and three on surface.

GALLIUM

Gallium Corporation of Canada, Limited

The Gallium Corporation of Canada, Limited, was incorporated in November, 1950, with an authorized capitalization of 3,000,000 shares of no par value, all of which have been issued. The officers are: F. B. Brower, president; S. A. Goff, vice-president; C. E. Anderson, secretary-treasurer. The head office is at 686 Richmond Street West, Toronto. The mine address, during the period of operation, was Tory Hill.

The company's property is in Monmouth township, Haliburton county, in the vicinity of Tory Hill.

Towards the end of 1952 a small building was erected to house a jaw-crusher, ball mill, Akins classifier, and Deister table. Operation of the mill began in February, 1953. Pegmatitic material obtained from trenching and pitting was treated at the rate of 25 tons per day, until the end of August when the operation ceased. The concentrate obtained was stored for testing and sampling.

An average of six men was employed.

GOLD

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 officers and directors are: J. Y. Murdoch, president; J. R. Bradfield, vice-president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; W. S. Row, N. C. Urquhart, and K. C. Gray, directors. The head office address is Bank of Nova Scotia Building, Toronto. The mine address is Box 2001, Timmins.

The company owns nine claims and holds a 99-year lease on two others, in Deloro township, Porcupine area, district of Cochrane.

Mining continued from the beginning of the year until October 13, when a labour strike caused a suspension of operations. The mill operated until October 27. Both mine and mill were idle for the rest of the year.

The mine is served by a vertical, three-compartment shaft, 3,082 feet deep. The following table shows the development work done during 1953 and the total at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
250-foot	.....	.....	.....	384	.....	.....
500-foot	.....	.....	.....	110	.....	.....
625-foot	.....	2,881	.....	838	.....	2,869
750-foot	.....	3,260	.....	694	.....	1,327
875-foot	.....	3,802	.....	1,058	.....	1,348
1,000-foot	67	7,191	.....	1,249	.....	4,203
1,125-foot	81	4,141	.....	807	36	2,452
1,250-foot	.....	4,851	.....	969	.....	1,942
1,375-foot	47	3,151	.....	748	.....	2,336
1,500-foot	.....	3,989	40	958	.....	1,726
1,625-foot	339	2,125	19	1,423	.....	2,167
1,725-foot	116	1,322	.....	158	.....	589
1,875-foot	.....	5,690	226	547	282	3,620
2,000-foot	114	1,371	.....	276	.....	343
2,125-foot	21	5,963	.....	1,012	98	4,158
2,500-foot	.....	557	.....	.....	.....	.....
2,900-foot	984	2,287	8	936	.....	.....

Diamond-drilling in 1953 consisted of 242 holes, totalling 23,852 feet, from underground.

The following is taken from the manager's report for the year ending Decem ber 31, 1953:

MINE

Production

Mining was carried on between the 1,250- and 2,125-foot levels.

Until the suspension of operations on October 13 the mining rate was 489 tons per calendar day, the same as in the previous year. The average grade was 0.403 ounces of gold per ton as compared with 0.426 ounces for 1952.

Development

Drifting west on the 2,900-foot level was continued. Total advance was 1,060 feet; at the year's end this drift had reached a point 1,200 feet from the Aunor-Delnite boundary.

Other development work consisted of drifting, raising, and diamond-drilling between the 1,250- and 2,125-foot levels for further detailed examination of the ore zone and in preparation for mining.

Ore Reserves

At the end of the year, the ore reserves above the 2,125-foot level, were as follows:

	Tons	Percent	Ounces of gold per ton
Broken	12,000	1.7	0.232
Proved	702,000	96.6	0.373
Probable	12,000	1.7	0.304
Total	726,000	100.0	0.370

New ore developed during the year was 131,000 tons. Ore sent to the mill was 139,759 tons.

MILL

	1953[1]	1952	To date
Milled ..... tons	139,759	178,827	2,264,750
Milled per calendar day ..... tons	492.0	488.6	489.5
Average gold content per ton ..... ounces	0.403	0.426	0.353
Average tailings loss per ton ..... ounces	0.0115	0.0103	0.0090
Total recovery ..... percent	97.13	97.58	97.45
Total production ..... ounces	54,663.8	74,347.5	777,916.0
Value of total production	$1,889,589	$2,680,476	$28,764,427
Recovery per ton	$13.52	$14.99	$12.70

Sources of Ore Milled, 1953

	Tons	Percent
Development	2,400	1.7
Drawn from 1,250-foot level	1,650	1.2
Drawn from 1,375-foot level	9,700	6.9
Drawn from 1,500-foot level	30,000	21.4
Drawn from 1,625-foot level	17,500	12.5
Drawn from 1,750-foot level	14,200	10.2
Drawn from 1,875-foot level	15,800	11.3
Drawn from 2,000-foot level	21,350	15.3
Drawn from 2,125-foot level	25,950	18.6
Drawn from reserve	1,209	0.9
Total	139,759	100.0

PLANT

The plant was maintained in good condition; no major additions or replacements were made.

An average of 302 men was employed, of whom 212 were underground and 90 in the mill. R. E. Findlay is manager.

Banner Porcupine Mines, Limited

Banner Porcupine Mines, Limited, was incorporated in June, 1945, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,172,843 have been issued. The officers and directors are: George Bannerman, president; B. W. Lang, vice-president; R. A. Cranston, secretary-treasurer; J. T. Gauthier and A. R. Harkness, directors. The head office is at 372 Bay Street, Toronto. The mine address is Pamour.

The company owns 14 claims in Whitney and Tisdale townships, Porcupine area, district of Cochrane.

The property is operated under the management of Broulan Reef Mines, Limited, and further reference to the work appears under that company's name.

All the present work on the property is being done from the Reef shaft. In 1953 the drift on the 650-foot level from the Reef mine was driven a further 517 feet into Banner ground, making a total of 1,368 feet. No development work was done in the old Canusa shaft area.

Diamond-drilling consisted of six holes, totalling 4,224 feet, from underground.

Between July 11 and September 3 operations were curtailed by a labour strike and did not reach a normal basis again until December.

There was no production in 1953.

W. F. Brown is mine manager. Employment figures are included in the report for Broulan Reef Mines, Limited.

[1]Only 9½ months' operation.

Bonwhit Mines, Limited

Bonwhit Mines, Limited, was incorporated in September, 1951, with an authorized capitalization of 100,000 shares of no par value, of which 90,005 have been issued. The officers and directors are: B. W. Lang, president; W. F. James, vice-president; T. C. Newman, secretary-treasurer; F. G. Lawson and F. J. Bowley, directors. The head office is at 372 Bay Street, Toronto. The mine address is Pamour.

The company, a wholly owned subsidiary of Broulan Reef Mines, Limited, owns that part of the Bonetal mine that was developed from the Reef shaft. The property is in Whitney township, Porcupine area, district of Cochrane, and forms part of the group operated by Broulan Reef Mines, Limited. All operations are conducted through the Reef shaft. Further information regarding operation and production appears under Broulan Reef Mines, Limited.

Operations continued throughout 1953, but were curtailed from July 11 to the end of the year because of a labour strike. The following table shows the amount of underground development work done during 1953 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
500-foot	466	466	.....	.....	.....	.....
650-foot	355	1,083	143	143	134	305
800-foot	.....	928	.....	77	194	363
970-foot	105	1,552	.....	83	51	720
1,120-foot	839	839	172	172	22	22

Diamond-drilling consisted of 113 holes, totalling 15,284 feet, from underground.

A total of 63,762 tons of ore was mined and was treated in the Broulan Reef mill.

W. F. Brown is mine manager. The employment figures given for Broulan Reef Mines, Limited, include those for the Bonwhit mine.

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 have been issued. The officers and directors are: B. W. Lang, president; W. F. James and F. G. Lawson, vice-presidents; D. R. Michener, secretary-treasurer; J. B. Streit, F. H. Snyder, and F. J. Bowley, directors. The head office is at 372 Bay Street, Toronto. The mine address is Pamour.

The company owns the Broulan Reef mine and part of the old Bonetal mine in Whitney, Murphy, and Tisdale townships, Porcupine area, district of Cochrane. It also operates the property of its wholly-owned subsidiary company, Bonwhit Mines, Limited, and the properties of Banner Porcupine Mines, Limited,[1] and Hugh-Pam Porcupine Mines, Limited,[2] all in the same group.

Mining operations in both the Reef and Broulan shaft areas of the Broulan Reef mine continued from the beginning of 1953 until July 11, when a labour

[1]See page 8.
[2]See page 34.

strike caused the suspension of work in the Broulan shaft area. Curtailed operations were carried on in the Reef shaft area and in the Banner, Bonwhit, and Hugh-Pam sections until September 3. Work was then resumed in the Broulan shaft area, but operations were not on a normal basis until December.

During the first half of the year the vertical, three-compartment, No. 1 Reef shaft was sunk a further 221 feet to a total depth of 1,771 feet, and new levels were cut at 1,570 and 1,720 feet below the collar. At the end of the year the shaft was about 300 feet short of its original objective.

The following table shows the development work done during 1953 and the total at the end of 1953 from the Reef shaft:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
200-foot	.....	1,139	.....	579	.....	416
350-foot	72	2,176	.....	467	43	1,205
500-foot	482	2,565	79	604	.....	1,152
650-foot	.....	2,499	.....	689	168	1,134
800-foot	.....	2,234	.....	684	.....	988
970-foot	142	2,589	.....	734	220	947
1,120-foot	56	1,734	.....	496	63	363
1,270-foot	784	784	441	441	.....	.....
1,420-foot	.....	.....	13	13	.....	.....
1,570-foot	.....	.....	87	87	.....	.....

Diamond-drilling in the Reef shaft area in 1953 consisted of 75 holes, totalling 7,568 feet, from underground.

A 15-horsepower Hunslet diesel trammer was put into service on the 970-foot level of the Reef mine. This is the first underground diesel trammer in the Porcupine area.

The vertical, three-compartment No. 1 Broulan shaft is 675 feet deep. A vertical, two-compartment winze runs from a depth of 630 feet to a total depth of 1,002 feet below the surface. The only development work in the Broulan shaft area in 1953 was 89 feet of drifting on the 880-foot level. The following table shows the total amount of development from the shaft and winze at the end of 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
173-foot	3,164	1,000	3,576
273-foot	3,177	794	1,582
398-foot	1,551	918	1,685
523-foot	7,770	482	1,429
650-foot	318	330	337
630-foot (winze)	467	136	335
755-foot (winze)	.....	252	225
880-foot (winze)	187	.....	.....

Diamond-drilling in the Broulan shaft area in 1953 consisted of seven holes, totalling 2,404 feet, from underground. This included 1,917 feet drilled from Pamour ground.

A 29-foot Dorr agitator was added to the mill equipment, and was housed in a 40- by 34-foot addition to the building.

The following is taken from the mine manager's report for the year ending December 31, 1953:

REEF MINE

Production and Treatment

During the year, 64,958 tons of ore were mined and milled. Production was 19,189.45 ounces of fine gold valued at $660,473, in addition to which it is estimated that $73,553 will be received under the terms of the Emergency Gold Mining Assistance Act. Average recovery was 0.295 ounces of gold or $10.17 per ton milled.

Mining

In addition to the exploration and development work done during the year, the following work was done for other companies:

1) 937 feet of drifting, 22 feet of crosscutting, 294 feet of raising, 1,353 tons of slashing, 5,075 feet of diamond-drilling, and the mining and hoisting of 42,625 tons of ore for Hugh-Pam Porcupine Mines, Limited.
2) 517 feet of drifting, 788 tons of slashing, and 4,224 feet of diamond-drilling for Banner Porcupine Mines, Limited.
3) Considerable work, which is detailed under a separate heading in this report,[1] for the wholly owned subsidiary, Bonwhit Mines, Limited

Ore Reserves

Proven ore reserves are calculated to be 324,000 tons having an average uncut grade of 0.37 ounces of gold per ton or a cut grade of 0.26 ounces per ton. Experience has been that the grade as mined approximates 80 percent of the uncut grade.

BROULAN MINE

Production and Treatment

During the year 17,562 tons of ore were mined and milled. Production totalled $81,032 in addition to which it is estimated that $15,459 will be received under the terms of the Emergency Gold Mining Assistance Act.

Mining

Operations have not been resumed here since the work stoppage on July 11, 1953. There is still a small tonnage of marginal grade ore remaining in the winze area that may be mined at some later date.

BONWHIT MINES, LIMITED

Production and Treatment

During the year 63,762 tons of ore were mined and milled. Production totalled $673,878 representing 19,016.54 ounces of fine gold. Average recovery was 0.298 ounces of gold or $10.57 per ton milled.

Ore Reserves

Proven ore reserves are calculated to be 149,000 tons having an average uncut grade of 0.59 ounces of gold per ton or a cut grade of 0.30 ounces on the basis of arbitrarily cutting the high assays to one ounce.

MILLING FOR ALL MINES

During the year the mill treated 188,907 tons of ore from which were recovered 50,231.07 ounces of gold and 2,991.07 ounces of silver. Recovery averaged 97.8 percent.

GENERAL

Operating costs for the full 188,907 tons of ore mined and milled from all sources during the year, including head office administration and general expense, amounted to $6.43 per ton.

W. F. Brown is manager. An average of 204 men was employed, of whom 115 were underground and 89 in the mill and on general surface work. These figures include the men employed at all the properties operated by the company.

Buffalo Ankerite Gold Mines, Limited

Buffalo Ankerite Gold Mines, Limited, was incorporated in October, 1932, with an authorized capitalization of 1,000,000 shares of $1 par value, of which 997,500 have been issued. The officers and directors are: Dr. F. R. Burton, president and general manager; H. J. Carmichael, first vice-president; A. J. Baldeck, second vice-president; H. B. Clearihue, secretary-treasurer; J. D. Barrington, C. C. Calvin, Everett Bristol, Dr. W. F. James, and F. V. C. Hewett, directors.

[1]See page 9.

The address of both the head office and the mine is Box 340, South Porcupine. The secretary's office is at 320 Bay Street, Toronto.

Mining operations at the company's property in Deloro township, district of Cochrane, were discontinued on February 14, 1953, because of the exhaustion of ore reserves. No development was done in 1953. Following the suspension of operations the underground equipment was removed, and the mine was allowed to flood.

There were 9,530 tons of ore hoisted. The mill operated until March 26.

The following table shows the depths and the number of compartments of the shafts and winzes on the property, all of which are vertical:

Shaft or winze	Number of compartments	Depth
		feet
No. 1 shaft	3	367
No. 2 shaft	4	1,200
No. 3 shaft	3	425
No. 4 or south winze (425- to 1,050-foot level)	2	652
No. 5 shaft	5	3,996
No. 6 winze (1,050- to 2,020-foot level)	2	937
No. 7 or north winze (600-foot level to 1,048 feet)	3	448
No. 8 shaft (claim H.R.950)	2	109

The total amount of development work on the property is shown in the following table:

Level		Drifts	Crosscuts	Raises
North	South	feet	feet	feet
100-foot		661	743	154
	170-foot	2,540	570	180
250-foot	200-foot	4,600	1,299	288
	300-foot	2,197	924	346
365-foot		3,909	1,529	1,176
	425-foot	4,186	936	655
475-foot		4,417	4,183	1,485
	550-foot	1,348	125	230
600-foot		4,929	4,129	1,366
	675-foot	1,686	725	1,251
725-foot		4,422	818	2,367
	800-foot	4,691	765	1,298
875-foot		4,357	1,042	1,760
	925-foot	2,233	696	.....
1,000-foot		450	200	150
1,050-foot	1,050-foot	10,469	7,263	2,932
1,250-foot	1,250-foot	5,263	2,647	3,724
1,400-foot	1,400-foot	7,459	1,649	3,211
1,550-foot	1,550-foot	6,933	3,357	3,527
1,700-foot	1,700-foot	4,806	1,652	3,733
1,850-foot	1,850-foot	2,712	505	1,277
2,000-foot	2,000-foot	3,902	5,482	2,262
2,200-foot		52	403	279
2,350-foot		656	3,803	257
2,500-foot		2,242	2,129	563
2,650-foot		283	892	380
2,800-foot		606	1,399	257
2,950-foot		2,431	4,542	852
3,100-foot		3,436	1,858	1,786
3,250-foot		4,784	7,085	2,236
3,300-foot		.....	42	.....
3,400-foot		.....	.....	278
3,450-foot		4,095	2,087	2,083
3,600-foot		1,559	435	123
3,750-foot		398	2,366	45

The following is taken from the mine manager's report for the year ending December 31, 1953:

Mining

The mining of all ore in place was completed during January. Broken ore was cleaned from all working places, ore passes, ore pockets and surface storage bins and delivered to the milling plant. Mining costs for the period increased owing to the heavy overhead in the month of February, when only 1,125 tons of ore were hoisted to complete the hoisting of ore for the year.

Milling

In 1953 the mill treated 9,332 tons of ore. Total bullion recovery including the clean up from milling and refinery plant was 3,138.076 ounces. Total production including silver was valued at $101,915. Mint returns for gold for the 1953 period averaged $34.28 per ounce as compared with $34.22 for the year 1952.

The milling plant was thoroughly cleaned of all gold-bearing residues. The refinery was similarly cleaned up, and remaining gold residues and slag were shipped to Noranda Mines, Limited, for the final recovery.

Plant and Equipment

All underground equipment was salvaged and brought to surface. Surface and underground equipment was properly housed.

During the year mine plant and equipment sold totalled $298,131. Sales eased during the latter part of the year owing to strikes or threatened strikes at mines in Ontario and Quebec.

An average of 33 men was employed, 12 of whom were underground and 21 on surface. C. E. Bowker 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, 3,999,500 of which have been issued. The company is a subsidiary of Dome Mines, Limited, which owns 2,265,105 shares of the stock. The officers and directors are: C. W. Michel, president; J. B. Redpath, vice-president; C. C. Calvin, secretary; E. J. Andrecheck, treasurer; J. K. McCausland and W. F. James, directors. The head office is at 50 King Street West, Toronto. The mine address is Balmertown.

The company owns 27 claims, approximately 1,175 acres, in Balmer township, Red Lake area, Patricia portion of Kenora district.

Mining and milling operations continued throughout 1953. The vertical, four-compartment No. 1 shaft, on claim K.R.L.20071, was sunk a further 1,070 feet to a total depth of 2,240 feet. Eight new shaft stations were cut at intervals of 150 feet. The lowest working level will be the 14th, at a depth of 2,050 feet. Ore- and waste-pass systems are being driven from the loading-pocket on this level.

The following table shows the development work done during 1953, and the total:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st	325	4,950	.....	1,388	.....	466
2nd	669	5,331	8	1,718	482	1,388
3rd	1,012	6,739	37	1,987	286	1,551
4th	847	6,747	.....	1,404	316	1,779
5th	1,310	4,648	83	2,052	330	1,442
6th	1,023	4,390	.....	998	388	1,104
7th	1,409	5,663	.....	863	332	1,162
8th	.....	.....	36	36	.....	.....
9th	.....	.....	23	23	.....	.....
10th	.....	.....	19	19	.....	.....
11th	.....	.....	13	13	.....	.....
12th	.....	.....	19	19	.....	.....
13th	.....	.....	19	19	.....	.....
14th	.....	.....	21	21	.....	.....
15th	.....	.....	38	38	.....	.....
Loading-pockets	.....	.....	.....	.....	32	226

Diamond-drilling in 1953 consisted of eight holes, from surface, totalling 9,122 feet and 222 holes, from underground, totalling 28,052 feet.

The following is taken from the general manager's report for the year ending December 31, 1953:

During the year 224,973 tons were hoisted of which 181,026 were ore and 43,947, waste.

The 181,026 tons of ore milled yielded bullion containing 89,411.241 ounces of gold, the average yield being 0.49391 ounces or 9.878 pennyweights per ton. All grades of ore will be expressed in pennyweights (dwt.) throughout this report. One pennyweight equals one-twentieth of an ounce, troy weight. At $35 per ounce of gold, one pennyweight is worth $1.75 in Canadian funds. During the year the gold production was sold to the Mint; the average price received was $34.44 per ounce as compared to $36.63 received on the free market in 1952.

The following statement gives particulars of revenue and expenditures for the year under review:

OPERATING STATEMENT
(For the year ending December 31, 1953)

REVENUE:		
Bullion		$3,082,929
EXPENDITURES:		
Development	$ 316,253	
Mining, including hoisting	574,822	
Reduction	410,220	
Refining and marketing	27,059	
General and administrative expenses	145,446	
Taxes other than income	5,029	
	$1,478,829	
Less estimated income under Emergency Gold Mining Assistance Act	212,000	
		1,266,829
Profit before depreciation, amortization of deferred development, and preproduction expenses and provision for tax under Ontario Mining Tax Act		$1,816,100

Mining

Broken ore totalling 144,200 tons remains in the stopes and on the surface ore dump, an increase of 18,800 tons over the previous year.

In all, 154,072 tons of a grade of 11.96 dwt. were drawn from the stopes and sent to the mill.

All major stoping operations are above the 4th level or the 550-foot horizon.

Ore Production

The mine produced 181,026 tons of ore that averaged 11.27 dwt., during the year. The stopes produced 154,072 tons averaging 11.96 dwt., and the development work produced 26,954 tons averaging 7.38 dwt.

Ore Reserves

The ore reserves are estimated at 764,200 tons, an increase of 300 tons over last year. The ore reserves include 144,200 tons of broken ore in the stopes and on the surface stockpile.

A summary of the distribution of ore in place, broken ore, and total ore mined to the end of 1953 is as follows:

SUMMARY OF ORE RESERVES AND EXTRACTION BY LEVELS

Source	Ore in place	Average grade	Broken ore in stopes	Total ore extracted from stopes to end of 1953
	tons	dwt.	tons	tons
Ore dump, surface	.....	.....	16,300	.....
Surface to 1st level	45,400	11.87	31,800	117,782
1st to 2nd level	28,400	11.37	21,400	158,155
2nd to 3rd level	55,400	10.80	38,500	135,260
3rd to 4th level	40,300	8.99	22,500	141,315
4th to 5th level	126,600	9.54	4,700	7,818
5th to 6th level	132,200	10.30	3,700	7,537
6th to 7th level	191,700	11.72	5,300	11,357
Total	620,000	10.71	144,200	579,224

Mill

The following are the results of milling operations:

Tons treated	tons	181,026
Average grade of ore treated	dwt. per ton	11.275
Recovery	dwt. per ton	9.878
Recovery	percent	87.61

The milling rate for the year is shown in the following table:

Period	Total milled	Average milled per day
	tons	tons
1st quarter	43,941	488
2nd quarter	45,544	500
3rd quarter	45,921	499
4th quarter	45,620	496
Average	45,282	496

Costs

The expenditure on mining was $574,822 or $3.175 per ton milled.

The expenditure on development was $316,253 or $1.747 per ton milled.

Operating costs before depreciation, amortization of preproduction expenses and income under Emergency Gold Mining Assistance Act were $8.169 per ton milled.

Capital Expenditures

Capital expenditures for the year totalled $321,793. The principal items were a new hoist-house, new office, addition to the mill substation, foundations for the addition to the mill, a second tailings line, crusher-house equipment, and equipment for the mill-tonnage increase.

One new staff house was built on the Balmertown townsite. Twelve company-owned houses, and eight employee-owned houses, formerly on company property, were moved to the townsite and placed on concrete basements. A 2,200-volt power line was installed from the mine substation to the townsite.

General

The major equipment to implement the initial increase in the daily mill tonnage from 500 to 600 tons per day was placed on order for delivery in the second quarter of 1954. The extension of the mill building to house this additional equipment is underway.

J. G. McCrea was general manager until his death on September 12. Joseph Chisholm, formerly mine manager, was appointed general manager. An average of 253 men was employed, of whom 130 were underground and 123 on surface.

Central Porcupine Mines, Limited

Central Porcupine Mines, Limited, was incorporated in December, 1933, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 3,695,118 have been issued. The officers and directors are: C. H. E. Stewart, president; W. Samuel, vice-president; H. D. Poole, secretary-treasurer; J. M. Cunningham-Dunlop, W. H. Woods, and T. M. Mungovan, directors. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The property consists of 14 claims adjoining the south boundary of the Coniaurum mine, in Tisdale township, Porcupine area, district of Cochrane.

The present operation is a joint effort by Central Porcupine Mines, Limited, and Coniaurum Mines, Limited. The work is under the direction of the latter company, and further reference to it appears on page 22 of this report.

The employment figures are included in those given for Coniaurum Mines, Limited. W. O. Lafontaine was acting manager for Coniaurum.

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

2,961,655 have been issued. The officers and directors are: W. M. Cochenour, president; G. M. Huycke, secretary-treasurer; E. C. Cochenour, J. M. Macintosh, and Oliver Hall,[1] directors. The head office is at 501 Dominion Bank Building, Toronto. The mine address is Cochenour.

The mine is in Dome township, Red Lake area, Patricia portion of Kenora district. The company also has an option on the adjoining property of Marcus Gold Mines, Limited.

Mining and milling continued throughout 1953. There are two vertical, three-compartment shafts on the property. Operations are conducted through No. 1 shaft, which is 1,207 feet deep. No. 2 shaft, 446 feet deep, is not being used.

The following table shows the development work done during 1953 and the totals:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
150-foot	.....	8,085	.....	4,408	.....	2,124
275-foot	.....	9,247	.....	4,153	347	4,364
375-foot	246	10,802	.....	4,993	122	4,635
475-foot	1,096	11,937	16	4,636	592	3,906
575-foot	590	5,239	317	2,978	1,242	2,715
675-foot	60	1,815	1,466	3,513	13	878
775-foot	462	462	1,089	2,179	719	719
875-foot	41	41	1,791	1,791	126	126
975-foot	.....	.....	.....	.....	.....	.....
1,075-foot	.....	.....	.....	.....	.....	.....
1,175-foot	.....	.....	136	136	48	48

The following is taken from the mine manager's report for the year ending December 31, 1953:

Production

Ore treated	tons	61,680
Value per ton	(0.4899 ounces per ton)	$16.90
Gross value		$947,227.49
Gold and Silver produced:		
Gold: 27,467.047 ounces at $34.456052		$946,406.02
Silver: 978.870 ounces at $ 0.839200		821.47
Total value		$947,227.49
Recovered per ton	(0.44571 ounces per ton)	$15.36

ANNUAL PRODUCTION SINCE 1949 AND TOTAL SINCE 1939

Year	Tons milled	Value per ton	Gross value	Recovery per ton	Total value
1949	83,891	$14.08	$ 1,181,185.28	$12.77	$ 1,071,610.11
1950	71,171	22.69	1,614,869.99	20.30	1,445,050.07
1951	70,531	21.28	1,500,899.68	18.72	1,320,839.10
1952	67,361	20.56	1,384,942.16	18.47	1,244,456.40
1953	61,680	16.90	1,042,318.50	15.36	947,227.49
All-time total since 1939	871,422	$18.22	$15,882,787.35	$16.60	$14,468,501.53

In 1953 all bullion was shipped and sold to the Royal Canadian Mint, and the company qualified for assistance under the Emergency Gold Mining Assistance Act.

[1]Died February 15, 1954.

This estimated assistance for the year amounts to $114,765.56. The total assistance claim by your company under the Act from January 1, 1948, to December 31, 1953, now amounts to $284,929.89.

Total bullion sales plus Emergency Gold Mining Assistance Act receipts to date are as follows:

All-time production (bullion)	$14,468,501.53
All-time Emergency Gold Mining Assistance Act	284,929.89
	$14,753,431.42

Mining

	tons
Ore broken from stopes	47,912
Ore from development	13,768
	61,680

The 61,680 tons averaged 0.4905 ounces per ton, and at $34.456 per ounce showed a value of $16.90 per ton for a gross value of $1,042,318.50.

Development

	1953	1952	1951	1950	1949
	feet	feet	feet	feet	feet
Shaft-sinking	.....	519	.....	.....	.....
Drifting	3,412	4,023	3,362	2,489	4,230
Crosscutting	4,700	1,918	2,257	2,232	907
Raising	3,820	2,814	1,945	1,855	1,637
	11,932	8,755	7,564	6,576	6,774
Diamond-drilling:					
Underground	50,298	38,126	34,306	35,984	52,273
Surface	.....	3,317	.....	.....	.....
Marcus property	5,439	13,300	.....	.....	.....
Test holes	8,068	8,605	5,384	12,283	22,817

It will be noted that the amounts of crosscutting, drifting, raising, and diamond-drilling accomplished in the last year are generally higher than the amounts driven in the four previous years. This increase became necessary for several reasons:

1) New levels developed by the shaft-sinking completed in 1952 required extremely long crosscutting to reach the possible north ore zones.

2) The seventh level, first to reach the north ore zone in early 1953, has not yet produced the volume and grade of ore required to replace orebodies being mined from upper levels.

3) Extraction of ore from the upper levels of the north section of the mine was seriously affected by water troubles requiring grouting, and subsequent slow attack.

It was therefore considered advisable in the last quarter of the year to press development south, southwest, and southeast of the shaft into new areas in the search for new structures while continuing the investigation of the north zone.

In conjunction with the increased lateral advance, exploratory diamond-drilling was greatly increased.

Mining and Metallurgy

Details of the mill operations are shown in the following summary:

	1953	1952	1951	1950	1949
Total milled, tons	61,680	67,361	70,531	71,171	83,891
Operating time, percent	95.4	97.9	97.8	95.9	90.6
Milled daily, tons	169	184	193.2	194.9	229.8
Average millhead, gold, ounces	0.4899	0.5671	0.5692	0.5987	0.3827
Average flotation tail, gold, ounces	0.0220	0.0312	0.0468	0.0491	0.0277
Average calcine tail, gold, ounces	0.0222	0.0264	0.0217	0.0143	0.0097
Recovery, percent	90.98	89.87	88.00	89.41	90.45

The close analytical supervision necessary to the treatment of the ore has received continual attention, and it is gratifying to note a further improvement in the percentage extraction.

Operating Costs

Details of the company's operating costs are outlined in the following tables:

Cost Per Ounce

	1953	1952	1951	1950	1949
Development	$ 8.332	$ 4.039	$ 3.503	$ 2.779	$ 4.411
Diamond-drilling:					
Underground	2.471	1.436	1.244	1.275	1.770
Surface	0.123	0.211	.....	.....	.037
Mining	9.280	8.885	9.146	8.398	11.607
Crushing and conveying	0.475	0.400	0.355	0.345	0.571
Milling	5.132	4.128	3.905	3.411	4.699
General expense	2.096	1.733	2.044	2.367	2.813
Deferred development	.....	0.198	0.248	0.411	0.527
Depreciation	3.738	3.329	2.814	2.605	2.951
Head office	1.298	1.038	1.132	1.072	0.960
Taxes	0.488	0.946	4.350	3.703	0.504
Total	$34.333	$26.353	$28.741	$26.366	$30.850
Average price received by mine for gold	$ 34.45	$ 36.24	$ 37.39	$ 37.92	$ 36.94

Cost Per Ton Milled

	1953	1952	1951	1950	1949
Development	$ 3.710	$ 2.057	$ 1.754	$ 1.488	$ 1.562
Diamond-drilling:					
Underground	1.100	0.732	0.623	0.682	0.627
Surface	0.055	0.107	.....	.....	0.013
Mining	4.132	4.525	4.580	4.495	4.111
Crushing and conveying	0.211	0.204	0.178	0.185	0.202
Milling	2.286	2.102	1.955	1.826	1.665
General expense	0.933	0.883	1.023	1.267	0.996
Deferred development	.....	0.101	0.124	0.220	0.187
Depreciation	1.665	1.695	1.409	1.394	1.045
Head office	0.578	0.534	0.567	0.574	0.340
Taxes	0.218	0.482	2.179	1.982	0.178
Total	$14.888	$13.422	$14.392	$14.113	$10.926

Safety Award

The announcement that the mine, for the second successive year, won the Ontario award of the John T. Ryan trophies for mine safety for the year 1953 is very gratifying and a tribute to all employees.

Marcus Property

Outside exploration was confined to a diamond-drilling program on the optioned Marcus property at an expenditure of $21,654.59. Efforts were centred on the northeast area. Three zones have now been located in this part of the property, where overburden has averaged 60 feet. The discovery of No. 1 vein where persistence of both length and depth is indicated with a strike and relative structural location identical with those found at the mines in Balmer township is impressive enough to warrant consideration at some future date for the sinking of a shaft followed by an underground exploration program to evaluate the potentialities of this vein and the other two known zones. The results here during the past year are considered very encouraging.

An average force of 127 men was employed, of whom 58 were underground and 69 on the surface. C. A. Sheehan was mine manager until his death in September. He was succeeded by J. E. J. Fahlgren.

Coniaurum Mines, Limited

Coniaurum Mines, Limited, was incorporated in July, 1929, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,766,743 have been issued. The officers and directors are: J. M. Cunningham-Dunlop, president;

A. L. Bishop, vice-president; A. G. Fulton, secretary; W. B. Malone, treasurer; Thayer Lindsley, W. S. Morlock, T. H. Rea, and F. D. Reid, directors. The head office is at 25 King Street West, Toronto. The mine address is Schumacher.

The main property consists of 22 claims, adjoining the McIntyre Porcupine mine, in Tisdale township, Porcupine area, district of Cochrane. It includes the former Goldale, Newray, Armstrong-Booth, and Strong Bow properties.

Mining and milling continued from January 1, 1953, until September 25, when a severe explosion occurred within the conpressed-air system of the mine surface plant. The damage to equipment caused the curtailment of all operations for the rest of September and part of October. Repairs had just been completed when a labour strike was called on October 16. The strike lasted for the rest of the year.

The mine is operated through a system of vertical shafts and winzes, as shown in the following table:

Shaft or winze	Number of compartments	Total depth from surface
		feet
Bishop shaft	3 to 2,000 feet 4 to 3,666 feet	3,666
Bishop subshaft (below 3,250-foot level)	2 and 3 to 3,500 feet 4 below 3,500 feet	5,641
Goldale shaft	2 to 400 feet 3 to 1,020 feet	1,020
No. 1 winze (below 2,000-foot level)	2	2,533
No. 2 winze (below 3,000-foot level)	2 to 3,500 feet 3 to 5,028 feet	5,028
No. 3 winze (below 2,000-foot level)	2	2,755

The following table shows the development work done during 1953 and the totals by levels:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
100-foot	.....	71	.....	90	.....	19
150-foot	.....	414	.....	732	.....	.....
200-foot	.....	.....	.....	171	.....	490
250-foot	.....	.....	.....	484	.....	167
400-foot	.....	7,168	.....	3,831	.....	907
500-foot	.....	94	.....	548	.....	207
600-foot	.....	.....	.....	55	.....	323
650-foot	.....	78	.....	.....	.....	.....
700-foot	.....	3,390	.....	3,710	.....	1,988
770-foot	.....	5	.....	.....	.....	.....
800-foot	.....	.....	.....	304	.....	485
850-foot	.....	497	.....	1,189	.....	209
900-foot	.....	174	.....	1,430	.....	1,230
950-foot	.....	.....	88	289	.....	.....
975-foot	.....	.....	.....	101	.....	.....
1,000-foot	.....	8,518	30	7,037	566	6,937
1,100-foot	.....	43	.....	141	.....	61
1,125-foot	.....	229	.....	529	.....	.....
1,250-foot	.....	4,881	.....	3,660	.....	2,716
1,300-foot	.....	71	.....	42	.....	121
1,375-foot	.....	.....	.....	247	.....	.....
1,500-foot	84	8,039	175	5,702	118	2,602
1,625-foot	.....	.....	.....	469	.....	8
1,750-foot	348	4,032	104	2,710	391	1,291

DEVELOPMENT WORK, 1953—*Continued*

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1,950-foot				27		
1,975-foot				68		19
2,000-foot	50	5,884	149	5,292	212	3,904
2,125-foot				340		
2,200-foot				83		
2,250-foot		335		1,198		539
2,300-foot	133	1,701		949	394	1,388
2,350-foot				77		29
2,450-foot		761		1,024		2,718
2,500-foot		689		1,278		173
2,525-foot		86		335		259
2,600-foot		693		1,164		2,012
2,750-foot		2,653		2,604		3,647
2,800-foot				140		20
2,825-foot				147		18
2,875-foot		224		101		510
2,900-foot				163		242
2,950-foot				82		169
3,000-foot		6,346		2,644		6,035
3,225-foot				157		105
3,250-foot		3,072		2,626		3,874
3,300-foot				156		
3,375-foot		110		338		188
3,400-foot				136		37
3,450-foot					13	13
3,500-foot		11,327		3,966		5,589
3,550-foot		127		90		119
3,750-foot	24	4,077	337	5,484	255	5,874
3,800-foot				188		112
3,900-foot		255		466	82	286
3,925-foot			131	223		
4,000-foot	39	2,582	283	5,784	221	6,209
4,050-foot				117		49
4,075-foot				178		136
4,100-foot			25	1,030	28	906
4,150-foot		303		1,514		1,625
4,250-foot		2,645		3,080		4,483
4,325-foot				124		24
4,375-foot			40	113	139	170
4,400-foot				852		326
4,425-foot				117		38
4,500-foot	138	5,539		2,429		4,928
4,750-foot	18	3,837	18	2,583	296	2,200
4,925-foot				163		18
4,950-foot				262	50	361
5,000-foot	104	11,783	149	3,410	329	4,070
5,025-foot			164	164	17	17
5,100-foot			10	105		
5,250-foot		5,137	130	3,908	142	4,382
5,300-foot				50		
5,325-foot		45		291		182
5,400-foot				515		277
5,500-foot	24	10,810		2,107	5	4,309
5,500-foot loading-pocket						349

Diamond-drilling in 1953 consisted of one hole, 653 feet long, from surface, and 75 holes, totalling 17,023 feet, from underground.

The following is taken from the report of the acting manager for the year ending December 31, 1953:

Exploration and Development

Underground development work was carried out in all active sections of the mine from the 1,000- to the 5,500-foot level. Because of rising costs, development work was limited to essential operations, and this resulted in a considerable reduction in the total footage for the part of the year

in which the mine operated. No underground development work was done after September 25.

Crosscutting, drifting, and raising for the year amounted to 6,678 feet of actual advance as compared with 11,700 feet in 1952.

The greater part of the development program for the year was again directed towards outlining ore in the No. 68 vein section between the 1,000- and 2,300-foot levels.

On the 1,000-foot level, development work was completed on No. 68A vein, and No. 68B vein was partially developed in a drift and raise from the 950-foot sublevel. On the 1,750-foot level the main crosscut reached No. 68 vein zone, and a short length of better-than-average grade ore was opened on No. 68 drift. From the 2,300-foot level a line drive raise was driven to No. 68 vein on the 2,000-foot level. From this raise it is planned to develop the No. 68 zone by sublevel work.

The following is a summary of the principal ore sections developed in drifting and raising during the year:

Level	Heading	Vein No.	Length	Width	Grade
			feet	feet	ounces per ton
950-foot	Drift	68B	52	4.2	0.22
	Raise	68B	93	3.5	0.22
1,000-foot	Raise	68A	77	3.5	0.26
1,500-foot	Drift	68	57	4.4	0.28
1,750-foot	Drift	68	55	4.0	0.53
	Drift	68A	25	4.9	0.23
	Raise	68	122	3.8	0.33
3,900-foot	Raise	34A	55	4.2	0.41
4,750-foot	Raise	51B	91	2.6	0.36
5,000-foot	Raise	66	197	3.0	0.34
5,025-foot	Drift	67	80	2.8	0.57

SUMMARY OF DEVELOPMENT

	Footage			Average grade	Average width
	Total	In ore	Percentage in ore		
				ounces per ton	feet
Drifting	1,833	982	53.6	0.32	3.7
Raising	3,883	1,405	36.2	0.34	3.3
Drifting and raising	5,716	2,387	41.6	0.33	3.5
Crosscutting	962	.....	.....	.....	.....
Total	6,678	2,387	35.7	0.33	3.5

Diamond-Drilling

As in previous years, drilling was carried out in all active sections of the mine, but in 1953 the work was confined principally to local exploratory work in and around the producing veins. On the 1,750-foot level, a number of holes were drilled in the No. 68 vein zone in "99" greenstone, and several intersections remain to be checked by crosscutting.

Stoping

During the operating part of the past year, ore broken in the stopes amounted to 75,795 tons, having an average grade of 0.257 ounces per ton.

Distribution of production from the mine is given in the following table:

Levels	Trammed	Percentage of tonnage	Value	Percentage of value
	tons		ounces	
From above 1,000-foot	12,104	14.2	2,792.8	13.7
From 1,000 to 3,000-foot	11,212	13.2	2,720.4	13.3
From 3,000 to 4,500-foot	33,273	39.1	7,891.3	38.6
From 4,500 to 5,500-foot	28,552	33.5	7,050.1	34.4
Total	85,141	100.0	20,454.6	100.0

Ore Reserves

The ore reserves continued to decline as the chance of finding additional ore in the known ore zones has gradually become less through years of sustained development, and because a higher average gold content is required to meet the higher costs.

Broken ore reserves on December 31, 1953, are estimated at 67,915 tons, with an average gold content of 0.241 ounces per ton. This is a reduction from the previous year of 1,400 tons with an increase in grade of 0.016 ounces per ton.

Unbroken reserves on December 31, 1953, were estimated at 156,275 tons, having an average grade of 0.240 ounces per ton as compared with 179,375 tons, with an average grade of 0.236 ounces per ton at the end of 1952.

Milling

During the past year, 89,952 tons of ore were treated in the mill, resulting in a production of 23,534.9 ounces of fine gold and 3,908.2 ounces of fine silver. This represented a recovery of 97.2 percent of the gold content of the ore.

The average price received for gold produced in 1953, not including Emergency Gold Mining Assistance, was $34.52 per fine ounce, as compared with $33.96 during the previous year.

Coniaurum–Central Porcupine Effort

On the 5,500-foot level the joint work being done by Coniaurum Mines, Limited, and Central Porcupine Mines, Limited, on the latter company's property was continued to the point where all excavation for the shaft was completed. The excavation was rock-bolted, gunited, the necessary timber installed, and the hoist foundation completed. Work was suspended in June while diamond-drilling was carried out from the McIntyre 6,875-foot level to seek geological information in the vicinity of the new shaft at this horizon.

An average of 172 men was employed, of whom 108 were underground and 64 on the surface. This includes the men employed in the work being done on the Central Porcupine mine. W. O. Lafontaine is acting manager.

Curtin Prospecting Syndicate

The Curtin Prospecting Syndicate was organized in September, 1950, with an authorized capitalization of 3,500 units of $10 par value, of which 2,068 units are issued, and 1,166 vendor units pooled. The syndicate members are: S. J. White, A. W. Trotter, and C. H. Smith, who is secretary-treasurer. The head office and mine office address is Box 626, Espanola.

The syndicate owns 5 claims and holds 10 claims under option in Curtin township, district of Sudbury.

Work was carried on between June 1 and September 20, 1953. Two exploration shafts were sunk to depths of 30 and 40 feet. About 100 tons of ore were taken from an open cut. The 10-ton Gibson milling unit was operated intermittently, and treated 60 tons of ore.

There is a vertical shaft, sunk by former operators, on claim S.24308. No work has been done on it by the present operators.

An average of 13 men was employed, 7 underground and 6 on the surface. S. J. White is manager.

Delnite Mines, Limited

Delnite Mines, Limited, was incorporated in October, 1934, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,978,767 have been issued. The officers and directors are: W. V. Moot, president; K. C. Gray, vice-president; W. S. Walton, secretary; A. F. Osborn,[1] treasurer; L. R. Gulick, Harry Yates, James Savage, and A. H. Sharpe, directors. The address of both the head office and the mine is Box 590, Timmins. The secretary's office is at 44 King Street West, Toronto.

[1]C. L. Ingham, the former treasurer, died January 4, 1954.

The company's property consists of 16 claims in Deloro township, Porcupine area, district of Cochrane, three miles southeast of Timmins.

Mining and milling continued from the beginning of 1953 until September 25, when a labour strike caused the suspension of operations for the rest of the year.

The following table shows the depths and number of compartments of the shafts on the property, all of which are vertical:

Shaft	Number of compartments	Depth from surface
		feet
No. 1[1]	2	391
No. 2	3	3,031
No. 3 internal (below 2,875-foot level)	4	4,512

The following table shows the development work done in 1953, and the totals:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
125-foot	.....	1,938	.....	1,164	.....	601
250-foot	.....	5,000	.....	1,908	.....	1,058
375-foot	.....	2,024	.....	1,119	.....	1,223
500-foot	.....	5,671	.....	1,410	71	1,427
625-foot	.....	3,287	.....	1,106	.....	575
750-foot	.....	5,022	.....	2,451	.....	1,495
875-foot	.....	2,749	.....	453	.....	521
1,000-foot	.....	4,120	.....	1,205	.....	1,912
1,125-foot	.....	1,657	.....	131	.....	622
1,250-foot	.....	4,240	72	1,407	.....	1,875
1,375-foot	.....	1,395	.....	226	.....	690
1,500-foot	.....	4,465	.....	1,505	125	2,845
15 loading-pocket	.....	.....	.....	.....	.....	67
1,625-foot	.....	1,539	.....	530	.....	643
1,750-foot	.....	2,326	.....	2,653	111	1,468
1,875-foot	.....	460	.....	518	.....	519
2,000-foot	234	1,758	64	1,801	.....	838
2,125-foot	22	927	.....	780	110	568
2,250-foot	59	3,126	.....	2,348	97	1,433
2,375-foot	.....	2,263	.....	927	144	1,569
2,500-foot	175	3,872	.....	3,042	121	1,708
25 loading-pocket	.....	.....	.....	.....	.....	73
2,625-foot	26	2,141	.....	1,095	177	1,853
2,750-foot	272	1,765	.....	1,114	94	935
2,875-foot	.....	943	.....	2,484	195	1,327
28 loading-pocket	.....	.....	.....	.....	.....	202
3,000-foot	534	717	130	282	214	343
3,125-foot	645	788	193	267	368	368
3,250-foot	733	733	187	321	417	417
3,375-foot	771	771	184	278	375	375
3,500-foot	509	509	328	365	398	398
3,625-foot	394	394	303	385	432	432
36 loading-pocket	.....	.....	.....	.....	48	66
3,750-foot	.....	.....	.....	27	.....	.....
3,875-foot	.....	.....	.....	28	.....	.....
4,000-foot	.....	.....	.....	24	.....	.....
40 loading-pocket	.....	.....	.....	.....	.....	11
4,125-foot	.....	.....	9	33	.....	.....
4,250-foot	.....	.....	83	110	.....	12
4,375-foot	.....	.....	30	58	222	222
43 loading-pocket	.....	.....	.....	.....	50	68

[1]Not being used.

Diamond-drilling in 1953 consisted of 261 holes, totalling 23,437 feet, from underground.

The following is taken from the general manager's report for the year ending December 31, 1953:

Production

Ore treated	tons	106,027
Gross value		$1,109,823
Bullion recovered:		
Gold (30,751.789 ounces at $34.510184)	$1,061,250	
Silver (2,185.81 ounces at $0.840352)	1,837	
Total value		$1,063,087
Value per ton		10.467
Recovery per ton		10.027
Recovery	percent	95.789

PRODUCTION SINCE MILLING COMMENCED, JUNE 1, 1937

Fiscal period ending	Tons milled	Value per ton milled	Gross value	Recovery per ton	Recovery value	Average price per ounce
Mar. 31, 1938[1]	57,689	$ 7.01	$ 404,484	$ 6.41	$ 369,679	$35.17
Mar. 31, 1939	91,749	8.56	785,064	7.81	716,521	35.21
Mar. 31, 1940	114,922	7.78	894,641	7.12	818,313	37.04
Dec. 31, 1940[2]	99,342	7.22	716,875	6.70	665,391	38.50
Dec. 31, 1941	166,596	7.65	1,274,895	7.10	1,183,053	38.50
Dec. 31, 1942	172,727	7.53	1,299,701	7.07	1,220,663	38.50
Dec. 31, 1943	125,887	7.15	900,065	6.51	819,672	38.50
Dec. 31, 1944	93,112	6.57	612,086	6.12	570,247	38.50
Dec. 31, 1945	66,120	5.84	386,414	5.49	363,063	38.50
Dec. 31, 1946	92,731	7.09	657,265	6.79	629,375	36.58
Dec. 31, 1947	101,927	10.18	1,037,861	9.81	999,725	35.00
Dec. 31, 1948	124,835	9.94	1,241,401	9.49	1,184,625	35.00
Dec. 31, 1949	149,087	9.88	1,473,370	9.46	1,410,083	36.24
Dec. 31, 1950	153,165	10.20	1,562,097	9.75	1,492,946	37.90
Dec. 31, 1951[3]	139,278	11.16	1,554,592	10.73	1,493,931	36.89
Dec. 31, 1952	158,794	11.82	1,877,138	11.35	1,802,159	34.17
Dec. 31, 1953[3]	106,027	10.47	1,109,823	10.03	1,063,087	34.51

Ore and Waste Hoisted

Shaft	Ore	Waste	Total
	tons	tons	tons
No. 2	106,003	18,217	124,220
No. 3	10,044	17,177	27,221

Some 30,311 tons of backfill were placed in stopes (14,614 tons purchased).

Broken Ore Reserves

Broken ore reserves are estimated at 69,310 tons, a decrease of 15,269 tons for the year.

Development

Development work was largely confined to opening up the top half (six levels) of the No. 3 shaft. Some work was also done on levels in the bottom half of the No. 3 shaft and on levels of the No. 2 shaft.

Drifting advanced 4,373 feet, and of the 1,416 feet of ore developed, 1,190 was on No. 3 shaft levels. The 3,000-, 3,125-, 3,250-, and 3,375-foot levels are largely developed by drifting and produced ore of average grade. The 3,500-foot level is partially developed and has produced ore of average grade. On the 3,625-foot level there has been a small amount of drifting done, and indications are that the ore has improved in quantity and grade as compared with the levels above.

[1]For 10 months.
[2]For 9 months.
[3]Owing to strikes there was no production for a month of 1951 or for the last 4 months of 1953.

Subdrifting gave 366 feet of ore in an advance of 810 feet. This ore was all in small blocks.

In the No. 3 shaft area the ore and waste pockets are completed at the 3,625-foot level and a few feet of raising will complete the passes to serve the six levels above. The ore and waste pockets are completed at the 4,375-foot level, the bottom level of the shaft, and the passes have been started. The crosscuts to the ore have started on the 4,125-, 4,250-, and 4,375-foot levels.

Mining

Stoping was done from the 500-, to the 2,875-foot level, most of the work being concentrated on the 2,500-, 2,625-, 2,750-, and 2,875-foot levels. A small amount of breaking will complete the remaining stopes above the 1,500-foot level. The amount of ore broken in cut-and-fill stopes increased from 43 to 79 percent of the total, and since this required more material for stope filling, arrangements were made to obtain gravel from a pit about three miles to the west. The broken ore decreased by 15,269 tons and will continue to decrease as present shrinkage stopes in the upper part of the mine are completed.

Milling

For the operating period the milling rate was slightly higher at 447 tons per day as compared with 434 tons for 1952. The percentage recovery was down slightly from 96.01 to 95.79 percent. This decrease is accounted for by the lower grade of ore milled, which gave a recovery of 0.290 ounces of gold per ton as compared to 0.332 ounces in 1952. Removal of the ore in the two small, higher-grade veins referred to in last year's report was completed early in the year.

Costs

	Total costs	Cost per ton milled		Cost per ounce fine gold produced, 1953
		1953	1952	
OPERATING COSTS (before cost-aid):				
Development and exploration	$ 290,976	$ 2.744	$ 1.894	$ 9.462
Mining	514,466	4.852	4.966	16.730
Milling	152,528	1.439	1.350	4.960
General mine charges after deducting sundry revenue	88,783	0.838	0.688	2.887
Administrative expense (partly mine)	53,548	0.505	0.332	1.741
Bullion marketing expense, including ming handling and refining charges	7,995	0.075	0.085	0.260
Total	$1,108,296	$10.453	$ 9.315	$36.040
OTHER COSTS:				
Provision for depreciation	$ 62,018	$ 0.585	$ 0.485	$ 2.017
Provision for taxes	(35,773)	(0.337)	0.529	(1.163)
Outside exploration	25,042	0.236	.....	0.814
Total	$ 51,287	$ 0.484	$ 1.014	$ 1.668
Total costs	$1,159,583	$10.937	$10.329	$37.708

Additions to Plant Buildings and Equipment

Some $407, was spent for a housing to cover No. 1 shaft, which has not been in use for some years. The former headframe was burned when struck by lightning.

Additions to equipment cost $26,537. This included dust-collecting equipment for the crusher-house, a crusher for the assay office, two double-drum slushers, a log peeler, and a trolley locomotive complete with generator.

An average of 172 men was employed, of whom 111 were underground and 61 on surface. John Beattie is general manager.

Dome Mines, Limited

Dome Mines, Limited, was incorporated in July, 1923, to succeed the Dome Mines Company, Limited. The authorized capitalization is 2,000,000 shares of no par value, all of which have been issued; 55,332 shares are held in trust for the company. The officers and directors are: C. W. Michel, president and treasurer; J. H. Stovel and R. E. Dye, vice-presidents and consultants; J. B.

Redpath, executive vice-president; C. C. Calvin, secretary; M. F. Stern, F. W. Pershing, B. C. Foy, J. L. Carson, H. C. Brunie, and A. B. Matthews, directors. J. G. McCrea was vice-president until his death in September, 1953. The head office and mine office are at South Porcupine. The secretary's office is at 36 Toronto Street, Toronto.

The company owns 60 claims and the beds of Porcupine and Simpson lakes, in Tisdale, Whitney, and Shaw townships, Porcupine area, district of Cochrane.

Mining and milling operations continued throughout 1953. The mine was not affected by the strikes that occurred in the Porcupine area during the year.

The following table shows the depths of the shafts and winzes on the property and the number of compartments in each:

Shaft or winze	Number of compartments	Total depth from surface
		feet
No. 1 shaft[1]	3	105
No. 2 shaft[1]	3	805
No. 3 or main shaft	4 to 10th level 6 below 10th level	2,456
No. 4 internal shaft (below 13 level)[1]	3	2,052
No. 5 internal shaft (below 16th level)[1,2]	3	3,146
No. 6 internal shaft (below 16th level)[2]	5	4,097
No. 1,802 winze (below 18th level)[1]	2	2,870
No. 2,309 winze (below 23rd level)[1]	3	[3]3,775

The following table shows the development work done during 1953, and the totals:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
Not separated [from very old records]	.....	3,386	.....	2,077	.....	892
1st	.....	1,580	91	2,486	.....	2,329
2nd	.....	49	.....	144	.....	26
3rd	.....	7,285	.....	5,737	151	6,549
4th	.....	904	.....	867	.....	584
5th	591	10,467	149	8,230	.....	6,860
6th	.....	9,896	.....	6,543	.....	6,072
7th	47	11,718	.....	6,052	8	6,873
8th	8	11,975	184	7,034	.....	9,521
9th	948	13,619	182	5,675	42	5,820
10th	.....	17,115	.....	7,407	174	9,771
11th	657	20,999	417	8,292	403	11,624
12th	1,023	22,503	192	8,786	374	11,109
13th	560	21,127	153	7,917	451	9,336
14th	1,808	26,160	383	10,231	1,897	13,904
15th	1,231	24,691	301	12,146	1,309	18,677
16th	805	27,169	705	11,341	1,175	23,577
17th	574	13,025	215	4,077	2,776	8,276
18th	126	13,995	242	9,144	386	10,708
19th	219	3,820	.....	468	230	1,300
20th	.....	4,245	101	926	195	1,447
21st	.....	993	.....	36	43	503
22nd	374	2,049	369	1,775	.....	649
23rd	3,469	15,260	349	5,264	475	3,649
24th	158	6,766	.....	2,084	116	2,782
25th	490	6,711	.....	4,447	621	6,745
26th	211	3,777	938	2,656	496	2,210
27th	.....	2,786	39	1,730	171	2,202
28th	.....	2,175	.....	1,233	95	1,700
29th	258	3,974	55	2,201	89	986

[1]Not being used for hoisting.
[2]Connected with the main shaft on the 16th and 18th levels.
[3]This winze has been partially stoped out.

Diamond-drilling during 1953 consisted of 9 holes, totalling 7,626 feet, from surface and 477 holes, totalling 92,950 feet,[1] from underground.

The following is taken from the general manager's report for the year ending December, 31, 1953:

During the year, 687,300 tons of ore were treated in the mill. In the course of mining operations 46,600 tons of waste rock were excavated, most of which was used as fill underground.

The 687,300 tons of ore milled yielded 169,743 ounces of gold, the yield being 0.2470 ounces, or 4.94 pennyweight per ton.

All values of ore, etc., will be expressed in pennyweights (dwt.) throughout this report. One pennyweight equals 1/20 ounce troy weight. At $35 per ounce of gold, one pennyweight equals $1.75 in Canadian funds.

Costs

The expenditure on development was $1,046,702 or $1.52 per ton as compared with $1.61 per ton milled in 1952.

The expenditure on mining was $2,963,511 or $4.31 per ton as compared with $4.18 per ton milled in 1952.

The total operating charges for the year were $7.67 per ton as compared with $7.63 per ton milled in 1952.

Development

The total development work at 36,316 feet compares with 39,492 feet done in the previous year. The total development work done below the 16th level was 16,292 feet as compared with 20,822 feet done in the previous year. The 100,576 feet of core diamond-drilling done compares with 88,171.0 feet done in 1952.

Mining

The 687,300 tons of ore milled during the year were produced as follows:

	Tons	Average grade, dwt. per ton
From stopes	579,500	5.42
From development	107,800	3.53
Total	687,300	5.12

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

Source of ore	Tons	Dwt. per ton
5th level to surface	9,787	3.61
Ankerite veins	172,579	5.03
Area serviced by No. 6 shaft	175,100	5.29
Remainder of mine	329,834	5.13
Total	687,300	5.12

Ore Reserves

Ore reserves at the close of the year were estimated at 2,470,000 tons, a net decrease of 2,000 tons for the year. The following tabulation is presented to indicate the change:

	1953	1952
	tons	tons
Unbroken ore	2,093,000	2,066,000
Broken ore	377,000	406,000
Total	2,470,000	2,472,000

Ankerite ore makes up 29 percent of the ore reserves.

[1]Of this footage, 717 feet was drilled from Preston East Dome ground.

Mill

Following are the milling results:

Ore treated	tons	687,300
Average grade tested	dwt. per ton	5.12
Recovery	percent	96.46

Capital Expenditure

The details of changes in capital assets are as follows:

PLANT BUILDINGS AND EQUIPMENT

Additions:	
Mine buildings and equipment	$22,381
Surface buildings and equipment	59,915
Increase	$82,296
Less retirements	19,492
Net increase	$62,804

General

Whereas generally the cost of material and equipment continued to rise during the year, there was a reduction in some particular items. This fact coupled with an increase in efficiency retarded the upward trend in operating costs of the past few years. The labour turnover at present is the lowest in many years with the result that it has been possible to maintain an efficient labour force.

It will be noted that ore reserves were maintained at substantially the same figure as at the end of the previous year.

An average of 979 men was employed, of whom 621 were underground and 358 on surface. R. E. Dye, who had been general manager for many years, retired from the position in 1953. He remains with the company as a vice-president and consultant. C. P. Girdwood, previously general superintendent, became 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 officers and directors are: J. Y. Murdoch, president; Oliver Hall,[1] vice-president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; Russell Horsfall, assistant secretary; Harold Pinnock, assistant treasurer; F. M. Connell, L. H. Timmins, and H. L. Roscoe, directors. The head office and mine office are at Pamour.

The property is in Whitney township, Porcupine area, district of Cochrane, adjoining the west boundary of the Pamour Porcupine mine.

Mining and milling continued from the beginning of 1953 until July 11, when a labour strike caused the suspension of operations. The strike lasted for the rest of the year.

The mine is served by a vertical, three-compartment shaft, 3,156 feet deep. There was no sinking in 1953. The following table shows the development work done in 1953, and the total at the end of the year:

[1]Died February 15, 1954.

Level	Depth below collar	Drifts		Crosscuts		Raises	
		1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet	feet
1st	211	846	3,249	.....	1,237	10	328
2nd	361	.....	3,505	.....	1,508	.....	1,763
3rd	561	.....	4,959	.....	1,701	.....	2,050
4th	762	.....	3,601	.....	353	.....	1,891
5th	962	129	3,826	80	845	5	1,930
6th	1,112	232	3,887	.....	641	.....	1,025
7th	1,262	210	5,025	.....	1,086	.....	1,480
8th	1,412	.....	1,573	.....	188	333	824
9th	1,562	.....	2,603	.....	208	.....	95
10th[1]	.....	.....	.....	.....	.....	.....	.....
11th	1,860	.....	.....	96	96	.....	.....
12th[2]	2,010	.....	.....	.....	.....	.....	.....
13th[1]	.....	.....	.....	.....	.....	.....	.....
14th	2,160	.....	2,587	.....	150	.....	137
15th[1]	.....	.....	.....	.....	.....	.....	.....
16th[1]	.....	.....	.....	.....	.....	.....	.....
17th	2,612	.....	1,235	.....	522	.....	.....
18th	2,760	.....	2,756	.....	943	.....	14
19th	2,910	435	1,231	.....	667	124	124
20th	3,060	.....	3,107	.....	1,429	.....	.....

Diamond-drilling in 1953 consisted of 105 holes, totalling 15,924 feet, from underground.

The following is taken from the manager's report for the year ending December 31, 1953:

Drifting and Crosscutting

A total of 1,497 feet of drifting was done on the upper levels to further develop the main ore zone.

A crosscut was driven 96 feet north from the shaft on the 11th level, with 250 feet remaining to reach a possible ore zone indicated by diamond-drilling.

The 19th level, west drift was advanced 435 feet to explore for the downward extension of the ore lenses indicated on the 18th level. It is indicated that this ore does not reach the 19th level and further exploration by raising is being undertaken.

Of the total, 261.5 feet was in ore averaging 0.37 ounces per ton.

Raising

Raising amounted to 1,093.5 feet comprising 730.5 feet of ventilation and fill raises and 363 feet of box-hole raises.

Diamond-drilling

Diamond-drilling amounted to 15,924 feet comprising 2,753 feet of test holes necessary for mining on the upper levels and 13,171 feet of exploratory drilling. Of the latter, 7,331 feet was done on the 19th and 20th levels.

Interesting values were intersected in the lavas by four diamond-drill holes north of the 19th level, west drift, and a narrow vein 100 feet long open at both ends was indicated. This will be explored by drifting.

Diamond-drilling below the 3,000-foot or 20th level indicated a substantial zone carrying irregular values with frequent occurrences of free gold. Further exploration will be done, and shaft sinking may be required for this purpose.

Summary of Development

Drifting	feet	2,028
Sublevel and stope drifts	feet	582
Raising	feet	472
Stope fill raises	feet	258.5
Box-hole raises	feet	363
Slashing	cubic feet	9,780
Diamond-drilling (105 holes)	feet	15,924

[1]No station has been cut.
[2]Station only.

Stoping[1]

Ore broken amounted to 63,267 tons, and ore drawn off was 67,343 tons or 4,076 tons in excess of the tonnage broken. The broken-ore reserve was reduced to 23,415 tons.

Of the ore drawn, 62,375 tons came from cut-and-fill stopes, 4,934 tons from shrinkage stopes, and 2,651 tons from development headings.

The production from the various levels was as follows:

	1953	Total to Dec. 31, 1953
	tons	tons
1st level	1,759	59,954
2nd level	6,199	223,831
3rd level	2,449	285,092
4th level	10,043	287,959
5th level	11,266	354,411
6th level	8,160	238,084
7th level	19,441	232,441
8th level	7,992	22,014
18th level	.....	1,807
Miscellaneous and development	2,685	152,857
Total	69,994	1,858,450

Backfill placed in stopes amounted to 62,292 tons.

Ore Reserves

At December 31, 1953, the ore reserves were 368,137 tons of an average grade of 0.34 ounces of gold per ton.

Mill

The mill was in continuous operation until July 11, with short shutdowns for repairs and inspections. For this period the 8- by 8-foot ball mill was in operation for 4,558 hours or 99.4 percent of possible running time.

Tonnage milled averaged 363 tons per day of operation compared with 371 tons per day in 1952.

The mill treated 69,385 tons of ore from which was recovered 25,231 ounces of fine gold and 1,815 ounces of fine silver having a combined value of $910,187. The average recovery was $13.12 per ton compared with $13.91 per ton in 1952.

To December 31, 1953, the mill has treated 1,854,576 tons of ore from which has been recovered 789,105 ounces of fine gold and 60,056 ounces of fine silver, having a combined value of $29,398,312.

An average force of 97 men was employed, of whom 58 were underground and 39 on the surface. W. J. Marshall is manager.

Hollinger Consolidated Gold Mines, Limited

Hollinger Consolidated Gold Mines, Limited, was incorporated in January, 1916, with an authorized capitalization of 5,000,000 shares of $5 par value, of which 4,920,000 have been issued. The officers and directors are: J. R. Timmins, president; L. H. Timmins, vice-president; L. S. Weldon, executive vice-president; P. C. Finlay, secretary; J. I. Rankin, treasurer; A. A. McMartin, D. M. Dunlap, N. A. Timmins, Hon. Alphonse Raymond, and J. A. McDougald, directors. The mine office and head office are at Timmins. The general office is at 44 King street West, Toronto. E. A. Perry is manager of the Hollinger mine.

The main property operated by the company is in Tisdale township, Porcupine area, district of Cochrane, and includes part of the ground underlying the town of Timmins. The company has numerous other holdings and interests. It owns and operates the Ross mine in Hislop township, district of Cochrane,

[1]Only 6⅛ months' operation.

and controls and operates the Young-Davidson mine,[1] in Powell township, Matachewan area, district of Timiskaming.

Hollinger Mine

Mining and milling continued from the beginning of 1953 until September 24, when a labour strike caused the suspension of operations. The strike lasted until December 28.

The depths of the principal shafts on the property, and the number of compartments in each, are shown in the following table:

Shaft	Number of compartments	Depth from surface
		feet
Main	4	2,770
Central	6	3,195
No. 11	3	2,756
No. 26	5	3,063
No. 24 internal (below 2,750-foot level)	3	3,950
No. 25 internal (below 3,800-foot level)	4	5,150
No. 27 internal (below 2,450-foot level)	4	5,277

The following table shows the development work done during 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
100-foot	23	29	.....
200-foot	521	43	.....
300-foot	355	322	.....
425-foot	.....	12	71
550-foot	.....	.....	.....
675-foot	.....	.....	.....
800-foot	94	.....	.....
950-foot	234	100	.....
1,100-foot	136	.....	.....
1,250-foot	.....	.....	.....
1,400-foot	.....	.....	.....
1,550-foot	.....	.....	.....
1,700-foot	.....	.....	.....
1,850-foot	217	8	.....
2,000-foot	.....	.....	.....
2,150-foot	.....	.....	.....
2,300-foot	.....	.....	.....
2,450-foot	.....	.....	.....
2,600-foot	.....	.....	.....
2,750-foot	.....	.....	.....
2,900-foot	.....	.....	.....
3,050-foot	216	171	.....
3,200-foot	262	645	.....
3,350-foot	117	484	.....
3,500-foot	.....	.....	.....
3,650-foot	24	.....	.....
3,800-foot	141	43	.....
3,950-foot	383	42	.....
4,100-foot	70	250	.....
4,250-foot	298	119	.....
4,400-foot	181	.....	.....
4,550-foot	576	.....	.....
4,700-foot	.....	.....	.....
4,850-foot	.....	.....	.....
5,000-foot	.....	.....	.....
5,150-foot	569	310	.....
5,300-foot	470	197	.....
5,450-foot	647	60	.....

[1]See account on page 104.

Diamond-drilling in 1953 consisted of 10 holes, totalling 4,606 feet, from surface and 1,119 holes, totalling 125,511 feet, from underground.

There were 746,991 tons of ore hoisted.

The following is taken from the manager's report for the year ending December 31, 1953:

Bullion Statement

INVENTORY, JANUARY 1, 1953:		
Gold in process ($20.67)	$ 217,453	
Premium on gold in process	139,859	
Silver on hand	41,625	
		$ 398,937
GROSS VALUES PRODUCED, 1953:		
Ore milled	$7,899,178	
Tailings loss	269,235	
		7,629,943
		$8,028,880
INVENTORY, DECEMBER 31, 1953:		
Gold in process ($20.67)	$ 49,983	
Premium on gold in process	32,226	
Silver on hand	19,977	
		$ 102,186
BULLION SHIPPED DURING 1953		7,926,694
TOTAL		$8,028,880

Yearly Average Costs

Accounts	Sundries	Labour	Stores	Total	Per ton ore milled
General miscellaneous charges and administration	$ 83,702.36	$ 879,675.51	$ 190,124.49	$1,153,502.36	$1.3335
Surface services		104,131.71	56,974.21	161,105.92	0.1862
Insurance:					
Fire	40,191.43			40,191.43	0.0465
Group sickness and accident, medical, and unemployment		217,028.85		217,028.85	0.2509
Marketing bullion	56,041.29			56,041.29	0.0648
Workmen's compensation		115,810.05		115,810.05	0.1339
Silicosis assessment		98,739.12		98,739.12	0.1141
Milling charges		487,740.89	496,985.71	984,726.60	1.1383
Mining charges		3,578,426.60	1,655,674.83	5,234,101.43	6.0506
Total cost	$179,935.08	$5,481,552.73	$2,399,759.24	$8,061,247.05	$9.3188
Annual vacation[1]				$ 117,143.34	$0.1354

Milling

Total ore milled	tons	[2]865,051
Average value per ton		$9.13
Gross value	$7,899,177.62	
Deduct loss in tailings	269,235.00	
Net value recovered		$7,629,942.62
Average per day	tons	3,832
Proportion of possible running time	percent	86.4
Milled per 100 percent running time	tons	4,435

[1]The annual vacation cost is distributed among the first two and last two items of the table.
[2]This includes 113,361 tons from the Ross mine.

Solutions precipitated per ton of ore.....tons	1.2
Value per ton of tailings.....	$0.31
Cyanide consumer per ton of ore.....pounds	0.591
Zinc consumed per ton of ore.....pounds	0.046
Zinc consumed per ton of solution.....pounds	0.038
Lime consumed per ton of ore.....pounds	2.285
Lead acetate consumed per ton of ore.....pounds	0.098
Average value of pregnant solutions.....	$7.50
Average value received per ounce of gold sold.....	$34.47

Mining

The company is endeavoring to utilize its available potential both as to manpower and physical resources. All work is under continuous scrutiny with a view to improving the methods of performance. As a result, many operations have been either combined with others, eliminated, or mechanized. Evidence of the effectiveness of this effort is shown by the steady reduction in the work force from 1,824 in 1951, to 1,736 in 1952, and to 1,645 in 1953, while at the same time the tempo of operations has remained constant. An extensive program of underground exploration, consisting of both crosscutting and long-hole diamond-drilling, has been in progress over the past year and will be continued into 1954.

The mining program is being changed by intensifying the work on the lower levels to conform more closely with the distribution of the ore which is roughly as follows: surface to the 800-foot level, 24.7 percent; from the 950- to 2,750-foot level, 35.3 percent; from the 2,900- to 3,950-foot level, 22.2 percent; from the 4,100- to 5,450-foot level, 17.8 percent. Every effort is being made to maintain the rate of mining of stope remnants subject, however, to the requirements of volume, grade, and sequence that good mining practice and the economics of the operation dictate.

Ore from above the 800-foot level accounted for 33.5 percent of the tonnage milled, compared with 35.3 percent in 1952.

The estimated ore reserves at the Hollinger mine on December 31, 1953, were 4,080,091 tons, with a gold content of 0.321 ounces per ton. This is a decrease from the December 31, 1952, figures of 526,687 tons and a decrease in value of $5,778,039, taking the price of gold at $35 an ounce.

Ore Reserves (Hollinger and Ross Mines)

The ore reserves on December 31, 1953, consisted of 4,703,531 tons, averaging 0.309 ounces of gold, or $6.38 per ton, giving a total value of $30,002,050.

The ore reserves on December 31, 1952, consisted of 5,400,704 tons, averaging 0.305 ounces of gold, or $6.31 per ton, giving a total value of $34,060,276.

In the calculations dealing with ore reserves the price of gold at $20.67 per ounce has been taken as the basis of value. Taking the price of gold at $35 per ounce as the basis of value, the ore reserves had a total value of $50,797,220 at the end of the year, a decrease of $6,875,654 from the 1952 figure of $57,672,874.

Employees

The average number of men employed during the year was 1,771, distributed as follows:

MINERS:		
Exploration	29	
Development	58	
Production	848	
		935
MECHANICS:		
Operations	144	
Maintenance	146	
		290
GENERAL:		
Mill and refinery	137	
Technical	125	
Clerical	60	
Miscellaneous	98	
Ross mine	126	
		546
TOTAL		1,771

Young-Davidson Mine

There were 323,094 tons of ore milled, an average of 888 tons per 364 days' operation, with a recovery of $2.86 per ton (gold at $35 per ounce).

Broken ore in stopes on December 31, 1953, was estimated at 154,690 tons.

Ross Mine

The Ross mine consists of about 456 acres, owned by the company, in Hislop township, district of Cochrane.

Operations continued throughout 1953. This mine was not affected by the labour strike at the Hollinger mine.

The mine is served by a vertical shaft and winze, as shown in the following table:

Shaft	Number of compartments	Depth from surface
		feet
No. 1	3	1,598
No. 2 (winze, below 300-foot level)	2	1,535

The following table shows the development work done in 1953 and the total:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
150-foot	.....	2,350	.....	1,573	.....	936
300-foot	.....	6,153	.....	2,413	.....	2,624
450-foot	.....	7,050	.....	5,189	90	3,423
600-foot	264	4,310	.....	2,382	.....	2,647
750-foot	415	2,389	40	2,330	399	2,572
900-foot	435	3,306	89	2,821	199	1,704
1,050-foot	469	1,183	391	2,007	197	858
1,200-foot	498	1,015	654	2,373	.....	628
1,350-foot	280	478	1,079	2,284	.....	603
1,500-foot	74	543	646	1,853	31	819
1,650-foot	.....	.....	.....	13	.....	.....

Diamond-drilling in 1953 amounted to 204 holes, totalling 32,637 feet, from underground.

There were 113,333 tons of ore hoisted, the mill treated 113,361 tons.

The following is taken from the company's report for the year ending December 31, 1953:

> The ore reserves as of December 31, 1953, were 632,440 tons, with a gold content of 0.229 ounces per ton. These figures compare with 793,926 tons with an average gold content of 0.219 ounces per ton at the end of 1952. This is a decrease of 170,486 tons and a decrease in total value of $1,097,615, making a total value of $4,996,035 with gold at $35 per ounce.

The employment figures are included in those given for the Hollinger mine. J. J. Caty is resident manager. The mine address is Holtyre.

Hugh-Pam Porcupine Mines, Limited

Hugh-Pam Porcupine Mines, Limited, was incorporated in 1935, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 3,867,000 shares have been issued. The officers and directors are: R. A. Cranston, president; J. B. Streit, vice-president; George Scott, secretary-treasurer; J. A. Hackett and W. H. Maedel, directors. The head office is at 50 King Street West, Toronto. The mine address is Pamour.

The company owns 15 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. Further details regarding the work appear in the report on Broulan Reef Mines, Limited, on page 9.

On July 11, 1953, a labour strike caused a curtailment of operations. Work was continued for the rest of the year on a limited basis.

There are two vertical, two-compartment shafts on the property, the Mulholland and the Hughes, each about 200 feet deep. A two-compartment winze, 110 feet deep, runs at an angle of 70 degrees from the 200-foot level of the Hughes shaft. Considerable lateral work was done from these two shafts some years ago. The present work being done on the property is through extensions of the Reef workings of Broulan Reef Mines, Limited. The following table shows the work accomplished in the area in 1953, and the totals:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
200-foot	46	239	.....	.....	.....	167
350-foot	32	187	.....	35	145	145
500-foot	87	778	.....	46	.....	140
650-foot	.....	2,174	.....	44	.....	157
800-foot	41	915	.....	57	149	302
970-foot	590	1,069	22	418	.....	.....
1,120-foot	.....	335	.....	.....	.....	.....
1,270-foot	182	182	.....	.....	.....	.....

Diamond-drilling in 1953 consisted of 71 holes, totalling 5,075 feet, from underground.

The following is taken from the mine manager's report for the year ending December 31, 1953:

Production and Treatment

During the year, 42,625 tons of ore were mined and milled. Production totalled $345,079 representing 9,734.8 troy ounces of fine gold. Average recovery was 0.228 ounces of gold or $8.09 per ton milled.

Mining

During the year stopes on the 200-, 350-, 500-, and 800-foot levels were in operation, and stope preparation was in progress on the 800-, and 970-foot levels.

On the 970-foot level No. 91 west drift was extended 590 feet, of which 303 feet is in ore. During 1953 this ore shoot yielded 1,993 cars of ore assaying 0.43 ounces of gold per ton, or 0.20 ounces of gold per ton cutting high assays to one ounce.

Operating costs, exclusive of charges by Broulan Reef Mines, Limited, for use of shaft, plant, etc., were $5.75 per ton or $6.45 per ton including these charges.

W. F. Brown is mine manager. Employment figures for the year are given in the report on Broulan Reef Mines, Limited.

Kerr-Addison Gold Mines, Limited

Kerr-Addison Gold Mines, Limited, was incorporated in April, 1936, with an authorized capitalization of 5,000,000 shares of $1 par value, 4,730,301 of which have been issued. The officers and directors are: J. Y. Murdoch, president; G. A. Cavin, secretary; James Ingram, treasurer; André Dorfman, H. H. Leather, F. M. Connell, W. D. Smith, J. H. Rattray, and Oliver Hall,[1] directors. The

[1]Died February, 1954.

head office is at 44 King Street West, Toronto. The mine address is Virginiatown.

The company's main property consists of 34 claims, approximately 1,102 acres, in McGarry township, Larder Lake area, district of Timiskaming.

Mining and milling continued throughout 1953. The mine is operated through the vertical, five-compartment No. 3 shaft, 3,995 feet deep.

The following table shows the development work done in 1953, and the totals at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
60-foot[1]	.....	283	.....	1,248	.....	.....
175-foot	.....	7,545	.....	901	.....	2,773
300-foot	34	9,623	.....	2,131	168	6,400
500-foot	.....	9,398	.....	2,628	225	7,823
700-foot	.....	11,618	.....	1,920	.....	8,157
850-foot	.....	7,290	.....	2,300	77	4,093
1,000-foot	.....	14,344	.....	3,954	74	5,329
1,150-foot	.....	10,032	25	2,481	375	5,607
1,300-foot	182	13,602	66	2,258	181	6,824
1,450-foot	.....	8,512	57	2,991	419	4,756
1,600-foot	23	9,996	.....	3,232	215	8,036
1,750-foot	.....	5,568	.....	2,922	133	5,073
1,900-foot	.....	7,798	60	1,903	564	5,263
2,050-foot	72	6,089	52	3,007	258	3,005
2,200-foot	1,990	7,416	198	2,061	2,498	4,068
2,350-foot	1,989	7,070	128	1,602	1,093	2,440
2,500-foot	2,264	[2]10,245	101	2,033	4,174	5,416
2,650-foot	808	3,456	267	1,293	562	1,418
2,800-foot	1,744	2,028	97	913	463	463
2,950-foot	1,293	1,293	378	909	443	443
3,100-foot	1,782	1,806	114	883	410	438
3,250-foot	1,365	1,365	271	1,050	474	541
3,400-foot	.....	176	156	819	223	446
3,550-foot	409	664	246	1,061	.....	474
3,700-foot	927	1,220	379	1,131	.....	505
3,850-foot	.....	.....	7	184	.....	279

Diamond-drilling in 1953 consisted of 531 holes, totalling 97,000 feet, from underground.

There were 1,642,008 tons of ore hoisted; the mill treated 1,643,298 tons.

A timber-treatment plant was erected. In it timber is treated with chromated zinc chloride as a protection against decay.

A second deck was added to the service cage to permit the carrying of 60 men per trip into and out of the mine.

The plant for treating tailings for backfill was completed and a sand-screening plant was built. The sand for the backfill is obtained from the company's own pit in McGarry township. A further description of the hydraulic back-fill system is given in the manager's report below.

The following is taken from the manager's report for the year ending December 31, 1953:

Production and Costs

In terms of both tonnage milled and ounces of gold produced, 1953 production was slightly lower than the record high in 1952. In terms of dollar value the drop was large, $596,971.59 for a difference of only 6,200.6 ounces of gold. Dollar production in 1952 amounted to $36.10 per ounce of gold but dropped to $35.01 in 1953. Extraction of gold in milling was 95.44 percent.

[1]From an old adit, not from No. 3 shaft.
[2]Includes 465 feet on Arjon property.

SUMMARY OF PRODUCTION FOR 1953[1]

Total milled (average per day, 4,502.2 tons).....tons	1,643,298
Total gold recovered.....ounces	341,912.99
Total silver recovered.....ounces	7,744.38
Average gold recovered per ton (0.2081 ounces).....	$7.2835
Average tailings loss per ton (0.0099 ounces).....	$0.3465
Average mill head value per ton (bullion plus tails) (0.2180 ounces).....	$7.6300
Total realized value of bullion (Canadian funds).....	$11,969,639.08
Total realized value of bullion per ton (Canadian funds)	$7.284

SUMMARY OF COSTS FOR 1953

	Total	Per ton
Development	$1,323,066.03	$0.805
Stope development	498,040.00	0.303
Mining	1,344,089.08	0.818
Haulage	893,504.18	0.544
Hoisting	311,231.60	0.189
Crushing and conveying	197,194.70	0.120
Milling	1,133,345.88	0.690
General expense	529,597.80	0.322
Bullion marketing	112,660.96	0.069
Total operating costs at mine	$6,342,730.23	$3.860
Net operating profit at mine before provision for depreciation, taxes, and head office expenses	$5,626,908.85	$3.424

Operating costs, owing to costs of conversion to cut-and-fill stoping methods and large-scale filling of empty stopes, were up, according to estimates. Some filling charges absorbed into operating costs in 1953 were of a non-recurring nature.

Mining and Mine Development

On the new block of levels, from the 2,800- to the 3,850-foot levels inclusive, main crosscuts were completed at all except the 3,400- and 3,850-foot horizons. Main east drifts were driven as far as the known easterly limit of the No. 21 orebody on the 2,800-, 2,950-, 3,100-, 3,250-, and 3,700-foot levels.

Driving of both ore-pass and waste-pass systems for the new levels was completed. Construction of waste-pass control chutes is nearing completion. The waste crusher station was excavated and the crusher installed. Ore-pass control chutes are 35 percent finished.

Major programs of drifting and raising were carried out on the 2,200-, 2,350-, and 2,500-foot levels in preparation for stoping.

Mining was concentrated in the 900-foot block of ground between the 1,600- and 2,500-foot levels. Within this zone 84.3 percent of all ore breaking was done and from it was drawn 69.5 percent of the mill feed, whereas 26.5 percent of mill feed was drawn from between the 1,000- and 1,600-foot levels.

Of the 1,350,065 tons of ore broken, 16.7 percent was broken in development and stope development, 9.8 percent in pillar mining, and 73.5 percent in stoping. Of the ore broken in stopes and pillars, 96,594 tons were in cut-and-fill operations.

For conveying hydraulic backfill into and throughout the mine, a system of trunk lines of six-inch rubber-lined pipe and four-inch extra-heavy pipe was installed. This system will be extended as required. Preparations for large-scale hydraulic backfilling also included the completion of a second large sump at the 2,650-foot level, as well as the purchase and installation of additional larger pumps at both the 1,450- and 2,650-foot levels.

During the year, 363,836 cubic yards of sand extracted from mill tailings plus 41,245 cubic yards of screened pit sand were hydraulically placed in the mine. Also 212,829 cubic yards of dry fill were placed, making a total of 617,910 cubic yards.

The conversion from shrinkage and sublevel to cut-and-fill mining methods is progressing according to schedule. In 1954 it is estimated that cut-and-fill stopes may account for approximately 40 percent of the ore break in stoping.

Ore Development

At the 2,800-foot level, the flow-type ore zone east of the main crosscut has been diamond-drilled. This has blocked out in plan, in Nos. 16 and 21 orebodies, 3,544 tons per vertical foot having a grade of 0.5400 ounces per ton, before allowing for dilution. As a result of this there are now estimated, in these two orebodies between the 2,650- and 2,800-foot levels, 631,655 tons of ore having a grade of 0.4673 ounces per ton, after allowing for dilution.

[1]Gold at $35 per ounce.

At the 2,950-foot level, diamond-drilling of the same zones east of the main crosscut has outlined in plan, in Nos. 16 and 21 orebodies, 3,170 tons per vertical foot having a grade of 0.5274 ounces per ton, before allowing for dilution. These two orebodies are estimated to contain, between the 2,800-, and the 2,950-foot levels, 513,554 tons having a grade of 0.4780 ounces per ton, after allowing for dilution.

At the 3,700-foot level, diamond-drilling east of the main crosscut has outlined north, central, and south flow-type orebodies. These have been outlined by flat drill holes only and total 7,774 tons per vertical foot having a grade of 0.6768 ounces per ton, before allowing for dilution.

On all three levels further diamond-drilling followed by lateral development work will outline additional ore in the carbonate zone which lies north of the flows. Ore development also remains to be done west of the main crosscut on the three levels.

Ore Reserves

A falling price for gold plus the increased cost of mining at continually increasing depths have again made necessary the removal of some lower grade tonnage from ore classification. The result is a lower tonnage of better grade.

At the year's end, reserves of proven ore were as follows:

Between surface and the 1,600-foot level there are 4,191,779 tons having a grade of 0.2220 ounces per ton; between the 1,600- and 2,500-foot levels there are 8,845,554 tons having a grade of 0.3012 ounces per ton; between the 2,500- and 2,950-foot levels there are 2,231,200 tons having a grade of 0.3999 ounces per ton; or a total of 15,268,533 tons having a grade of 0.2938 ounces per ton, after allowing for dilution. Included in this reserve are 971,755 tons of broken ore having a grade of 0.1882 ounces per ton.

As the 2,800- and 2,950-foot levels are only partially developed, no ore has been estimated west of the main crosscut on them.

General

The plant for the production of backfill sand from mill tailings was completed and has proved its ability to produce 2,000 tons daily from 4,500 tons of tailings. In addition a sand screening plant, having a capacity of 120 tons per hour of screened sand to augment the supply of hydraulic fill, was constructed and started in operation in September.

A program of training in accident prevention was continued with such effect that the frequency of lost-time accidents was the lowest since the start of production.

An average force of 911 men was employed, of whom 543 were underground and 368 on the surface. W. S. Row is manager.

Kirkland Lake Gold Mining Company, Limited

Kirkland Lake Gold Mining Company, Limited, was incorporated in November, 1915, with an authorized capitalization of 5,500,000 shares of $1 par value, of which 5,326,699 have been issued. The officers and directors are: J. B. Tyrrell, president; V. H. Emery, vice-president and managing director; H. F. Cassidy, secretary-treasurer; J. A. Dalton, W. S. Walton, and N. S. Beaton, directors. The head office and mine office are at Chaput-Hughes. The executive office is at 44 King Street West, Toronto.

The company's main property consists of 11 claims in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1953.

The depths of the shafts and winzes in the mine are given in the following table:

Shaft or winze	Number of compartments	Total depth from surface
		feet
No. 1 shaft[1]	2	894
No. 2 or main shaft	3	2,666
No. 1 winze	4 below 2,475-foot to 2,975-foot level 3 from 2,975-foot level to bottom	4,952
No. 2 winze (below 4,900-foot level)	3	5,897
No. 3 winze (below 3,600-foot level	3	4,487
"1,000" winze (below 0,000-foot level)	2	1,134
No. 4 winze (below 4,750-foot level)	3	5,886

[1]Not being used.

There was no shaft-sinking in 1953.

The following table shows the development work done during 1953 and the totals to the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
No. 2 (main) shaft:						
100-foot	.....	.....	.....	.....	.....	171
200-foot	.....	.....	.....	.....	.....	96
300-foot	.....	.....	.....	.....	.....	179
400-foot	.....	213	.....	172	.....	109
500-foot	.....	445	.....	345	.....	58
600-foot	.....	987	.....	206	.....	.....
700-foot	.....	251	.....	107	.....	.....
800-foot	.....	1,918	.....	470	.....	287
900-foot	.....	754	.....	391	.....	185
1,000-foot	.....	1,990	.....	387	.....	365
1,100-foot (sub-level from 1,000-foot)	.....	552	.....	236	.....	173
1,200-foot	.....	1,698	.....	379	.....	196
1,300-foot	.....	1,484	.....	648	.....	321
1,400-foot	.....	.....	.....	17	.....	.....
1,500-foot	.....	.....	.....	19	.....	284
1,600-foot	.....	2,614	.....	1,893	.....	.....
1,725-foot	.....	.....	.....	27	.....	168
1,850-foot	.....	787	.....	256	.....	389
1,975-foot	.....	1,186	.....	499	.....	231
2,100-foot	.....	1,019	.....	238	.....	171
2,225-foot	.....	774	.....	464	.....	174
2,350-foot	.....	1,575	.....	426	.....	572
2,475-foot	.....	1,183	.....	676	.....	338
No. 1 winze:						
2,600-foot	.....	961	.....	453	.....	349
2,725-foot	.....	1,693	.....	259	.....	506
2,850-foot	.....	2,196	.....	310	.....	91
2,975-foot	.....	1,550	.....	282	.....	365
3,100-foot	.....	1,396	.....	195	.....	153
3,225-foot	.....	536	.....	275	.....	150
3,375-foot	.....	1,007	.....	84	.....	166
3,475-foot	.....	1,587	.....	677	.....	265
3,600-foot	.....	2,461	.....	3,401	.....	239
3,750-foot	.....	3,337	.....	796	.....	412
3,875-foot	.....	3,466	.....	1,729	.....	611
4,000-foot	.....	1,369	.....	821	.....	.....
4,150-foot	.....	2,333	.....	950	.....	228
4,300-foot	.....	4,503	.....	1,462	.....	475
4,450-foot	.....	7,689	.....	2,294	.....	954
4,600-foot	.....	4,839	.....	1,930	.....	642
4,750-foot	.....	3,824	.....	2,302	.....	1,571
4,900-foot	.....	5,036	.....	1,599	39	1,073
No. 2 winze:						
5,050-foot	.....	1,108	.....	516	.....	245
5,200-foot	.....	197	.....	320	.....	96
5,325-foot	.....	723	.....	210	.....	383
5,450-foot	423	7,492	53	1,951	.....	1,433
5,600-foot	.....	1,027	.....	70	.....	310
5,725-foot	.....	51	.....	7	.....	.....
5,850-foot	218	1,435	15	2,089	184	184
No. 3 winze:						
3,725-foot	.....	297	.....	321	.....	165
3,850-foot	.....	360	.....	192	.....	165
3,975-foot	.....	669	.....	214	.....	165
4,100-foot	.....	903	.....	152	.....	207
4,225-foot	.....	834	.....	181	.....	142
4,350-foot	.....	1,136	.....	254	.....	220
No. 4 winze:						
5,010-foot	218	1,985	.....	396	39	624
5,120-foot	.....	1,636	.....	391	25	336
5,230-foot	269	3,034	53	895	.....	380
5,340-foot	404	3,560	.....	725	266	1,092
5,600-foot	107	4,103	206	652	212	729
5,725-foot	382	2,716	540	841	71	351

Diamond-drilling in 1953 consisted of 42 holes, totalling 9,997 feet, from underground.

There were 112,616 tons of ore hoisted and milled. The mill operated at an average daily rate of 308.5 tons.

The following is taken from the report of the managing director for the year ending December 31, 1953:

Operating Costs

	Totals	Cost per ton milled
Development and exploration	$ 219,744.31	$ 1.95
Stoping	335,363.89	2.98
Timbering	251,124.56	2.23
Transporting ore, hoisting, etc.	292,930.07	2.60
Milling	185,480.18	1.65
Marketing bullion	13,050.97	0.11
General and undistributed charges (maintenance mine buildings, administration and management, insurance, workmen's compensation, and miscellaneous)	213,475.83	1.89
Total	$1,511,169.81	$13.41

Gold produced	ounces	43,173.519
Cost per ounce		$35.00

Taxes charged against operations (not included above) totalled $8,241.01 or at the rate of 7 cents per ton milled and 19 cents per ounce of gold produced.

For purposes of comparison with previous years the government cost-aid has not been taken into account in the foregoing calculations.

Development

Ore broken	tons	117,407
Drifting	feet	2,020
Crosscutting	feet	814
Raising	feet	875
Excavation	cubic feet	13,726
Diamond-drilling	feet	9,997

The distribution of work done for the year, excluding excavation, was as follows:

	Hoisting lifts		
	First (2,400-foot level to surface)	Second (4,900- to 2,400-foot level)	Third (5,850- to 4,900-foot level)
	percent	percent	percent
Ore hoisted	0.0	8.5	91.5
Development	0.0	6.5	93.5

NEW ORE DEVELOPED DURING THE YEAR

Level	Length	Average width	Average cut grade at $35 per ounce
	feet	feet	
50th	60	3	$15.00
52nd	20	3	23.90
53rd	365	3	14.70
54th	280	3	14.50
58th	50	3	13.00
Total	775	3	$14.77

Ore from development accounted for 14 percent of the ore milled during the year, and 38 percent of drifting was in ore.

Production

Tons milled	112,616
Value per ton	$13.78
Gross value	$1,552,131.51
Recovery per ton	$13.22
Bullion produced	$1,489,066.55

MILLING STATISTICS

Ore milled	tons	112,616
Average value per ton		$13.78
Gross value		$1,552,131.51
Loss in tailings		$63,064.96
Net value recovered		$1,489,066.55
Average milled per day	tons	308.5
Value in tailings per ton		$0.56
Extraction	percent	95.9

MEMORANDUM OF PRODUCTION

Quarter	Tons milled	Bullion value	Recovery per ton
1st	28,439	$384,845.89	$13.53
2nd	28,706	392,543.42	13.67
3rd	26,151	329,810.42	12.61
4th	29,320	381,866.82	13.02

The following figures show the effect on earnings owing to lower gold prices, resulting from the differences in exchange between the Canadian and American dollars.

Year	Ounces produced	Average price received per ounce for gold	Value of bullion recovered
1950	39,114	$38.11	$1,490,850
1951	42,035	36.86	1,549,738
1952	44,827	34.35	1,540,202
1953	43,173	34.42	1,489,066

General

During the year there was a further increase in over-all costs per ton of ore milled. The larger proportion of ore that had to be mined and hoisted through the third hoisting lift area was the principal cause for this increase.

The proven ore reserves in the mine at the end of 1953 amount to 310,444 tons, having a gross cut value of $4,710,486.00, calculated at $35 per ounce.

The mine payroll at Kirkland Lake for 1953 was $1,005,531.26, an increase of $6,677.13 over 1952.

The company spent $434,063.85 for supplies and materials in 1953, practically all from Canadian sources.

Mine Exploration

An exploration program was undertaken at the mine this year to test beyond the zone from which the main production has been obtained. At the 5,700-foot level a crosscut was driven 250 feet south from the main workings searching for the flat-dipping southern flank of No. 10 vein. Some drifting was done on a weak vein which appears to be in a subsidiary fracture. The southern flank of No. 10 vein has not yet been located at this horizon. Diamond-drilling from the end of the above-mentioned crosscut probed the area farther to the south. The first hole cut highly altered, fractured, and mineralized syenite porphyry from footage 460 to 720, and two sections at a depth of about 700 feet assayed $20.40 over 1.8 feet and $22.10 over 3.0 feet (gold at $35 per ounce). From the same set-up two other long holes were drilled, one angling off to the east and the other to the west. These cut zones of interbanded lamprophyre and syenite porphyry with some portions carrying mineralization, but values were not comparable to those from the first hole. These holes may be near the top of a favourable syenite porphyry body and the crosscut will be extended into this vicinity to serve as a base from which further exploratory work will be done.

Outside Exploration

Last winter 18 claims were staked on the Pic River, and these were prospected during the summer. As nothing of economic interest was found these claims will be allowed to become open.

In the territory west of Lake Nipigon, Northern Canada Mines, Limited, and Kirkland Lake Gold Mining Company, Limited, have jointly staked a group of 36 claims to protect an iron discovery made by their prospectors late last season. Outcrops showing magnetite were found over a considerable area. Spectroscopic and chemical analyses made of samples brought out show the magnetite to be of excellent quality and grade. Nothing is known, however, regarding the continuity or size of the deposit. It is planned to make a magnetic survey this winter to outline the extent of this mineralization and to determine if diamond-drilling is warranted.

An average of 298 men was employed, of whom 211 were underground and 87 on surface. G. C. Dunn, who had been general superintendent for eight years, died in September. He was succeeded by L. C. Dixon.

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 officers and directors are: A. L. Blomfield, chairman of the board; J. C. Adamson, president; Albert Wende, vice-president and treasurer; G. F. Doggett, secretary; W. W. Foskett and C. M. Hilton, directors. The head office and mine office are at Kirkland Lake.

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

Mining and milling operations continued throughout 1953.

The depths of the shafts in the mine are shown in the following table:

Shaft	Number of compartments	Total depth from surface
		feet
No. 1 (surface to 2,200-foot level)	3	2,250
No. 1 shaft extension (2,000- to 4,450-foot level)[1]	3	4,500
No. 2 (inclined)[2]	1	[3] 200
No. 3[1]	5	3,995
No. 4 (below 4,325-foot level)[4]	3	8,176
No. 5	5	3,995
No. 6 (below 3,575-foot level)[5]	5	6,098

No. 4 shaft was sunk a further 298 feet in 1953, to a total depth of 8,176 feet below surface, and new levels were established at 7,950 feet and 8,075 feet.

The following table shows the development work done in 1953 and the totals at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
100-foot	.....	582	.....	14	.....	.....
200-foot	.....	5,346	.....	2,001	.....	823
300-foot	.....	851	.....	181	.....	91
400-foot	.....	7,814	.....	2,727	.....	9,104
600-foot	.....	9,732	.....	3,146	.....	8,540
800-foot	.....	10,307	.....	3,304	.....	12,339
1,000-foot	.....	10,197	.....	4,013	.....	16,575
1,200-foot	.....	8,415	.....	1,677	.....	8,655
1,400-foot	.....	5,546	.....	2,616	.....	10,091
1,600-foot	.....	6,948	.....	2,360	.....	6,419

[1]Not being used.
[2]Used for supplies and timber only.
[3]Incline distance, 632 feet.
[4]Hoist at 5,575-foot level.
[5]Hoist at 3,825-foot level.

DEVELOPMENT WORK IN 1953—*Continued*

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1,800-foot	.....	5,872	.....	2,057	.....	5,796
2,000-foot	.....	6,776	.....	3,554	.....	4,763
2,200-foot	.....	7,217	.....	2,073	.....	6,542
2,325-foot	.....	6,814	.....	1,845	.....	3,843
2,450-foot	.....	6,647	.....	1,557	.....	3,049
2,575-foot	.....	7,035	.....	2,331	.....	3,698
2,700-foot	.....	7,118	.....	2,576	.....	3,628
2,825-foot	.....	7,678	.....	1,597	.....	2,142
2,950-foot	.....	7,418	.....	1,689	.....	2,316
3,075-foot	.....	9,116	.....	3,071	.....	2,287
3,200-foot	.....	7,801	.....	1,240	.....	2,334
3,325-foot	.....	5,575	.....	1,524	.....	1,692
3,450-foot	.....	5,888	.....	1,273	.....	1,274
3,575-foot	.....	5,172	.....	2,131	.....	1,315
3,700-foot	.....	6,521	.....	3,158	.....	1,986
3,825-foot	.....	4,217	.....	2,368	.....	1,260
3,950-foot	.....	4,673	.....	2,359	17	1,399
4,075-foot	.....	4,466	.....	1,505	.....	1,008
4,200-foot	.....	4,685	.....	1,833	.....	1,664
4,325-foot	90	4,952	.....	962	.....	1,445
4,450-foot	.....	5,411	436	2,343	21	1,787
4,575-foot	.....	4,454	326	1,997	.....	1,355
4,700-foot	.....	3,983	.....	881	.....	958
4,825-foot	.....	4,727	.....	846	.....	1,099
4,950-foot	.....	4,278	.....	992	.....	838
5,075-foot	.....	4,647	948	2,159	.....	1,107
5,200-foot	.....	4,902	.....	1,844	.....	1,110
5,325-foot	.....	4,605	.....	2,244	.....	1,172
5,450-foot	107	5,856	.....	3,687	31	1,502
5,575-foot	.....	4,456	.....	1,489	45	906
5,700-foot	.....	3,959	.....	1,518	20	661
5,825-foot	102	3,089	.....	1,551	61	1,009
5,950-foot	.....	4,479	.....	1,613	139	965
6,075-foot	.....	2,487	.....	855	.....	718
6,200-foot	.....	1,205	.....	601	.....	369
6,325-foot	.....	2,048	.....	417	53	479
6,450-foot	.....	138	.....	567	130	247
6,575-foot	.....	1,563	.....	1,461	.....	163
6,700-foot	.....	.....	.....	297	.....	155
6,825-foot	.....	1,230	.....	849	16	16
7,075-foot	.....	.....	.....	408	.....	.....
7,325-foot	127	2,242	.....	1,664	230	230
7,575-foot	14	400	.....	863	67	67
7,700-foot	141	926	.....	686	320	320
7,825-foot	515	1,987	85	1,257	99	162
7,950-foot	.....	.....	124	124	.....	.....
8,075-foot	.....	.....	120	120	.....	.....

Diamond-drilling in 1953 consisted of 91 holes, totalling 7,778 feet, from underground.

While the deepening of No. 4 shaft was in progress, lateral development and diamond-drilling from the lower levels of the shaft were suspended.

Sand for mine backfill was obtained from the company's own pit in Gauthier township.

The following is taken from the mine superintendent's report for the year ending December 31, 1953:

During the year, 236,669 dry tons of ore were treated, yielding 90,134 ounces of gold and 27,830 ounces of silver, having a gross value of $3,483,421.75.

Production

From March, 1918, to December 31, 1953:

Milled	tons	14,577,281
Gross value of bullion[1]		$239,620,545.57
Dividends paid		$102,960,000.00

Costs

Costs per ton milled for the last five fiscal periods are given below:

	1949	1950	1951	1952	1953
Development	$ 1.114	$ 1.234	$ 1.144	$ 1.432	$ 1.273
Mining	6.297	6.658	7.358	8.600	8.826
Milling and refining	1.653	1.586	1.744	[2]2.498	[2]2.449
Marketing bullion	0.116	0.104	0.159	0.093	0.114
General and administrative	0.299	0.299	0.334	0.428	0.406
Operating cost	$ 9.479	$ 9.881	$10.739	$13.051	$13.068
Depreciation	0.432	0.425	0.355	0.364	0.294
	$ 9.911	$10.306	$11.094	$13.415	$13.362
Provision for Dominion and Provincial taxes	$ 1.509	$ 1.125	$ 1.079	.....	$ 0.017
Total	$11.420	$11.431	$12.173	$13.415	$13.379
Re-treatment of other tailings	0.216	0.195	0.198	.....	.....

Ore Trammed for the Year

Level	Development	Stoping	Total
	tons	tons	tons
600-foot	.....	251	251
800-foot	.....	42	42
1,200-foot	.....	60	60
1,400-foot	.....	4,287	4,287
2,575-foot	.....	155	155
2,700-foot	.....	84	84
3,325-foot	.....	5,122	5,122
3,450-foot	.....	308	308
3,575-foot	.....	4,279	4,279
3,700-foot	.....	2,936	2,936
3,825-foot	111	5,833	5,944
3,950-foot	110	4,773	4,883
4,200-foot	.....	6,936	6,936
4,325-foot	767	6,059	6,826
4,450-foot	154	14,765	14,919
4,575-foot	441	7,575	8,016
4,700-foot	.....	5,327	5,327
4,825-foot	.....	4,685	4,685
4,950-foot	.....	2,784	2,784
5,075-foot	50	5,136	5,186
5,200-foot	.....	6,118	6,118
5,325-foot	.....	15,899	15,899
5,450-foot	874	34,006	34,880
5,575-foot	479	21,942	22,421
5,700-foot	66	7,538	7,604
5,825-foot	888	21,119	22,007
5,950-foot	1,133	14,646	15,779
6,075-foot	120	10,817	10,937
6,200-foot	351	1,874	2,225
6,325-foot	658	3,469	4,127
6,450-foot	571	.....	571
7,325-foot	1,360	970	2,330
7,575-foot	1,175	.....	1,175
7,700-foot	3,186	.....	3,186
7,825-foot	3,138	.....	3,138
Total	15,632	219,795	235,427

[1]Includes exchange premium recoverable under the Emergency Gold Mining Assistance Act (estimated for 1953).

[2]Re-treatment of other tailings is included in Milling and refining: 1952, $0.328; 1953, $0.376.

Development

In the period from March to November, 1953, No. 4 shaft was deepened for a distance of 298 feet, to provide two new levels at the 7,950- and 8,075-foot horizons. During this time deep-level, lateral exploration had to be stopped, with the result that the total footage of development drifting done in 1953 was less than half that of the preceding year.

In the year, 1,096 feet of development drifting, done on seven levels in the mine, exposed a total of 561 feet of ore having an average cut grade of 0.413 ounce per ton across a width in the drifts of 63.2 inches.

In the old No. 1 and No. 2 vein zones, 299 feet of drifting exposed 126 feet of 0.276-ounce ore over a width of 60.7 inches. The remainder of the drifting amounting to 797 feet was done in the new No. 4 vein zone. This work exposed 435 feet of ore grading 0.451 ounce per ton across a width of 63.9 inches.

This year, as in preceding periods, the best results secured from development drifting done in the No. 4 vein zone, were at the 7,825-foot horizon, where a total length of 386 feet of ore was exposed in 515 feet of drifting. Early in the year diamond-drilling, at this level, indicated the presence of a vein situated to the north of those already opened. By the year's end this vein had been drifted on for a distance of 268 feet, of which a continuous length of 214 feet was ore, having an average grade of 0.560 ounce per ton over a width in the drift of 66.9 inches. Farther to the north again, diamond-drill holes have intersected another vein, which will be opened by crosscutting and drifting in the months ahead.

In 1953, some development raising was done on the ore shoots in the No. 4 vein zone. Most of the work was done in the area to the east of the Lake Shore fault where a total of five raises were driven. From the 7,825-foot level one raise was driven in ore through to the 7,700-foot horizon. Two raises were driven in ore from the 7,700-foot level through to the 7,575-foot horizon and another raise from the 7,700-foot level was stopped in waste 62 feet above the level after the first 50 feet of advance was in ore. One raise was driven above the 7,575-foot level for a distance of 64 feet. Values were erratic, the average being below ore grade.

Results secured, to date, from development drifting and raising in the No. 4 vein zone strongly suggest that, to the east of the Lake Shore fault at least, the ore will not extend much above the 7,575-foot horizon. Recent work on the 7,825-foot level has disclosed the presence of veins which are situated farther to the north than those previously opened, and further development of these occurrences may necessitate a reappraisal of the ore chances at higher elevations. From present knowledge, however, there does not appear to be much encouragement for this possibility.

To the west of the Lake Shore fault, ore has been opened by drifting, in what is believed to be the No. 4 vein zone, on one level only, the 7,325-foot horizon. In the year, a raise was driven in ore on this ore shoot for a vertical distance of 120 feet above the level. At this height the ore was cut off by a strong fault. Stoping has been started on this ore-shoot, with grade to date averaging half an ounce per ton.

A considerable amount of development work remains to be done before stoping operations can be initiated in the No. 4 vein zone to the east of the Lake Shore fault. Before a sequence of stoping is established on the three levels on which ore has already been opened, it is necessary to know the pattern of ore occurrence on the two new levels provided by the deepening of No. 4 shaft. Crosscuts to the vein zone, now being driven on the two new levels, should reach their objective about the end of March, 1954. Exploration of the vein zone by drifting and diamond-drilling will require additional time. Other work still to be done is:

1) Completion of the loading pocket below the 8,075-foot level.
2) Driving an ore-pass from the loading pocket up to the 7,575-foot level.
3) Excavation of a sump for drainage water and the installation of a pump.
4) Completion of the waste-pass system.
5) Driving additional development raises on the ore between levels.

At the year's end the total footage of ore exposed in drifts in the mine and available for stoping was 14,068 feet, grading 0.516 ounce per ton over a width in drifts, before slashing, of 57.5 inches. This is a decrease from last year of 721 feet in length and an increase of 0.012 ounce per ton in grade. In the year, development drifting exposed a length of 561 feet of new ore as follows:

Level	Ore length	Width before slashing	Grade per ton
	feet	inches	ounces
4,325-foot	66	60.0	0.265
5,450-foot	30	60.0	0.359
5,825-foot	30	63.0	0.219
7,575-foot	14	60.0	0.145
7,700-foot	35	60.0	0.593
7,825-foot	386	64.3	0.448
Total	561	63.2	0.413

Mining

In the year, an average of 648 tons per day was milled as compared with 722 tons per day for the year ending December 31, 1952.

The sources of the ore milled, by levels, are given in the summary of ore trammed. The total, which is down 26,926 tons from last year, was made up of 32 percent from the No. 1 or south vein zone, 64 percent from the No. 2 or north vein zone and 4 percent from the new No. 4 vein zone.

The smaller tonnage treated, amounting to 74 tons per day, is almost equalled by the loss sustained through the discontinuance of ore recovery operations from old shrinkage stopes above the 1,400-foot level. No significant increase in tonnage is anticipated in the near future.

The driving of new crosscuts, which was started last year in order to provide a second means of exit from the stoping areas on a number of levels, was completed at a cost for the year of $57,000.

The cost of drift and crosscut maintenance and repair work was down $79,000 from the figure for last year. This item of cost is, nevertheless, still considerably higher than for the years preceding 1952. Because of the reduced tonnage treated, the increased cost of this work is inordinately reflected in the cost per ton milled. For 1953 the cost of maintaining and repairing drifts and crosscuts amounted to $0.963 per ton milled.

Shaft Work and Lower Development

In the period the following work was done on lower development:

1) The No. 4 shaft was extended from 53 feet below the 7,825-foot level to 102 feet below the 8,075-foot horizon, a distance of 298 feet.

2) No. 4 shaft level stations were completed at the 7,950-foot and 8,075-foot horizons and the shaft crosscuts driven to the location of the main crosscuts.

3) An excavation for a loading-pocket was made in No. 4 shaft 50 feet below the 8,075-foot level, but steel and concrete installation had not been completed at the year's end.

4) Temporary loading pockets, which will facilitate initial lateral development, were installed at the 7,950-foot and 8,075-foot levels.

5) A steel and timber spillage chute was installed near the bottom of the sump in No. 4 shaft. This installation will greatly reduce the work necessary to clean out the spillage from the bottom of the sump.

6) The deep-level ventilation program was continued during the year. Raises have been completed down to the 7,825-foot level, and with a fresh air fan at the top of the system at the 6,700-foot horizon, ventilation on the lower levels is much improved.

Safety First

It is gratifying to be able to report a decided improvement in the accident rate for the year. Based on the number of compensable accidents per thousand employees the rate for Lake Shore for 1953 was 58 as compared with a rate of 70 for all Ontario mines and a rate of 75 for all Ontario gold mines. The greatest improvement was in the record for surface employees. Out of a total of 61,707 shifts worked, only two shifts were lost because of accidents.

An average of 551 men was employed, of whom 345 were underground and 206 on surface. W. T. Robson is mine superintendent.

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 have been issued. The officers and directors are: K. J. Springer, president; J. H. C. McClelland, vice-president; W. W. McBrien, secretary-treasurer; F. E. Hall, assistant secretary; S. H. Robinson, J. D. Barrington, and J. R. Cryderman, directors. The head office is at 67 Yonge Street, Toronto. The mine address is Beardmore.

The main property is in Eva and Summers townships, district of Thunder Bay, about 5 miles from Beardmore by motor road.

Mining and milling operations continued throughout 1953.

The vertical, three-compartment No. 1 shaft is 3,006 feet deep. The new vertical, three-compartment winze, which had been begun in 1952 at the 19th (2,875-foot) level, about 1,200 feet west of the shaft, was sunk 505 feet to a depth of 3,375 feet from surface in 1953. New levels were established at 3,025, 3,175, and 3,325 feet. A ~~used 43-~~ by 30-inch double-drum Canadian Ingersoll-Rand electric hoist was installed at the 2,875-foot level.

The following table shows the development work done during 1953 and the totals at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st		2,240		756		485
2nd		2,500		625	79	593
3rd		2,433		390		1,336
4th		2,672		116		1,134
5th		4,879		239		1,237
6th		2,514		350		993
7th		2,772		387		1,093
8th		4,791		7,161		1,351
9th		2,703		628		1,584
10th		2,281		601		1,689
11th		2,632		623		1,405
12th		1,931		623		965
13th		2,005		593		1,036
14th		2,071		1,062		1,116
15th		1,670		982		1,153
16th				66		463
17th		1,480		1,034		473
18th		1,649		585	412	1,155
19th	173	1,817		1,288	162	1,270
19th sublevel						165
20th	31	31	62	62		
21st (station only)						
22nd (station only)						

Diamond-drilling in 1953 consisted of 20 holes, totalling 2,155 feet, from surface, and 3 holes, totalling 7,362 feet, from underground.

The following is taken from the manager's report for the year ending December 31, 1953:

Exploration and Development

Crosscutting and drifting	feet	189.5
Raising	feet	524.5
Station-cutting (19th-level winze preparation)	cubic feet	27,076
Raising (19th-level winze preparation)	feet	170.0
Sinking (winze)	feet	505.5
Station-cutting (development from winze)	cubic feet	28,084
Crosscutting (development from winze)	feet	67.0
Drifting (development from winze)	feet	31.0

The main feature of the year's development program was the preparation and plant installations for and the sinking of the winze from the 19th level. A pilot raise was driven from which the headframe and bin excavations could be slashed out, and a second raise was driven to meet it and to serve for the hoist-rope raise. Excavations were slashed out for the collar and hoist-room stations and for the headworks and bin spaces. The old 42- by 30-inch, double-drum, electric hoist was set up on concrete foundations in the hoist-room. The drums were lagged to meet the new mining regulations and to make them 45 by 30 inches. The equivalent of an 85-foot headframe with a 125-ton ore bin and 100-ton waste bin, together with the necessary head sheaves, chutes, and control doors was erected. The winze was sunk to a depth of 505.5 feet below the collar, and stations were established at the 3,025-, 3,175-, and 3,325-foot levels on contract. On completion of sinking, a two-ton skip and a cage were installed and lateral development operations were started. All three stations were enlarged, and crosscutting begun. No. 2 vein was reached on the 21st or 3,175-foot level and opened up for a length of 31 feet. This development was on the thin, east-end section of the vein, but values were good.

Exploratory diamond-drilling was completed on the 8th level, but nothing of importance was revealed. A number of exploratory holes were drilled on the 18th and 19th levels north of the Nos. 2 and 4 veins and east and south of the shaft. This latter area proved singularly barren, but the drilling north confirmed the results of previous drilling, showing the existence of a narrow vein striking generally east-west and lying about 50 feet north of the winze. This was called No. 8 vein.

A short crosscut from the winze station was advanced north to intersect No. 8, vein, and it was opened up for about 115 feet. The east heading which is still open shows about 20 feet of near ore. It is planned to explore this vein further on the new lower levels. No. 1902W. drift was advanced 45 feet in ore.

A number of raises were driven in stopes on various levels to provide service entries and aid ventilation. Backs were timbered on the No. 16 vein developed on the 8th level, and shrinkage stoping at these ore shoots was started. During the year 3,598 tons of ore, grading 0.56 ounces per ton, were broken, indicating a profitable future production from this zone and a return of at least part of the development costs.

At the end of the year, surface diamond-drilling was started to cross-section and check a zone where previous drilling had revealed one or two isolated high-grade intersections. The few holes completed to date have not revealed any continuity to these occurrences.

Ore Reserves

Ore reserves are estimated at 80,906 tons, of average grade 0.640 ounces per ton, making a total of 51,799.23 ounces.

Hoisting

There were 52,589 tons of ore hoisted: 264 tons or 0.5 percent from drifts, 732 tons or 1.4 percent from raises, and 51,593 tons or 98.1 percent from stopes.

There were 17,033 tons of waste hoisted.

Milling

There were 38,614.1 tons of ore milled after sorting 11,302 tons of waste. Tons milled per day averaged 106.4, and tons sorted per day were 31.1 based on 363 operating days during the year. Production for the year was 32,159.653 ounces of fine gold and 961.45 ounces of fine silver, valued at $1,107,408.13. Average recovery was 0.843 ounces of gold per ton milled.

Tailings losses averaged 0.327 ounces per ton, and extraction was 96.2 percent.

Costs

Operating costs per ton milled for the year were as follows:

Exploration and development:	
Surface diamond-drilling	$ 0.15
Underground diamond-drilling	0.27
Drifting	0.15
Raising	0.23
Station-cutting, winze preparation	0.43
Raising, winze preparation	0.12
Sinking, winze	1.95
Station-cutting, development from winze	0.59
Crosscutting, development from winze	0.08
Drifting, development from winze	0.04
Total	$ 4.01
Mining	13.00
Milling	4.33
Total operating cost at mine	$21.34

Over-all operating costs were $1.38 per ton milled higher than in 1952. Most of the increase was due to higher development costs. These were $4.01 per ton milled as against $3.09 last year. Mining costs were higher, $13.00 per ton milled as against $12.46 last year. Milling costs were slightly lower, being $4.33 per ton milled as compared with $4.41 in 1952.

Unit costs were much the same as last year. No comparable figures are available for lateral development since an insufficient amount of this work was done this year.

A tabulation of unit costs for the past three years follows:

	1951	1952	1953
Raising, cost per foot advance	$17.00	$17.62	$16.89
Mining, cost per ton broken	9.22	10.70	9.83
Milling, cost per ton milled	3.75	4.41	4.33

Unit costs were all lower than during the previous year. Mining costs per ton milled were higher owing to the larger tonnage sorted and also because a considerable amount of mining was done over current demand so that broken ore reserves were increased. The large development program including the winze sinking added substantially to costs. The costs of most supplies increased during most of the year although some reductions were noted at the year's end.

General

Mining and milling operations were stepped up during the year. A rather severe reduction was noted during the holiday season, but the slack was picked up in the balance of the year, and

production records were set. The development program was much larger than for the past few years and was successfully completed on schedule.

The supply of labour was adequate, but skilled miners for development work are scarce.

An average of 124 men was employed, of whom 64 were underground and 60 on the surface. G. A. McKay is manager.

Little Long Lac Gold Mines, Limited

Little Long Lac Gold Mines, Limited, was incorporated in January, 1933, with an authorized capitalization of 2,000,000 shares of no par value, of which 1,841,000 have been issued. The officers and directors are: J. G. Boeckh, president; J. C. Allen, vice-president; M. C. Maddigan, secretary-treasurer; S. J. Bird, P. K. Hanley, and R. C. Stanley, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Geraldton.

The company owns the Little Long Lac mine, a property consisting of 39 claims in the townships of Errington and Ashmore, Little Long Lac area, district of Thunder Bay. A group of 68 claims, adjoining the east boundary of the Lun-Echo property in the Manitouwadge Lake area, district of Thunder Bay, was acquired in 1953.

Mining operations at the Little Long Lac mine continued from the beginning of 1953 until December 14. The mill operated until the end of the year. The salvaging of the underground equipment and the mill clean-up were almost completed by December 31.

The mine was developed from a shaft and winze, both vertical, the depths of which are shown in the following table:

	Number of compartments	Total depth from surface
No. 1 shaft	3	2,322
Winze, below 16th level	3	3,952

There was no new level development work in 1953. About 60 feet of raising from the 2nd level and 65 feet from the 16th level were done.

The following table shows the total development work when operations ceased:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
No. 1 shaft:			
1st	112	57	50
2nd	1,695	1,239	1,280
3rd	1,219	394	575
4th	2,558	1,027	500
5th	1,186	126	223
6th	973	428	788
7th	1,098	30	673
8th	2,035	1,539	763
9th	1,145	24	629
10th	1,451	266	490
11th	1,604	90	590
12th	1,792	290	999
13th	1,979	161	573
14th	2,169	202	852
15th	6,459	366	669
16th	5,138	1,053	1,299

DEVELOPMENT WORK—*Continued*

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
Winze:			
17th	1,736	411	1,207
18th	1,697	432	1,041
19th	1,704	417	986
20th	1,756	418	1,088
21st	1,882	209	568
22nd	1,050	214	645
23rd	1,013	255	467
24th	698	264	341
25th	900	458	439
26th	972	318	270

The following is taken from the manager's report for the year ending December 31, 1953:

Production

Ore hoisted	tons	83,044
Ore milled	tons	83,044
Bullion recovered, gold	ounces	23,037.02
Bullion recovered, silver	ounces	2,193.98
Total gold in residue	ounces	2,049.69
Calculated mill head assay		$10.42
Calculated mill residue assay		$0.85
Recovery	percent	91.83

The total production since the beginning of operations in November, 1934, is shown below:

Milled	tons	1,772,459
Gross production		$22,114,722.28
Average value per ton		$12,474

Milling

The mill treated 83,044 tons of ore and operated 336.9 days or 92.3 percent of full time.

The average daily tonnage treated was 246.4, and recovery was 91.83 percent or almost 2 percent better than 1951.

Mill clean-up operations began on December 16. It is estimated that about $15,000 of December's production came from clean-up.

Mining

During 1953, 73,279 tons were broken in stopes. Of the 82,773 tons drawn, 54.5 percent was drawn from the shaft pillar, 21.8 percent from the surface pillar, 4.5 percent from the "09" vein, and 19.2 percent from the 16th-level pillar.

Mining operations were completed on December 14, when salvage of pumps, power cables, pipes, etc., from the main-shaft area began.

Surplus Buildings and Equipment

The bulk of the surplus equipment was sold during the year. This included the winze hoist, roaster plant, scheelite mill, and certain surplus mill and other equipment. Rails, pipe, muck cars, locomotives, power cable, etc., salvaged from the winze area of the mine, were disposed of.

Fifteen of the 25 townsite houses were sold, as well as some of the smaller plant buildings. The mining and milling plants are still intact

An average of 101 men was employed, of whom 54 were underground and 47 on the surface. W. A. Carter is manager.

Macassa Mines, Limited

Macassa Mines, Limited, was incorporated in April, 1926, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,678,068 have been issued. The officers and directors are: R. A. Bryce, president; L. Soliague, vice-president; H. W. Salthouse, secretary-treasurer; C. R. Leonard, J. D. Perrin, A. G. Slaght, and H. M. Porteous, directors; G. A. Howes, director and mine manager. The head office is at 85 Richmond Street West, Toronto. The mine address is Kirkland Lake.

The company's property consists of 11 claims in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling operations continued throughout 1953.

The following table shows the depths of the shafts and winzes on the property:

Shaft	Number of Compartments	Depth from surface
		feet
Elliott[1]	2	523
Main No. 1	3	3,043
No. 1 winze, (below 3,000-foot level)	3	4,824
No. 2	3	4,070
No. 2 winze, (below 4,625-foot level)	3	5,756

A loading-pocket was established at the 5,150-foot level from No. 2 winze, and a raise was driven from the 5,150- to the 4,750-foot level in 1953.

The following table shows the development work done in the workings from Nos. 1 and 2 shafts and the winzes in 1953 and the totals at December 31, 1953:

Level[2]	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1,300-foot	.....	581	.....	47	.....	933
1,400-foot	.....	1,101	.....	138	.....	169
1,500-foot	.....	2,940	.....	837	.....	360
1,525-foot	.....	113	.....	.....	.....	50
1,550-foot	.....	63	.....	.....	.....	.....
1,625-foot	.....	1,110	.....	363	.....	395
1,725-foot	.....	245	.....	39	.....	88
1,850-foot	.....	1,377	.....	258	.....	371
2,000-foot	.....	1,958	.....	573	.....	356
2,175-foot	.....	1,682	.....	289	.....	800
2,325-foot	.....	2,392	.....	402	.....	529
2,475-foot	65	2,467	138	1,613	.....	769
2,525-foot	.....	457	.....	.....	.....	.....
2,575-foot	.....	2,179	.....	543	.....	260
2,675-foot	.....	4,015	.....	1,535	.....	262
2,800-foot	.....	6,215	.....	1,790	.....	731
3,000-foot	.....	[3]8,266	22	[4]7,448	.....	1,469
3,100-foot	619	6,947	180	1,454	.....	690
3,225-foot	454	6,204	6	1,114	.....	667
3,350-foot	.....	5,386	.....	1,392	.....	766
3,475-foot	.....	4,066	.....	593	.....	797
3,600-foot	.....	4,341	80	923	.....	1,023
3,725-foot	.....	3,831	88	2,112	.....	1,431
3,875-foot	.....	2,751	.....	744	.....	557
4,000-foot	.....	2,281	.....	437	.....	588
4,125-foot	.....	3,580	.....	2,064	54	918
4,250-foot	20	4,488	.....	885	119	622
4,375-foot	155	3,236	.....	404	157	483
4,500-foot	218	5,162	15	1,661	.....	125
4,625-foot	633	5,392	324	2,248	.....	775
4,750-foot	1,005	1,363	112	442	.....	.....
4,900-foot	1,117	1,222	138	362	186	356
5,025-foot	59	219	.....	221	345	345
5,125-foot (station only)	.....	.....	.....	.....	.....	.....
5,150-foot (loading pocket below the level)	.....	.....	.....	.....	180	180
5,150-foot	.....	.....	.....	142	.....	358
5,300-foot	.....	.....	.....	60	.....	.....
5,450-foot	.....	.....	.....	73	.....	.....
5,600-foot	.....	.....	.....	157	.....	.....

[1]Not being used.
[2]At the levels above 1,300 feet, stations only have been cut.
[3]Includes 273 feet of drifting in Casakirk property.
[4]Includes 721 feet of crosscutting in Casakirk property.

Diamond-drilling in 1953 consisted of 97 holes, totalling 9,951 feet, from underground.

The following is taken from the mine manager's report for the year ending December 31, 1953:

Production

The following are the production figures for 1953 with comparative figures for the previous two years:

Year	Gross recovery	Tons milled	Recovery per ton
1951	$1,655,383.35	135,440	$12.22
1952	1,534,630.74	139,660	10.99
1953	1,603,630.54	144,175	11.12

During the year, the price of gold, expressed in Canadian dollars, fluctuated between a high of $34.888 and a low of $33.978 per ounce. The average price received for our gold from the Canadian Mint for the year was $34.43. Under the provisions of The Emergency Gold Mining Assistance Act it is estimated that the company is entitled to receive the sum of $188,344.97 which is $1.306 per ton milled, or $4.070 per ounce of gold recovered. Of this amount $112,844.97 has been received on account. The average price received for silver was $0.838 per ounce. Combining the Mint price with the estimated cost-aid gives a total of $38.50 per ounce as compared with $37.43 for 1952, and $39.295 for 1951.

Milling

The average tons milled per day for 1953 was 395 as compared with 381.6 for 1952 and 371 for 1951. The mill operated at full capacity with the exception of the July holiday period of two weeks, when some necessary mechanical repairs were made. Over-all extraction was 94.8 percent. Bullion recovery comprised 46,387.547 ounces of gold and 7,129.68 ounces of silver. From the commencement of milling in October, 1933, 2,198,976 tons of ore have been treated from which 897,648.2 ounces of gold and 154,292.6 ounces of silver have been recovered, having a gross value of $32,914,109.32, the equivalent of $14.96 per ton exclusive of cost-aid.

Development and Exploration

During the year, a total of 1,625 feet of new ore was exposed in drifting, which has an average value of 0.51 ounces over an average width of 5.2 feet. Of this total, 275 feet is on the 3,100-foot level, 61 feet on the 3,225-foot level, 127 feet on the 4,375-foot level, and 274 feet on the 4,625-foot level. On the new levels below the 4,625-foot, 508 feet were followed by drifting on the 4,750-foot level averaging 0.51 ounces over 5.5 feet and on the 4,900-foot level 380 feet averaging 0.45 ounces over 5.0 feet. The results from developing these two levels to date indicate promising possibilities for the six levels below the 4,900-foot at which stations have been cut, but at which little work was done along the favourable zone.

An ore and waste-pass system extending from the loading pocket below the 5,150-foot level station in No. 2 winze was completed through to the 4,750-foot level and is now in use.

Active exploration of both the older part of the mine above the 4,625-foot level and the new levels below the 4,625-foot will be continued as quickly and as extensively as conditions will permit.

Ore Reserves

New ore developed by drifting and extensions of known ore outlined by sublevels and stoping resulted in a positive ore reserve as of December 31, as follows:

	Tons	Ounces per ton	Value at $35 per ounce
Unbroken	317,700	0.38	$13.30
Broken	44,883	0.35	12.25
Total	362,583	0.376	$13.16

Operating Costs

The cost of most operating supplies held steady with no increase in basic labour costs during the year; operating costs per ton milled were down slightly below those of 1952. The operating

and other costs per ton milled and per ounce of gold recovered, compared with those of 1952, were as follows:

	1953		1952	
	46,387.547 ounces recovered from 144,175 tons milled		44,640.04 ounces recovered from 139,660 tons milled	
	Per ton	Per ounce	Per ton	Per ounce
Development and exploration	$ 1.435	$ 4.460	$ 1.316	$ 4.116
Mining	6.276	19.507	6.965	21.789
Milling	1.390	4.321	1.498	4.687
Undistributed mine operating charges	0.430	1.337	0.433	1.355
Administration and head office	0.444	1.380	0.430	1.344
Operating costs	$ 9.975	$31.005	$10.642	$33.291
Depreciation	0.225	0.698	0.233	0.731
Provision for municipal, provincial, and federal taxes	0.448	1.394	0.090	0.280
Total cost	$10.648	$33.097	$10.965	$34.302

A comparison of the main items of expenditure during 1953 with those of 1952 is as follows:

	1953	1952
Wages and salaries	$868,606	$911,741
Supplies and services	443,827	468,409
Power (hydro-electric)	76,434	75,230
Provision for taxes	64,660	12,636

Capital Expenditures

An expenditure of $1,476.57 on new surface equipment and additions, and one of $13,140.72 on underground equipment was necessary during the year. This was offset by the sale of two used, diesel engines, purchased in 1948 but now not necessary, for $14,316.42. The net increase was $300.87 on capital during the year.

An average of 257 men was employed, of whom 179 were underground and 78 on the surface.

McIntyre Porcupine Mines, Limited

McIntyre Porcupine Mines, Limited, was incorporated in March, 1911, with an authorized capitalization of 800,000 shares of $5 par value, of which 798,000 have been issued. The officers and directors are: Balmer Neilly, president; B. E. Smith, vice-president; E. D. Fox, secretary; W. B. Dix, treasurer; J. C. Fraser, D. H. McDougall, and R. S. McLaughlin, directors. The address of the head office and the mine is Schumacher. The executive office is at 25 King Street West, Toronto.

The company has numerous holdings in Ontario, the chief of which is the McIntyre mine in Tisdale township, Porcupine area, district of Cochrane.

Mining and milling continued from January 1, 1953, until September 21, when a labour strike caused the suspension of operations. The strike lasted for the rest of the year.

There are twelve shafts on the property, four of which are used at the present time. The depths of the four shafts are shown in the following table:

Shaft	Number of compartments	Total depth from surface
		feet
No. 5	2 to 1,375 feet 3 to bottom	2,389
No. 6	3 to 1,000 feet 4 to bottom	3,045
No. 11 (main)	5	4,130
No. 12 (below 3,875-foot level)	4	7,007

The following table shows the development work done in 1953, and the totals as at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
50-foot	.....	420	.....	167	.....	.....
100-foot	.....	956	.....	975	.....	.....
200-foot	.....	9,839	.....	4,859	.....	1,747
300-foot	.....	13,075	.....	3,329	.....	1,064
400-foot	.....	5,762	.....	3,297	.....	704
500-foot	47	12,554	.....	5,607	.....	2,035
600-foot	.....	10,746	.....	3,510	.....	1,100
700-foot	108	9,567	.....	3,076	.....	1,280
800-foot	422	11,754	.....	4,951	.....	882
900-foot	.....	4,414	67	1,404	.....	635
1,000-foot	173	13,541	32	6,894	.....	1,810
1,125-foot	.....	10,139	78	3,290	.....	1,134
1,250-foot	24	17,036	.....	6,844	.....	2,694
1,375-foot	424	16,445	.....	5,210	.....	1,021
1,500-foot	282	16,174	26	4,199	.....	1,403
1,625-foot	67	12,971	.....	4,555	.....	941
1,750-foot	853	14,301	.....	6,008	.....	821
1,875-foot	68	15,639	.....	9,558	.....	1,636
2,000-foot	79	15,092	.....	5,073	.....	971
2,125-foot	.....	11,367	.....	5,317	.....	715
2,250-foot	361	13,592	.....	4,910	.....	415
2,375-foot	.....	18,719	112	9,995	376	1,397
2,500-foot	342	15,059	25	4,945	.....	818
2,625-foot	.....	18,986	42	5,251	.....	664
2,750-foot	197	16,943	149	4,680	41	686
2,875-foot	306	18,542	.....	7,191	.....	1,004
3,000-foot	151	10,986	33	2,071	.....	471
3,125-foot	.....	12,156	.....	2,393	.....	590
3,250-foot	.....	10,784	23	2,392	.....	452
3,375-foot	889	12,549	389	8,243	.....	1,107
3,500-foot	.....	9,811	49	3,738	58	622
3,625-foot	22	10,869	.....	5,808	.....	579
3,750-foot	.....	13,053	118	6,770	591	1,253
3,875-foot	340	10,553	197	13,733	138	886
4,025-foot	697	5,769	29	1,148	.....	485
4,175-foot	635	10,775	165	5,439	749	1,783
4,325-foot	844	7,996	225	4,401	263	506
4,475-foot	88	9,562	60	5,510	.....	875
4,625-foot	79	5,768	48	3,570	.....	749
4,775-foot	443	6,661	69	3,249	.....	606
4,925-foot	320	11,818	.....	5,476	.....	551
5,075-foot	.....	806	.....	1,733	231	475
5,225-foot	25	5,293	282	2,213	222	473
5,375-foot	302	12,330	127	13,600	.....	860
5,675-foot	884	3,021	208	3,533	.....	.....
5,975-foot	760	3,486	.....	3,100	.....	.....
6,125-foot	.....	.....	52	52	.....	.....
6,275-foot	.....	.....	50	50	.....	.....
6,425-foot	1,560	2,821	20	2,746	.....	.....
6,575-foot	13	68	234	336	.....	.....
6,825-foot	589	1,515	.....	2,986	279	312
6,995-foot	.....	.....	.....	.....	.....	179

Diamond-drilling in 1953 consisted of 770 holes, totalling 128,635 feet, from underground.

The following is taken from the manager's report for the fiscal year ending March 31, 1954:

Development

Development work amounted to 17,043 feet. This includes 10,496 feet of drifting, of which 1,723 feet was on line and 3,849 feet in ore averaging 0.353 ounces per ton over a width of 6.5 feet.

No. 3 Vein.—Stopes produced 45,454 tons of an average of 0.296 ounces per ton; 32 feet of drifting was done on the 2,000-foot level.

No. 5 Vein.—Stopes produced 28,372 tons of an average of 0.312 ounces per ton; 877 feet of drifting on the 700-, 1,000-, and 1,750-foot levels developed 108 feet of ore averaging 0.481 ounces per ton over a width of 6.6 feet.

No. 6 Vein.—Stopes produced 2,473 tons of an average of 0.179 ounces per ton.

No. 7 Vein.—Stopes produced 19,144 tons of an average of 0.235 ounces per ton; 845 feet of drifting on the 1,125-, 1,250-, 1,375-, 1,625-, 2,000-, 2,250-, and 2,500-foot levels developed 489 feet of ore averaging 0.387 ounces per ton over a width of 8.3 feet.

No. 8 Vein.—Stopes produced 4,187 tons of an average of 0.313 ounces per ton.

No. 9 Vein.—Stopes produced 47,481 tons of an average of 0.295 ounces per ton; 1,189 feet of drifting on the 1,500-, 2,500-, 2,625-, 2,875-, 3,000-, and 3,375-foot levels developed 176 feet of ore averaging 0.261 ounces per ton over a width of 6.6 feet.

No. 10 Vein.—Stopes produced 85,884 tons of an average of 0.320 ounces per ton; 1,207 feet of drifting on the 2,500-, 3,625-, 4,025-, 4,175-, 4,325-, 4,625-, 4,775, and 5,375-foot levels developed 184 feet of ore averaging 0.339 ounces per ton over a width of 5.5 feet.

No. 12 Vein.—Stopes produced 31,919 tons of an average of 0.286 ounces per ton; 447 feet of drifting on the 500-, 800-, 1,625-, and 1,750-foot levels developed 101 feet of ore averaging 0.252 ounces per ton over a width of 6.7 feet.

No. 13 Vein.—Stopes produced 28,583 tons of an average of 0.294 ounces per ton; 318 feet of drifting on the 2,000-, and 2,250-foot levels developed 51 feet of ore averaging 0.213 ounces per ton over a width of 4.6 feet.

No. 14 Vein.—Stopes produced 7,217 tons of an average of 0.245 ounces per ton; 311 feet of drifting on the 2,750-foot level developed 94 feet of ore averaging 0.399 ounces per ton over a width of 8.9 feet.

No. 15 Vein.—Stopes produced 35,767 tons of an average of 0.220 ounces per ton; 25 feet of drifting was done on the 5,225-foot level.

No. 16 Vein.—Stopes produced 4,381 tons of an average of 0.359 ounces per ton; 278 feet of drifting on the 4,775-, and 4,925-foot levels developed 56 feet of ore averaging 0.256 ounces per ton over a width of 7.2 feet.

No. 18 Vein.—Stopes produced 3,893 tons of an average of 0.286 ounces per ton.

No. 20 Vein.—Stopes produced 1,048 tons of an average of 0.116 ounces per ton.

No. 21, 22, and 24 Veins.—Stopes produced 68,431 tons of an average of 0.302 ounces per ton; 4,909 feet of drifting on the 3,875-, 4,025-, 4,175-, 4,325-, 4,475-, 5,375-, 5,675-, 5,975-, 6,425-, and 6,825-foot levels developed 2,558 feet of ore averaging 0.348 ounces per ton over a width of 6.1 feet.

No. 25 Vein.—Stopes produced 39,192 tons of an average of 0.515 ounces per ton; 58 feet of drifting on the 4,325-foot level developed 32 feet of ore averaging 0.721 ounces per ton over a width of 5.3 feet.

Ore Reserves

	Tons	Ounces of fine gold	Value (gold at $35 per ounce)
Estimated in place	2,589,570	848,224.5	$29,687,860
Broken ore	49,472	12,179.1	426,270
Total	2,639,042	860,403.6	$30,114,130
Average per ton		0.326	$11.40

Costs

Mining Costs

	Labor and employees' insurance	Explosives	Other supplies	Shop repairs and maintenance	Power and air	Indirect charges	Total	Cost per ton
Drifts	$ 133,989.71	$ 25,398.82	$ 24,179.22	.....	$ 18,345.80	$ 33,627.24	$ 235,540.79	$0.4658
Crosscuts	45,052.90	10,158.75	7,588.92	.....	5,510.80	11,027.65	79,339.02	0.1569
Raises	59,539.35	9,706.65	15,213.53	$ 318.80	8,833.85	13,222.35	106,834.53	0.2112
Diamond-drilling	70,451.95	.....	44,767.09	4,668.62	7,866.30	6,859.02	134,612.98	0.2661
Exploration, mine	20,099.52	.....	111.80	.....	.....	1,047.00	21,258.32	0.0420
Mining	1,486,836.74	128,344.19	237,244.60	90,838.39	79,299.68	181,243.63	2,203,807.23	4.3572
Timbering	324,994.83	.....	215,549.33	14,571.33	1,241.10	13,723.31	570,079.90	1.1271
Backfilling	113,422.85	.....	51,498.20	6,902.74	926.35	2,981.70	175,731.84	0.3474
Tramming, development	44,962.00	.....	26,471.00	18,073.70	2,425.80	1,262.50	93,195.00	0.1843
Tramming, mining	53,598.23	.....	38,062.24	21,795.56	2,913.10	13,767.35	130,136:48	0.2574
Hoisting, development	14,833.00	.....	1,351.00	4,208.00	3,066.00	81.00	23,539.00	0.0465
Hoisting, mining	157,762.43	.....	14,480.20	67,451.07	33,530.43	17,491.65	290,715.78	0.5748
Total	$2,525,543.51	$173,608.41	$676,517.13	$228,828.21	$163,959.21	$296,334.40	$4,064,790.87	$8.0367
Cost per ton ore milled	$4.9934	$0.3432	$1.3376	$0.4524	$0.3242	$0.5859	$8.0367	

Milling Costs

	Labor and employees' insurance	Supplies	Shop repairs and maintenance	Power	Indirect charges	Total	Cost per ton
Crushing and conveying	$ 30,506.05	$ 53,887.94	$11,854.67	$10,653.95	$16,823.26	$123,725.87	$0.2446
Tube milling	18,922.90	82,842.66	6,101.00	17,570.45	.....	125,437.01	0.2480
Flotation	44,780.57	59,348.73	24,885.52	11,919.90	28,308.91	169,243.63	0.3346
Cyanidation	54,263.50	99,641.20	5,369.40	10,590.25	27,894.35	197,758.70	0.3910
Refining	11,808.99	6,460.06	441.55	96.00	.....	18,806.60	0.0372
Assaying	10,347.45	3,519.05	2,117.60	1,018.40	.....	17,002.50	0.0336
Mill alterations	.....	.....	.....	.....	.....	.....	.....
Total	$170,629.46	$305.699.64	$50,769.74	$51,848.95	$73,026.52	$651,974.31	$1.2890
Unit cost per ton	$0.3374	$0.6044	$0.1003	$0.1025	$0.1444	$1.2890	.....

OPERATING COSTS

	Total	Per ton ore milled
Mining:		
Exploration	$ 21,258.32	$0.0420
Development	673,061.32	1.3308
Breaking and stoping	3,370,471.23	6.6639
Total mining	$4,064,790.87	$8.0367
Milling	651,974.31	1.2890
Administration and general expense	83,228.77	0.1646
Total	$4,799,993.95	$9.4903

ADDITIONS TO PLANT BUILDINGS AND EQUIPMENT

(For year ending March 31, 1954)

Surface equipment	$62,844.41
Underground equipment	32,988.04
Total	$95,832.45

Production

Ore treated	tons	505,780
Value per ton (0.3055 ounces per ton)		$10.5343
Gross value		$5,328,041.35
Gold and silver produced:		
Gold (147,300.035 ounces at $34.476)	$5,078.252.02	
Silver (30,175.050 ounces at $0.8398)	25,343.29	
Total value		$5,103,595.31
Recovered per ton (0.2927 ounces per ton)		$10.09

PRODUCTION SINCE THE BEGINNING OF MILLING OPERATIONS IN 1912 TO MARCH 31, 1954

Milled	tons	22,515,583
Average value per ton		$10.12
Gross value		$227,758,305.46
Average recovery per ton		$9.64
Total value		$216,963.437.73

Mining

	Tons
Ore broken in stopes	431,892
Ore from development	45,044
Total	476,936
Ore delivered to passes	498,470

General

Since 1948 when the Emergency Gold Mining Assistance Act was introduced, we have received $2,651,433 in cost-aid on which we have paid the customary Dominion and Provincial taxes. During this same period, and with practically the same number of men on the payroll, wages and salaries increased by $3,649,792.

Ore reserves were maintained at about the same figure as that of last year. About 31 percent of the drifting in ore was above, and 69 percent was below the 3,875-foot level. Sixty-six percent of the total ore developed was in the No. 22 vein, and 70 percent of that amount was on the 5,375-foot level and below. Results of drifting on the 5,675- and 6,425-foot levels continue to be favourable, although the grade on those two levels is slightly lower than that on the 5,975-foot level. It would now appear there is a more or less continuous ore zone from the 5,375- to well below the 6,425-foot level.

An average of 964 men was employed, of whom 609 were underground and 355 on surface. M. L. Urquhart is 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, of which 2,940,000 have been issued. The officers and directors are: H. G. Young, president and managing director; A. C. Snively, vice-president and secretary-treasurer; Stanley Langley, G. P. Campbell, and J. A. McDougald, directors. The address of the head office and mine office is McKenzie Island.

The property consists of 12 claims at the north end of McKenzie Island in Red Lake, Dome township, Patricia portion of Kenora district.

Mining and milling operations continued throughout 1953.

Work on the new inclined No. 5 shaft was continued by driving the pilot raise to surface and slashing the shaft to full size. More detailed information regarding the new shaft is given below in the mine manager's report.

The depths of the other shafts on the property are given in the following table:

Shaft	Inclination	Number of compartments	Total depth from surface
			feet
No. 1	Vertical	3	456
No. 2 (below 450-foot level)	36 degrees	3	1,275
No. 4 (below 1,250-foot level)	Vertical	3	1,635

The following table shows the development work done during 1953 and the totals at December 31, 1953, by levels:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
150-foot	.....	1,828	.....	384	.....	475
250-foot	.....	3,689	.....	1,184	.....	1,302
350-foot	.....	3,447	.....	616	.....	2,066
450-foot	81	7,034	126	1,166	175	2,941
550-foot	227	5,596	43	942	.....	2,033
650-foot	263	7,662	.....	1,340	176	3,751
750-foot	.....	4,194	.....	747	.....	921
850-foot	365	12,182	87	2,623	1,120	4,930
950-foot	.....	3,869	.....	1,009	.....	1,262
1,050-foot	1,142	12,302	196	3,254	387	7,982
1,150-foot	.....	312	.....	186	.....	137
1,250-foot	643	12,309	138	2,879	443	5,399
1,350-foot (station only)	.....	.....	.....	16	.....	.....
1,450-foot	.....	511	.....	134	.....	.....
1,550-foot (station only)	.....	.....	.....	5	.....	.....
1,650-foot	.....	24	.....	353	.....	.....
No. 5 shaft development	.....	121	68	867	353	2,158

Diamond-drilling in 1953 consisted of 3 holes, totalling 3,246 feet, from surface and 208 holes, totalling 33,182 feet, from underground.

The following buildings were erected at No. 5 shaft: a deck-house at the shaft collar, a hoist-house, a crusher-house, and a conveyer gallery connected with the mill building.

The following is taken from the report of the mine manager for the year ending December 31, 1953:

Production and Costs

	1953	1952
Milled.....tons	75,070	83,288
Average value per ton milled.....ounces	0.289	0.259
Value of gold bullion recovered	$748,099.45	$739,010.16
Operating cost	$745,119.66	$796,254.48

The above figures are based on mint returns which gave an average price per ounce of $34.69 for 1953 as compared with $34.23 for 1952.

Development

Total development for the year amounted to 5,612 feet. Of this, 2,721 feet was drifting and subdrifting, 590 feet was crosscutting, and 2,301 feet was raising. Of the drifting 844 feet, or 31 percent, was done on new structure, and the remaining 69 percent was in stope development. 1,756 feet of the raising, or 77 percent, was in ore, and the remainder was for draw points. Diamond-drilling for the year amounted to 36,428 feet, an increase of 23 percent over the previous year. Of this drilling 3,246 was surface drilling, exploring ground in the hanging wall of our present structures.

Construction

No. 5 shaft is completely slashed out to full size from surface to the 1,650-foot level. Stations have been cut on the 450- and 650-foot levels; all is in readiness for the construction work necessary in the shaft, as soon as the headframe and hoist installations are complete. At the time of writing the hoist-room is complete, the hoist is 90 percent installed with only the electrical wiring to be completed. The headframe is in the process of erection.

The underground crusher-room and connected tunnels were excavated and foundations poured. The crusher building, housing the secondary crusher and screens is completed and connected to the mill building by a conveyer way. The machinery is ready to be installed in these buildings when the time for change-over arrives. This change-over hinges on the speed with which the shaft construction proceeds, but the time element involved is difficult to estimate until work begins. It is probable, however, that the new shaft will be in operation by fall.

Ore Position and Future Development

In an area designated as the 12-15 area, diamond-drilling has disclosed an ore structure between the 1,250- and 1,050-foot levels, approximately 200 feet in the footwall of our main structures. Diamond-drilling has traced this structure with promising results for a slope distance of 470 feet; 200 feet of drifting on the 1,250-foot level and 356 feet on the 1,050-foot level was done by the year's end. The northern limit of this structure has been located, but it remains open to development upward, downward, and to the south. A large tonnage is indicated of about mine grade. Further diamond-drilling and development are being continued on this structure in preparation for stoping.

A systematic program of checking extensions of old stopes is being continued. This program resulted in the finding of No. 551 stope this past year, in the midst of old workings, and gave us 6,033 tons grading $13.95.

On completion of No. 5 shaft, development on the new levels will get under way immediately towards the area where downward extensions of known ore structures exist.

Mining and Milling Operations

	1953	1952	Total to date
	tons	tons	tons
Ore broken in stopes and stope development, slashes included	71,069	82,286	1,416,759
Ore broken in development	13,283	12,445	185,133
Ore milled	75,070	83,288	1,359,625
Ore discarded by sorting	9,282	11,443	242,267
Total ore hoisted (milled and sorted, dry)	84,352	94,731	1,601,892
	ounces	ounces	ounces
Average value per ton milled	0.2956	0.2660	0.3203
Average recovery per ton milled	0.2894	0.2592	0.3119

Mining and Milling Operations—*Continued*

	1953	1952	Total to date
	feet	feet	feet
Diamond-drilling	36,428	29,586	422,013
Percentage of extraction	97.90	97.45	97.37
Total value of bullion produced and marketed	$748,099.45	$739,010.16	$15,507,584.30
Total operating cost	745,119.66	796,254.48	10,862,319.78

Operating Costs

	Total cost	Per ton milled and sorted (84,352 tons)	Per ton milled (75,070 tons)
Mine operations:			
Development and exploration:			
Diamond-drilling	$ 43,120.05	$0.511	$0.574
Current development	132,119.53	1.566	1.760
Total	$175,239.58	$2.077	$2.334
Stoping	$307,102.87	$3.640	$4.091
Mill operations:			
Crushing and conveying	$ 20,126.50	$0.239	$0.268
Sorting	12,516.30	0.148	0.167
Milling	100,622.65	1.193	1.340
Total	$133,265.45	$1.580	$1.775
General expenses	$117,406.97	$1.392	$1.564
Head office expense	12,104.79	0.144	0.161
Totals	$745,119.66	$8.833	$9.925

An average of 150 men was employed, of whom 90 were underground and 60 on the surface. R. W. Warren is mine 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 have been issued. The officers and directors are: F. G. MacLeod, president; Arthur Cockshutt, vice-president; J. M. Macintosh, secretary-treasurer; A. L. Cochrane, J. W. Baker, and William Smith, directors. The head office is at 357 Bay Street, Toronto. The mine address is Geraldton.

The company owns and operates a property consisting of 23 claims in Ashmore and Errington townships, district of Thunder Bay.

Mining and milling operations continued throughout 1953.

The depths of the shafts serving the mine are given in the following table:

Shaft	Number of compartments	Total depth from surface
		feet
No. 1, vertical	3	2,053
No. 2, vertical	4	1,921
No. 3 winze, inclined 45 degrees (below the 11th level)[1]	4	2,015

[1]Not being used.

The following table shows the development work done during 1953, and the totals at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st–4th	.....	28,007	.....	9,187	.....	8,518
5th	.....	6,831	.....	2,820	.....	2,727
6th	.....	4,523	.....	2,055	.....	1,774
7th	.....	5,250	.....	1,404	.....	2,267
8th	.....	5,571	.....	1,682	296	1,586
9th	416	11,142	184	2,078	.....	2,107
10th	331	8,940	8	1,810	.....	2,783
11th	20	11,135	97	1,378	394	4,566
12th	.....	1,172	.....	381	.....	.....
13th	1,134	5,988	.....	510	381	642

Diamond-drilling during 1953 consisted of 6 holes, totalling 4,353 feet, from surface and 231 holes, totalling 28,102 feet, from underground.

The mill capacity was increased to about 1,500 tons per day.

A total of 453,772 tons of ore was hoisted during 1953. The mill treated 453,732 tons, at an average daily rate of 1,250 tons.

The following is taken from the general manager's report for the fiscal year ending September 30, 1953:

General

During the past year, all the ore milled was from the *F* zone with the exception of 3,980 tons from No. 1,360 drift and back stope in the north diorite zone.

Mining

Ore supplied to the mill totalled 433,243 tons, an increase of about 102 tons per day over the previous year's total of 396,119 tons.

The broken ore reserves for the year were reduced from 177,736 to 125,917 tons, and the tonnage drilled off ready for blasting was increased from 98,939 to 201,999 tons.

Production per man-shift on the payroll increased 12.4 percent, and the underground production per man-shift showed an increase of 13.8 percent.

ORE DELIVERED TO THE ORE-PASS SYSTEM

(OCTOBER, 1952, TO SEPTEMBER, 1953)

Level	Total ore	Percentage of total tonnage	Grade	Total production	Percentage of production
	tons		ounces per ton	ounces	
F zone:					
8th	834	0.19	0.206	171.93	0.28
9th	195,073	44.93	0.132	25,812.66	42.29
10th	163,407	37.63	0.145	23,672.68	38.79
11th	70,405	16.22	0.149	10,514.35	17.23
13th	485	0.11	0.160	77.58	0.13
Total *F* zone	430,204	99.08	0.140	60,249.20	98.72
North diotite zone:					
13th	3,980	0.92	0.197	783.40	1.28
Total	434,184	100.00	0.141	61,132.60	100.00

ORE MINED FROM COMMENCEMENT OF OPERATIONS TO SEPTEMBER 30, 1953

	Tons	Ounces per ton	Total ounces
North diorite zone	105,574	0.198	20,893.67
South zone	261,503	0.234	61,247.13
North zone	2,041,117	0.225	458,282.58
West zone	528,207	0.229	121,014.80
South limb of iron	106,427	0.229	24,416.04
Surface dump	3,956	0.163	643.22
F zone	1,221,551	0.173	211,056.96
Total	4,268,335	0.210	897,554.40

Ore Reserves

Ore reserves at the end of the fiscal year were 1,526,673 tons with a grade of 0.159 ounces per ton, of which 318,239 tons were in sulphide zones.

Milling

The production from 433,243 tons of ore milled amounted to $2,260,000.50 or $5.2165 per ton, which includes cost-aid amounting to $184,905.36. The mill operated for 353.5 days at an average rate of 1,226 tons per day. Mill heads during the year averaged $5.7446 including cost-aid.

A rod mill was installed during the year to permit finer grinding at an increased tonnage. This unit was put into operation on September 4, 1953.

Operating Costs

(October, 1952, to September, 1953)

	Amount	Per ton Milled
Property expansion development	$ 19,601.40	0.0452
Diamond-drilling	31,042.94	0.0716
Current development	94,071.47	0.2172
Mining	811,071.96	1.8722
Milling	471,332.13	1.0879
Mine office and supervision	94,177.82	0.2174
General operating expense	131,904.73	0.3045
Marketing bullion	20,026.04	0.0462
Total expense at property	$1,673,228.49	3.8622

An average of 235 men was employed, of whom 96 were underground and 139 on the surface. J. M. Kilpatrick was general manager until December 1, and was succeeded by H. E. Rudd, the former assistant manager.

Madsen Red Lake Gold Mines, Limited

Madsen Red Lake Gold Mines, Limited, was incorporated in March, 1935, with an authorized capitalization of 5,000,000 shares of $1 par value. On June 6, 1940, the capitalization was reduced to 3,500,000 shares by the cancellation of 1,500,000 unissued shares. The number of shares issued at the end of 1953 was 3,499,528. The officers and directors are: Joseph McDonough, president; F. R. Marshall, vice-president; M. Masterson, secretary-treasurer; Marius Madsen, Hugh Mackay, H. G. Young, A. H. Seguin, and S. J. Bird, directors. The head office is at 67 Yonge Street, Toronto. The mine address is Madsen.

The company's main property is in Baird and Heyson townships, Red Lake area, Patricia portion of Kenora district. It is about seven and a half miles southwest of the Howey mine and may be reached by road from Red Lake.

Mining and milling operations continued throughout 1953. The depths of the two shafts on the property are shown in the following table:

Shaft	Number of compartments	Depth from surface
No. 1, vertical[1]	2	573
No. 2, vertical	3	2,949

The following table shows the development work done in 1953, and the totals at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st	.....	1,908	.....	271	.....	848
2nd	.....	5,993	.....	756	.....	3,471
3rd	.....	2,370	.....	226	118	1,556
4th	.....	5,705	.....	603	.....	2,627
5th	796	5,946	.....	490	.....	2,408
6th	19	6,376	.....	783	120	1,906
7th	1,393	4,830	.....	749	176	2,602
8th	1,968	6,300	.....	883	.....	1,296
9th	1,094	6,100	147	2,144	546	2,540
10th	2,086	7,211	.....	963	29	2,085
11th	90	6,661	9	1,028	.....	1,955
12th	2,584	6,554	.....	873	254	857
13th	1,036	5,185	144	889	241	900
14th	742	3,914	.....	881	514	943
15th	1,532	4,150	.....	929	177	616
16th	1,142	1,142	353	1,092	.....	455
17th	.....	.....	.....	389	.....	417
18th	.....	.....	.....	53	.....	418

Diamond-drilling in 1953 consisted of 33 holes totalling 22,187 feet, from surface, and 982 holes, totalling 131,312 feet, from underground.

The following is taken from the general manager's report for the year ending December 31, 1953:

Summary

New high records were established in the following items during 1953: ounces of gold and silver produced, revenue from the sale of bullion, total operating profit, and net profit.

A net increase of 63,040 tons to the ore reserve resulted after deducting the 285,018 tons milled from the new ore developed during the year.

The grade of the whole ore reserve was increased by 0.019 ounces per ton.

Production

The total value of the bullion produced during the year amounted to $2,857,683.67. This was realized from the sale of 82,595.968 ounces of fine gold at an average price of $34.414 per ounce, and 18,137.13 ounces of fine silver at an average price of $0.838 per ounce. The average price received for gold was $0.20 per fine ounce higher than that obtained during 1952.

The above bullion was recovered from the treatment of 285,018 tons of ore. This was an average recovery of $10.026 per ton of ore milled.

Total production since milling started on August 11, 1938, to December 31, 1953, amounts to $24,502,313.81 from the treatment of 2,817,027 tons of ore. Average recovery per ton of ore milled was $8.70.

Operating Costs

The higher grade of ore milled, resulting in a record number of ounces of gold, reduced the total operating costs "per ounce of fine gold produced" by $5.366 per ounce.

[1]Not being used.

The total operating costs "per ton of ore milled" increased by $0.461 to $6.975 before the application of credits obtained under the Emergency Gold Mining Assistance Act. The net operating costs, after Emergency Gold Mining Assistance Act credits of $1.168 per ton, amounted to $5.807 per ton. This was an increase of just $0.226 per ton over last year's corresponding figure. The chief factors causing this increase in costs were: lower tonnage milled, increased amount of stope preparation work, continued heavy development program, and changing of mining methods.

The estimated amount of assistance to be received under the Emergency Gold Mining Assistance Act was calculated to be $333,000, an increase of $49,000 more than last year.

The details of the operating costs are outlined in the following table:

	Total	Per ton milled	Per ounce produced
Development and exploration	$ 587,050.00	$2.060	$ 7.107
Stope preparation	193,640.23	0.679	2.344
Stoping	327,926.77	1.150	3.970
Mucking, tramming, and hoisting	294,387.76	1.033	3.564
Crushing and conveying	73,738.83	0.259	0.894
Milling	270,085.71	0.947	3.270
Mine general expense	175,409.81	0.615	2.124
Head office expense	40,662.84	0.143	0.492
Marketing charges	25,252.62	0.089	0.306
Total operating costs	$1,988,154.57	$6.975	$24.071
Estimate of emergency assistance	333,000.00	1.168	4.032
Net operating costs	$1,655,154.57	$5.807	$20.039

Exploration

Property Exploration.—The program of surface diamond-drilling was continued throughout the year. The results of this drilling to date have been meagre, with only a few holes to the immediate west of No. 2-15 stope showing ore values.

Outside Exploration.—The group of 36 claims in the Gorman River area of northwestern Ontario was permitted to lapse.

Two groups, one of 22 and the other of 17 claims, were staked in the province of New Brunswick. A geophysical survey is being conducted on these claims.

A third group of 95 claims, also in New Brunswick, was purchased late in the year.

Mine Development

Lateral development work continued to be a heavy charge against the operation. Although the footages of crosscutting and raising were again reduced, the amount of drifting was maintained very close to last year's footage. However, the footage of underground exploratory diamond-drilling was increased by 52,713 to a total of 131,821 feet.

In view of the results obtained in Nos. 6-W and 9-W drifts last year, a program of drifting and diamond-drilling was undertaken to fully open the section of the mine to the west of the shaft, between the 4th and 11th levels. The face of No. 5-W drift was advanced to a position 2,000 feet west of the shaft, while Nos. 7-W, 8-W, 9-W, and 10-W drift faces were all driven out to positions approximately 1,500 feet west of the shaft. The footage of drifting completed in this work amounted to a total of 5,643 feet.

On the east side of the shaft the exploration drifts on the 8th, 10th, 11th, 12th, 13th, 14th, and 15th levels were all advanced. In this work a total of 4,139 feet of drifting was completed.

No. 16-O-S crosscut was advanced 405.0 feet and drifting east and west from the end of the crosscut was undertaken. No. 16-E drift was driven 383.0 feet, while No. 16-W drift was advanced 811.0 feet.

Above the 11th level 1,122.0 feet of drifting was done to open up orebodies for mining. Below the 11th level a total of 2,939.0 feet of drifting for extraction purposes was driven on the 12th, 13th, and 15th levels.

The slashing of the ore-storage pocket above the 2,820-foot loading station and the excavation of the crusher station at the 2,740-foot horizon were both completed.

The footage of exploration and stope service raising completed during the year was 2,497 feet.

Mining

The installation of the second unit of three DorrClones in the mill was completed in March. This unit was immediately placed into service, producing backfill material by the classification of mill tailings. The total production of sand from both units of DorrClones during the year was 97,953 tons (dry). This material was piped underground and distributed as required to the various stopes. Besides this tonnage of classified mill tailings. 128,450 tons of development waste rock were drawn from No. 2-A stope storage area and from current drift advances. This waste rock was used to accelerate the back filling of No. 9-10 stope and the west end of No. 11-10 stope.

The mining of No. 3-15 orebody was continued, but the plan of mining was changed from inclined cut-and-fill to shrinkage methods.

The drawing of the broken ore from Nos. 4-14, 5-14, 6-14, and 7-16 stopes was continued.

The mining of No. 6-12 orebody was completed.

Nos. 9-16 and 11-10 stopes were both backfilled before the end of the year. The fill in No. 9-10 stope was well above the 8th level.

The mining of Nos. 9-8, 9-10A, and the east end of No. 10-10 orebodies was continued.

The preparation of Nos. 8-16, 9-22, the west end of No. 10-10, and No. 10-10A orebodies was started.

The mining of No. 10-1 orebody was suspended, while mining was continued in Nos. 10-24, 11-6, and 11-24 orebodies.

Below the 11th level the preparation of Nos. 12-2, 12-10, 12-24, 12-26, 13-2, and 14-4 orebodies was undertaken.

Ore Reserve

The calculated ore reserve is as follows:

Block	December 31, 1952			December 31, 1953		
	Tonnage	Ounces	Grade	Tonnage	Ounces	Grade
7th level to surface	15,530	3.205	0.206	15,530	3,205	0.206
11th level to 7th level	382,960	87,899	0.230	311,430	74,051	0.238
15th level to 11th level	251,740	89,404	0.355	465,610	150,686	0.323
Broken reserve	136,560	25,537	0.187	57,260	10,708	0.187
Total reserve	786,790	206,045	0.262	849,830	238,650	0.281

All high assays were reduced to 1 ounce, and a dilution factor of 10 percent was allowed on the calculation of the tonnage of the reserve.

Milling

The details of the mill operation are shown in the following summary. For comparative purposes the details of the two previous years' operations and for the total operating life of the mine are also shown:

	1951	1952	1953	Aug. 11, 1938, to date
Dry tons treated	302,227	304,251	285,018	2,817,027
Percentage operating time	98.20	98.54	98.46	94.52
Treated per day, tons	828.0	831.3	780.9	501.1
Average gold assay of heads, ounces	0.2158	0.2358	0.3141	0.2523
Average gold assay of tails, ounces	0.0117	0.0145	0.0243	0.0154
Percentage recovery	94.58	93.87	92.25	93.90

The ore treated during the year contained a higher than average percentage of extremely fine disseminated gold, which was not released to the action of chemicals at our present degree of comminution. This resulted in the percentage being lower than last year, even though the tonnage of ore treated was decreased by an average of 50 tons per day in an effort to increase the degree of comminution.

Buildings, Machinery, and Equipment

The construction of a new change-house for the men working underground was started in December; this will be completed in 1954.

A second jaw-crusher was purchased for underground. The excavation of the station for this machine was cut at the 2,740-foot horizon. The crusher will be installed in 1954.

The charges to the buildings and machinery account were as follows:

Installation of DorrClones	$ 11,596.66
Spare motor for tube mill	4,387.63
Foundation and partial installation No. 5 compressor	1,720.33
New change-house (partial)	8,023.41
Miscellaneous	43.34
Total	$ 25,771.37

The charges to the equipment account during the year were as follows:

Underground crusher installation (partial)	$ 73,834.79
3-ton battery locomotive with charging equipment and batteries	10,987.96
Electric slusher hoists	5,407.52
Rock drills	2,369.98
Distribution transformers for underground	7,860.62
Miscellaneous	122.10
Total equipment	$100,582.97
Less write-offs	741.76
Total	$ 99,841.21
Net total capital expenditures	$125,612.58

An average of 292 men was employed, of whom 167 were underground and 125 on the surface. E. G. Crayston is general manager.

Matachewan Consolidated Mines, Limited

Matachewan Consolidated Mines, Limited, was incorporated in July, 1933, with an authorized capitalization of 4,000,000 shares of no par value, of which 3,439,000 have been issued. The officers and directors are: Thayer Lindsley, president; H. H. Sutherland, vice-president; J. M. Cunningham-Dunlop, managing director; A. G. Fulton, secretary; W. B. Malone, treasurer; George McKeown, director. The head office is at 25 King Street West, Toronto. The mine address is Matachewan.

The company's property is in Cairo and Powell townships, Matachewan area, district of Timiskaming.

Operations continued on a salvage basis during the early part of 1953. Both mining and milling were suspended on April 24. No development work was done in 1953. The following table shows the total development work when operations ceased:

Level	Depth from surface	Drifts	Crosscuts	Raises
	feet	feet	feet	feet
1st	167	4,668	2,035	1,323
2nd	267	5,404	1,611	2,643
3rd	367	2,675	618	838
4th	500	4,035	1,748	2,573
5th	650	1,972	376	943
6th	783	2,419	176	949
7th	916	5	.....	233
8th	1,050	4,109	1,012	2,548
9th (loading pocket)	1,200	.....	.....	212
10th	1,300	2,693	135	1,781
11th	1,550	2,701	216	2,024
12th (loading pocket)	1,677	.....	.....	177
13th	1,801	2,286	557	274
14th (loading pocket)	1,933	.....	.....	135
15th	2,041	.....	.....	.....
16th	2,281	1,945	504	.....
17th (loading pocket)	2,401	.....	.....	110

The depths of the three shafts on the property are shown in the following table:

Shaft	Number of compartments	Depth from surface
		feet
No. 1, vertical	2	170
No. 2, inclined at 70 degrees	1	33
No. 3, vertical	3	2,452

All work for some years has been done through No. 3 shaft, and the other two shafts have not been in use.

There were 49,577 tons of ore hoisted in 1953. The mill treated 50,277 tons, at an average daily rate of 448.9 tons. In January and February the mill treated 6,022 tons of lead-zinc ore from the Consolidated Matarrow Mines, Limited.

The following is taken from the report of the managing director for the year ending December 31, 1953:

As predicted at the end of 1952, the exhaustion of the broken-ore reserves and the removal of some pillars in ore required only a short period of time in 1953. In addition, the continued weakening of base metal prices brought an end to the operations at Matarrow Lead Mines Limited.

Milling of Matarrow ore ceased in February. From then on the mill fell back on the broken gold ore in the mine until this tonnage was withdrawn completely on April 24, 1953. Thereafter efforts were confined to recovering gold from the mill circuit and generally placing the machinery in readiness for a prolonged shut-down.

All equipment was removed from underground including pipe, track, and electric cables. Diamond-drill holes that had been drilled from the Young-Davidson property through the Matachewan boundary were cemented to shut off possible water seepage if operations are again resumed on either side.

Positions and jobs were found, where possible, for the older members of the staff and employees. At present the plant is being taken care of by a small crew, so that heat may be available in some of the shops and buildings and fire protection kept up.

Ore Reserves

Broken ore reserves as at December 31, 1952, were estimated to be 39,207 tons. During the year 7,330 tons were broken and there were 49,577 tons hoisted as against 50,227 tons milled. The differences can be accounted for by spalling in the stopes and a small accumulation in the ore bins.

Milling

Since operations were on a combined basis of milling Matarrow ore and under curtailment at both places, comparative performance with other years means little.

Milled	tons	50,227
Average daily rate	tons	448.9
Average value of heads	ounces per ton	0.0929
Average value of tails	ounces per ton	0.091
Average value of recovery	ounces per ton	0.0838
Recovery averaged	percent	90.20

Production

Recovery:		
gold	ounces	4,374,091
silver	ounces	2,271.27
Net value of metals recovered		$171,955.42
Value per ton		$3.43
Operating costs		$249,167.53
Cost per ton		$4.96
Operating loss		$77,212.11
Loss per ton		$1.53
Price of gold		$39.21

Remarks

In accordance with the company's agreement with Matarrow Lead Mines, Limited, and with arrangements made since, certain equipment was withdrawn from Matarrow for the purpose of being returned to its owners, stored at Matachewan, or sold. The proceeds from the sale of equipment was applied against the loss the company suffered in the Matachewan-Matarrow operating account.

As operations were brought to a close at Matarrow, a considerable footage of diamond-drilling was completed to the west on the strike of the Matarrow lead veins. While one or two narrow intersections of ore were obtained, there was nothing of sufficient consequence to justify further work in this direction at the time.

Exploration

During the latter part of the year, an extensive examination and sampling job was performed on a group of claims in Holmes township in the Matachewan district. Although some gold occurs on the properties in a good geological setting, no further work was thought advisable.

An option was taken on a silver-cobalt prospect in Mickle township, near Elk Lake. The ground will be examined in detail during 1954.

During the period of operation, from January to the end of May, an average of 95 men was employed. From June 1 to the end of the year, 15 men were employed on surface maintenance work. A. A. Dundas succeeded G. H. McDougall as manager.

Midcamp Mines, Limited

Midcamp Mines, Limited, was incorporated in November, 1946, with an authorized capitalization of 4,500,000 shares of $1 par value, of which 2,881,355 have been issued. The officers and directors are: J. Y. Murdoch, president; J. R. Timmins, vice-president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; W. H. Bouck, E. H. Walker, and James Ingram, directors. R. V. Porritt is manager. The head office and manager's address is Bank of Nova Scotia Building, Toronto. The mine address is Timmins.

The company owns 355 acres in Deloro and Tisdale townships, Porcupine area, district of Cochrane.

Underground development is carried on from the levels of the adjoining Paymaster Consolidated and Preston East Dome mines.

Operations continued throughout 1953. The following table shows the development work done during 1953, and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
From Preston East Dome mine:						
9th	.....	112	.....	2,819	.....	6
12th	.....	2,310	.....	5,017	.....	15
23rd	.....	.....	589	892	.....	.....
From Paymaster mine:						
10th	.....	547	.....	.....	.....	.....
20th	.....	419	.....	321	.....	.....
25th	.....	1,125	.....	.....	.....	.....

Diamond-drilling consisted of 12 holes, totalling 8,608 feet, from underground.

The labour was all supplied by Preston East Dome Mines, Limited, and is included in the employment figures for that company. R. E. Findlay is resident manager.

New Dickenson Mines, Limited

Dickenson Red Lake Mines, Limited, was incorporated in November, 1944, with an authorized capitalization of 3,500,000 shares of $1 par value. In June, 1947, the capitalization was increased to 4,000,000 shares. In June, 1949, the company was reorganized, and the name was changed to New Dickenson Mines, Limited. The capitalization was reduced to 3,750,000 shares. The number of shares issued at the end of 1953 was 2,750,066. The officers and directors are: A. W. White, president and treasurer; C. R. Diebold, vice-president; R. B. Law, secretary; L. W. McIlmurray, assistant secretary; R. A. Jodrey, T. M. Fyshe, and E. B. Magee, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Balmertown.

The company owns 32 claims, 16 of which were bought in 1953, in Balmer township, Red Lake area, Patricia portion of Kenora district.

Mining and milling continued throughout 1953. Operations are conducted through the vertical No. 1 shaft, which is 1,315 feet deep; it has three compartments from the surface to the eighth level and four compartments from there to the bottom.

The following table shows the development work done during 1953, and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st	252	3,355	.....	2,135	78	893
2nd	.....	4,459	.....	2,771	99	1,855
3rd	113	2,813	36	1,169	.....	1,047
4th	14	3,663	.....	3,474	527	2,373
5th	1,546	2,608	.....	1,069	768	768
6th	1,567	2,365	29	1,084	367	554
7th	1,274	1,722	23	1,173	235	376
8th	2,116	2,116	1,664	2,180	305	504
9th	.....	.....	.....	.....	102	196

Diamond-drilling in 1953 consisted of one hole, 375 feet long, from surface, and 213 holes, totalling 27,208 feet, from underground.

There were 126,090 tons of ore hoisted. The mill treated 125,606 tons at an average daily rate of 344 tons.

The dry-house and core-shack were enlarged during the year, and a two-storey dwelling-house was built in Balmertown.

An average of 202 men was employed, of whom 104 were underground, and 98 on the surface.

New Mosher Longlac Mines, Limited

New Mosher Longlac Mines, Limited, was incorporated in June, 1950, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 4,440,821 have been issued. The officers and directors are: Thayer Lindsley, president; J. M. Cunningham-Dunlop, executive vice-president; Baptist Johnston, vice-president; A. K. Roberts, secretary-treasurer; C. R. Archibald, assistant secretary; J. T. N. Woodrooffe, assistant treasurer; M. C. Mosher, T. H. Rea, and J. C.

Allen, directors. The head office is at 25 King Street West, Toronto. The mine address is Box 160, Geraldton.

The main property consists of 21 claims west of the MacLeod-Cockshutt mine, in Errington township, district of Thunder Bay. The company also owns the former Hard Rock property, consisting of 17 claims, in Errington township, and has an 80 percent interest in 6 claims in Jordan township, district of Kenora.

Operations at the main property continued throughout 1953. The vertical, three-compartment No. 1, or Mosher, shaft was sunk a further 841 feet, to a total depth of 2,041 feet. New levels were established at 1,250, 1,500, 1,740, 1,890, and 2,040 feet. Lateral development work consisted of 1,601 feet of drifting and 352 feet of crosscutting, all on the 1,740-foot level. Twenty-five diamond-drill holes, totalling 9,493 feet, were drilled from the 1,740-foot level.

An average of 25 men was employed, of whom 9 were underground and 16 on the surface. A. E. Cave is 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 of which have been issued. The officers and directors are: J. Y. Murdoch, president; G. H. Rainville, vice-president; C. H. Windeler, secretary; R. G. Rudolf, treasurer; J. R. Timmins, Messmore Kendall, Oliver Hall,[1] and L. H. Timmins, directors. The head office is in the Bank of Nova Scotia Building, Toronto. The mine address is Pamour.

The main property, in Whitney township, Porcupine area, district of Cochrane, includes the former La Palme Porcupine, Three Nations, and Porcupine Grande properties.

Mining and milling continued throughout 1953. The mine was not affected by the strike, which caused a cessation of operations at some of the other Porcupine properties. Operations are conducted through a vertical shaft and winze, the depths of which are shown in the following table:

Shaft	Number of compartments	Total depth from surface
		feet
No. 3	[2]5	3,144
No. 4 internal (below 600-foot level)	2	[3]2,437

The following table shows the development work done in 1953 and the total amount at the end of the year:

	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
100-foot	.....	1,018	.....	713	.....	140
200-foot	.....	9,342	.....	4,806	.....	3,359
300-foot	.....	33	.....	116	.....	.....
400-foot	1,538	22,545	325	4,249	255	14,697
500-foot	.....	264	.....	88	.....	263

[1]Died February, 1954.
[2]Cage, cage-counterbalance, two skip, and manway compartments.
[3]The 2,400-foot level was incorrectly described in last year's report as the 1,400-foot level.

DEVELOPMENT WORK IN 1953—*Continued*

	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
600-foot	.....	17,807	.....	1,757	647	14,594
700-foot	.....	35	.....	.....	.....	79
800-foot	131	13,706	345	2,978	1,095	9,203
900-foot	.....	27	.....	.....	.....	.....
1,000-foot	15	9,976	.....	1,684	561	8,360
1,100-foot	.....	72	.....	.....	.....	56
1,200-foot	302	11,534	198	2,429	576	11,038
1,300-foot	.....	29	.....	.....	.....	.....
1,400-foot	.....	15,474	209	1,717	529	4,983
1,600-foot	1,000	5,361	366	1,722	199	1,408
1,700-foot	.....	213	.....	.....	.....	276
1,800-foot	12	3,356	188	242	271	271
1,900-foot	.....	41	.....	.....	.....	737
2,000-foot	115	394	196	196	271	344
2,100-foot	.....	114	.....	26	.....	65
2,200-foot	782	4,157	284	307	262	262
2,400-foot	466	5,736	14	332	599	599
2,600-foot	351	746	10	10	257	257
2,800-foot	359	613	.....	22	256	256
2,900-foot	.....	113	.....	7	106	106
3,000-foot	.....	14	.....	24	273	292
3,100-foot	.....	66	.....	.....	.....	57

Diamond-drilling in 1953 consisted of 6 holes, totalling 4,397 feet, from surface, and 367 holes, totalling 62,478 feet, from underground.

There were 627,398 tons of ore hoisted and milled. The mill treated a daily average of 1,723.6 tons.

The following is taken from the manager's report for the year ending December 31, 1953.

Development

Development work underground consisted of drifting, crosscutting, raising, boxhole and drawpoint raising, stope development and diamond-drilling.

About 56 percent of the drifting and crosscutting for the year was executed below the 1,400-foot level. Further drifting was carried on to explore the lavas north of the main ore zone in both the east and west sections of the mine. Of the remaining lateral development above the 1,400-foot level about 43 percent was in the west greywacke section, 25 percent was in east greywacke zones, and 32 percent in the east conglomerate section of the mine. A total of 1,075 feet of lateral advance was in ore with an average assay of 0.120 ounces per ton over drift width.

Preparatory stoping was carried on in seven greywacke stopes, in five conglomerate stopes, and in two lava stopes.

Ore Reserves

	Tonnage	Grade
		Ounces per ton
Broken ore:		
East end	488,616	0.082
West end	296,129	0.127
Total broken ore	784,745	0.099
Ore in place:		
East end	410,538	0.087
West end	251,163	0.131
Total ore in place	661,701	0.104
Total east end	899,154	0.084
Total west end	547,292	0.129
Total	1,446,446	0.101

No allowance was made for dilution in calculating the above tonnages and grades. The complicated system of faults and the irregularity of the ore limits in the west end of the mine indicate that there will be considerable dilution.

After milling 627,398 tons of ore, broken ore reserves were increased by approximately 30,000 tons, all in the east end of the mine. Total ore reserve tonnage was increased by approximately 195,000 tons with no change in the over-all grade. This may be accounted for by the fact that the heavy development program which was started in 1950 is nearing completion, and it has been possible to direct more of the development effort into probable ore areas.

Stoping

Stoping was carried on in 10 conglomerate stopes in the east end, 3 lava stopes north of the main ore zone, and 12 greywacke stopes in the west end of the mine. The east end produced 70 percent of the tonnage broken and almost 60 percent of the tonnage milled. Details of stoping and ore production are listed below:

Level	Broken		Pulled			
	Tons	Percent	Tons	Percent	Ounces	Ounces per ton
West end:						
400-foot	1,258	0.30	18,508	3.03	1,274.37	0.069
600-foot	45,922	10.97	125,684	20.54	16,467.61	0.131
800-foot	51,928	12.42	63,102	10.31	7,777.93	0.123
1,000-foot	6,713	1.60	12,532	2.05	1,684.17	0.134
1,200-foot	.....	.....	.....	.....	.....	.....
1,400-foot	16,242	3.88	26,134	4.27	2,914.97	0.112
1,600-foot	575	0.14	490	0.08	56.28	0.115
Total	122,638	29.31	246,450	40.28	30,175.33	0.123
East end:						
400-foot	4,358	1.04	26,540	4.34	2,476.74	0.093
600-foot	.....	.....	72,960	11.93	5,558.82	0.076
800-foot	96,815	23.14	64,585	10.56	5,376.45	0.083
1,000-foot	12,045	2.88	57,678	9.43	5,552.95	0.096
1,200-foot	115,199	27.52	108,235	17.68	9,932.68	0.092
1,400-foot	67,403	16.11	35,345	5.78	3,070.80	0.087
Total	295,820	70.69	365,343	59.72	31,968.44	0.088
Total mine	418,458	100.00	611,793	100.00	62,143.77	0.102

Cut-and-fill stopes produced 4 percent of the ore broken and 2.8 percent of the ore pulled. The remainder of the ore was produced from shrinkage stopes.

Mill

The average grade of ore milled was 0.101 ounces per ton and the over-all recovery was 92.26 percent. Production by quarters is tabulated below:

Quarter	Milled	Mill head assay	Recovery	Recovery		Gross value of bullion shipped
				Gold	Silver	
	tons	ounces per ton	percent	ounces	ounces	
1st	158,698	0.0958	91.99	13,973	1,104	$ 479,251
2nd	159,608	0.0911	92.06	13,387	1,184	466,004
3rd	154,020	0.1044	92.47	14,865	1,227	514,415
4th	155,072	0.1133	92.46	16,250	1,444	556,945
Total, 1953	627,398	0.1010	92.26	58,475	4,959	$2,016,615
Total, 1952	611,270	0.1003	92.06	56,430	5,458	$1,936,028

Diamond-drilling

The surface drilling was planned to explore the lavas east and north of No. 3 shaft and did not indicate any ore. The underground drilling in the east end was in both lavas and conglomerate and indicated additional stoping areas.

Drilling in the west end was to explore the greywacke above the new 1,600-foot level and to locate faulted extensions of known veins in the No. 4 shaft area.

General

The tonnage of ore mined and milled during 1953 exceeded that recorded for any previous year.

An average of 370 men was employed, of whom 233 were underground and 137 on the surface. D. E. G. Schmitt succeeded T. R. Wearing as manager during the year.

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 have been issued. The officers and directors are: E. H. Walker, president and managing director; A. S. Fuller, vice-president; E. L. O'Reilly, secretary-treasurer; W. W. Lindsay, assistant secretary-treasurer; C. E. Cook, H. M. Pryale, and H. D. Rothwell, directors. The head office and mine office are at South Porcupine. The executive office is at 19 Melinda Street, Toronto.

The main property, in Deloro and Tisdale townships, Porcupine area, district of Cochrane, contains about 748 acres and consists of amalgamated holdings of former operating companies.

Mining and milling continued from January 1 to December 16, 1953, when operations were suspended.

The vertical, three-compartment No. 5 shaft was sunk a further 653 feet in 1953, to a total depth of 4,287 feet. A new winze, known as No. 6, was collared at the 4,075-foot level, about 80 feet north of No. 5 shaft, and sunk 27 feet below the level.

The depths of the various shafts and winzes on the property are included in the table below, which shows the amount of development work done during 1953, the section of the mine in which it was done, and the total:

Shaft and level	1953				Total			
	Drifts	Cross-cuts	Raises	Winzes	Drifts	Cross-cuts	Raises	Total depth of shafts and winzes
	feet	feet	feet	feet	feet	feet	feet	feet
No. 1 SHAFT[1]								80
No. 2 SHAFT[1]								814
No. 3 SHAFT[1]								400
"Tunnel"					144	130		
38-foot					76	27		
100-foot					921	1,156		
200-foot					769	395	70	
300-foot					4,543	2,336	602	
400-foot					2,423	3,500	578	
600-foot					1,521	902	991	
800-foot					892	839		
475-foot[2]						1,537		
1,400-foot[2]					505	218	141	
1,550-foot[2]					627		184	
1,700-foot[2]					314	29	386	
2,000-foot[2]					140		68	
3,100-foot[2]					640	50		
3,250-foot[2]					172	49		
3,450-foot[2]					175		210	

[1]On former Premier Paymaster property.
[2]Work done from the No. 5 shaft of the Buffalo-Ankerite mine.

UNDERGROUND DEVELOPMENT WORK—*Continued*

Shaft and level	1953				Total			
	Drifts	Cross-cuts	Raises	Winzes	Drifts	Cross-cuts	Raises	Total depth of shafts and winzes
	feet	feet	feet	feet	feet	feet	feet	feet
No. 4 SHAFT[1]								253
100-foot					450	312		
200-foot					467	240		
No. 5 SHAFT[2]				653				4,287
No. 7 SHAFT[2]								75
No. 8 SHAFT[2]								185
No. 9 SHAFT[2]								185
No. 5-1051-1 WINZE[2]								162
No. 5-1051-2 WINZE[2]								582
No. 5-1051-3 WINZE[2]								1,070
No. 5-2075-1 WINZE[2]								2,156
60- and 75-foot					988	393		
120-foot					1,171	303		
180-foot					2,769	713	5	
300-foot					2,543	887		
400-foot					3,430	1,493	186	
500-foot					1,406	927	67	
600-foot					2,224	338	53	
750-foot					1,806	251		
900-foot					2,736	367	263	
1,050-foot	17				8,463	4,660	1,852	
1,200-foot					5,973	1,721	1,101	
1,325-foot					3,202	662	805	
1,450-foot					5,480	2,296	834	
1,575-foot			147		6,975	2,164	985	
1,740-foot	157	119			5,568	1,284	1,469	
1,910-foot	21		141		6,158	1,184	3,090	
2,075-foot					6,281	4,167	3,444	
2,200-foot	534	68	121		4,939	710	1,714	
2,325-foot	40		270		5,585	1,260	2,056	
2,450-foot			309		2,976	286	1,429	
2,575-foot	76		75		6,592	12,601	1,504	
2,700-foot	13	80	687		4,090	730	2,609	
2,825-foot			784		4,902	1,471	2,603	
2,950-foot	84		480		4,491	520	2,267	
3,075-foot	125	37	512		4,739	646	1,935	
3,200-foot	206	85	522		3,031	530	584	
3,325-foot	260	14			1,742	273	347	
3,450-foot	294				1,785	403	370	
3,575-foot	813		103		1,555	536	479	
3,700-foot	64	130	396		230	314	409	
3,825-foot	48	79	353		257	302	353	
3,950-foot	139	1,029	570		139	1,103	570	
4,075-foot		838	1,450		4,431	6,094	2,407	
No. 6 WINZE[2]				27				27
No. 6 SHAFT (inclined)[3]								482
No. 6-400-1 WINZE[3]								615
100-foot					266	908		
200-foot					2,804	317	138	
300-foot					5,824	1,864	427	
400-foot					3,960	820	488	
525-foot					3,662	834	849	
675-foot					4,259	782	1,211	
800-foot					1,547	512	774	
1,000-foot					1,173	255	392	

[1]On former United Mineral Lands property.
[2]On former Dome Lake property.
[3]On former West Dome property.

Diamond-drilling in 1953 consisted of 264 holes totalling 23,318 feet, all from underground. This includes holes drilled by Buffalo Ankerite Gold Mines, Limited, within Paymaster ground.

During the calendar year, 154,761 tons of ore were hoisted. The mill treated 154,247 tons, at an average daily rate of 440.7 tons.

The following is taken from the general manager's report for the fiscal year ending June 30, 1954:

Mining

Development and mining consisted mainly of the following:

Development work on No. 14 vein on the 2,200-foot level and Nos. 8, 18, 23, and 31 veins from the 3,075-foot to the 4,075-foot level.

No. 3902 S crosscut in No. 5 shaft area was advanced 380.7 feet towards No. 36 orebody. Approximately 450 feet of additional crosscutting will be required to reach No. 36 orebody and approximately 1,200 feet of drifting to develop the upward extension of No. 4036 A, B, C, and D orebodies.

The deepening of the No. 5 shaft, the cutting of the underground crusher station, the loading pocket, and a spillage pocket below the 4,075-foot level has been completed. All the stations and pockets will have to be gunited.

The rock work in preparation for sinking No. 6 winze from the 4,075-foot level has progressed as follows: (a) The hoistroom has been completed. (b) The cable raise, a pilot raise for the cable way, has been completed. There remains the slashing out for size. (c) Transfer raises to permit direct gravity transfer of ore from No. 6 winze to No. 5 shaft crushing and hoisting system are nearly completed. (d) No. 6 winze headframe has advanced 71 feet above the 4,075-foot level, and the winze bottom is 27 feet below the 4,075-foot level.

Of the ore milled, 6.5 percent was from lateral development, 18.1 percent from stoping between the 1,050- and 2,075-foot levels, and 75.4 percent was from stoping between the 2,075- and 3,200-foot levels.

Ore Reserves

	Tonnage	Grade
		ounces per ton
Probable ore	150,705	0.264
Positive ore	257,594	0.232
Broken ore	50,889	0.250
Total	459,188	0.244

Ore reserves showed a decrease of 30,334 tons. The over-all grade increased from 0.241 ounces at June 30, 1953, to 0.244 ounces per ton at June 30, 1954.

Milling

During five and a half months of the fiscal year in which mining operations were carried out, 70,263.6 tons of ore were milled. The average daily milling rate was 431 tons as against 472 tons for the previous fiscal year.

Costs (July 1, 1953, to December 16, 1953)

The mining cost per ton of ore broken was $5.33.

Following is an analysis of operating costs:

	Total cost	Cost per ton milled
Diamond-drilling	$ 6,675.29	$ 0.10
Shaft-sinking and stations	86,389.66	0.23
Drifting	23,190.35	0.33
Crosscutting	22,351.92	0.32
Raising	48,313.30	0.69
Mining	357,050.19	5.08
Ore transportation	8,698.13	0.12
Crushing	14,066.96	0.20
Milling	97,597.60	1.39
General expense	62,177.22	0.88
Total	$726,510.62	$10.34

Construction and Plant Additions

The total amount expended on construction and plant additions was $125,189.01. The principal items were: A Mathers and Platt high-lift turbine pump; a Denver mineral jig; a 4-foot Symons cone crusher; two 20- by 24-foot Dorr agitators; a permanent signal system, from the 2,575-foot to below the 4,075-foot level; a double-deck cage; two 80-cubic-foot aluminium and steel skips; a 12-inch-diameter, spiral-weld, pipe airline in No. 5 shaft; and alterations to No. 5 shaft headframe.

General

As in the past, no bullion was sold on the open market.

The average prices received from the Royal Canadian Mint per ounce of gold sold during each of the last four fiscal years were as follows:

Fiscal Year Ending	Per Ounce
June 30, 1951	$37.54
June 30, 1952	35.87
June 30, 1953	34.34
June 30, 1954	34.40

The total cost of shaft-sinking and station-cutting for the fiscal year was $99,496.18. This amount was charged direct to operations and contributed to the operating loss of $61,433.24.

Since mining operations were temporarily discontinued on December 17, 1953, the following repair, maintenance, and construction work was completed:

At No. 5 shaft approximately 45,000 square feet of old, worn lining boards and 5,400 linear feet of old guides were removed above the 2,575-foot level and replaced by new ones.

The temporary, sinking manway was removed and the new permanent manway with expanded metal landings, ladders, and pipelines installed from the 2,450-foot to the 4,325-foot level.

The rock pentice above the 2,700-foot-level station was removed and the 2,700-foot station brow cut. New four-compartment shaft timbers were installed from the 2,575-foot loading pocket to the 2,700-foot level.

The upper section of the shaft from surface to the 2,575-foot level, was connected up with the newly deepened section from the 2,575-foot level to 250 feet below the 4,075-foot level.

New stairways were installed to the top of the headframe. The old 7-foot sheave wheels were dismantled and replaced with new 8-foot sheave wheels. New cableways were built and the new 1¼-inch hoisting cables installed for direct hoisting from the loading pockets below the 4,075-foot level.

All the timber and lumber was cut and framed and the hardware made up for the above jobs in our own shops.

In the milling plant, after cyanidation was completed, the tanks, pipelines, etc., were drained. The gold retained in the grinding and precipitation circuits was recovered and refined.

Repairs and protective maintenance to the mill machinery and equipment were carried out during the winter months.

The No. 3 belt conveyer in the crushing plant was dismantled and removed. Alterations were made in the building to allow for the installing of a larger conveyer.

The Traylor three-foot cone crusher, which is being replaced by a crusher of greater capacity, was moved to a new location where it will be used as a standby unit.

After December 17, 1953, a total of 30 employees was continued on the payroll. Twenty-six of these were staff, and four were watchmen, etc. Four of the staff were engaged in the recovery of values and other work in the milling plant; two in the office; and the balance were directly employed in connection with the underground, headframe, and hoist-room work.

An average of 331 men was employed during 1953, of whom 245 were underground, and 86 on the surface. C. E. Cook is general manager.

Pickle Crow Gold Mines, Limited

Pickle Crow Gold Mines, Limited, was incorporated in January, 1934, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 3,136,850 have been issued. The officers and directors are: J. E. Hammell, president and managing director; C. S. Hamilton, vice-president; A. G. Hattie, director of mining; G. M. Huycke, secretary-treasurer; John Bland, assistant secretary-treasurer. The head office and mine office are at Pickle Crow. The executive office is at 25 King Street West, Toronto.

The property consists of 96 claims in Connell and McCullagh townships, Pickle Lake area, Patricia portion of Kenora district.

Mining and milling continued throughout 1953. No. 3 shaft was sunk a further 405 feet to a total depth of 2,036 feet, and two shaft stations were cut at 1,750 and 1,900 feet.

The following table shows the total depths of the shafts on the property and the number of compartments in each:

Shaft	Inclination	Number of compartments	Total depth from surface
			feet
No. 1, main[1]	vertical	3 to 1,200 feet 4 from 1,200 to 2,450 feet 3 from 2,450 feet to bottom	3,042
No. 2 (winze, below the 750-foot level)[2]	vertical	3	1,547
No. 3[3]	vertical	3 to 1,554 feet 4 from 1,554 feet to bottom	2,036

The following table shows the development work done in 1953 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
No. 1 VEIN:						
125-foot	.....	1,869	.....	140	89	510
250-foot	.....	1,216	.....	222	.....	254
375-foot	.....	1,643	.....	379	.....	300
500-foot	.....	1,561	.....	291	.....	468
625-foot	.....	1,311	.....	232	.....	405
750-foot	.....	2,426	.....	7,055	.....	370
900-foot	.....	1,417	.....	229	.....	657
1,050-foot	.....	1,415	.....	384	.....	530
1,200-foot	.....	1,750	.....	354	.....	571
1,350-foot	.....	1,922	.....	2,732	.....	799
1,500-foot	.....	1,315	.....	668	.....	638
1,650-foot	.....	1,030	.....	623	.....	594
1,800-foot	.....	1,074	.....	940	.....	531
1,950-foot	.....	936	.....	724	.....	1,080
2,075-foot	.....	793	.....	.....	52	367
2,200-foot	.....	775	.....	806	38	1,046
2,450-foot	8	1,284	.....	1,380	156	971
IRON-FORMATION ZONE:						
2,600-foot	.....	235	.....	310	90	292
2,750-foot	.....	.....	.....	340	.....	.....
2,900-foot	.....	.....	.....	8	.....	.....
No. 2 VEIN:						
250-foot	.....	.....	.....	1,450	.....	308
450-foot	.....	909	.....	999	.....	348
550-foot	.....	1,279	.....	857	.....	1,089
600-foot	.....	.....	.....	.....	.....	75
750-foot	.....	2,454	.....	1,727	.....	1,382
850-foot	.....	1,432	.....	771	.....	1,141
975-foot	.....	2,281	.....	1,556	.....	1,424
1,100-foot	.....	1,265	.....	1,887	.....	1,381
1,225-foot	.....	1,085	.....	1,060	.....	741
1,350-foot	.....	.....	.....	144	.....	182
1,475-foot	.....	923	.....	1,549	266	988
1,600-foot	.....	866	.....	2,164	.....	235
No. 5 VEIN:						
1,350-foot	.....	.....	.....	.....	.....	23
No. 6 VEIN:						
1,475-foot	519	519	213	213	211	211
1,600-foot	.....	799	23	23	185	373
1,900-foot	.....	.....	49	49	56	56

[1]On Howell vein system, claim Pa.747.
[2]In Cohen-McArthur section, about a mile northeast of No. 1 shaft; not being used.
[3]On claim Pa.2,062, about 5,000 feet northeast of No. 1 shaft, and 1,400 feet south of No. 2 shaft (winze).

Diamond-drilling in 1953 amounted to 37 holes, totalling 6,039 feet, from underground.

A new dust-control system was installed in the crusher-house. Two Canadian Westinghouse transformers, 100-kilovolt-amperes, 2,200 to 550 volts, were installed on the 1,200-foot level from No. 1 shaft.

The following is taken from the manager's report for the year ending December 31, 1953:

Development

During the year the following work was carried out:

No. 1 Shaft, 125-foot Level.—The 170E. raise was driven from the back of the 170E. stope to surface with an advance of 89 feet. The purpose of this raise is to enable sand fill to be passed from surface to the 260E. stope, which is being mined. It will also be used for filling other stopes on the 250-foot level and for filling the 160E. and 170E. stope when the pillars have been removed.

2,075- and 2,450-foot Levels.—Three raises, totalling 156 feet, were driven from the west end of the stopes on the 2,075-, 2,200-, and 2,450-foot levels to the levels above the respective stopes. These raises were required for second exits from the stopes and may also be used for transferring backfill.

The 2460E. No. 2 raise was driven from the back of the 2460E. stope, to the 2,200-foot level, with an advance of 90 feet. This raise is being used for transferring fill to the 2460E. stope.

Iron-Formation Zone, 2,600-foot Level.—The 2603W. No. 2 raise was started from the back of the west section of the 2603W. stope, 30 feet above the level. This raise, which was advanced 90 feet, was driven to contact diamond-drill hole No. 2485. This hole was drilled downward from the southwest branch of the 2403W. drift, and assayed $13.30 for the first 65 feet. This ore zone was not reached at the year's end.

No. 2 Vein, 1,475-foot Level.—A total of 266 feet of raising was done on the 1,475-foot level on No. 2 vein during the year. This consisted of the 3-141 No. 2 raise, driven 226 feet, from the back at the east end of the 3-141 No. 2 stope to the 1,225-foot level, and a finger raise 40 feet in length, connecting to the 3-141 No. 2 raise. Channel samples in the raise to the 1,225-foot level averaged $16.00 across 14 inches. Both of these raises will be used for transferring fill to the stope.

No. 6 Vein, 1,475-foot Level.—The 3-143W. crosscut was advanced 148 feet. At this point No. 6 vein was encountered and the top of the 3-162W. No. 1 raise was contacted. A total of 519 feet of drifting was done on the vein and the following results were obtained: (1) 87 feet continuous length averaging $11.55 across 27 inches, cut, or $13.65 uncut. (2) 160 feet continuous length, adjoining (1) to the south averaging $3.85 across 19 inches. (3) 195 feet continuous length, adjoining (2) to the south, averaging $16.80 across 25 inches, cut, or $24.15, uncut. A total of 62 feet of drifting was done to the north of length (1) and to the south of length (3) but this was below ore grade.

Three rounds, totalling 15 feet, were taken on a narrow vein in the west wall of the drift. This vein will be further explored by diamond-drilling.

The 3-142 No. 1 raise was started from the 3-142W. drift to be driven to the 1,225-foot level. The object of this raise was to explore the No. 6 vein between the 1,475- and 1,225-foot levels and to investigate the values of $24.52 across 74 inches obtained in diamond-drill hole No. 3-1238. The heading was advanced 133 feet on the vein and channel samples averaged $7.70 across 19 inches cut grade or $8.75 uncut. A flat roll in the vein was encountered at this point and a further 78 feet of raising was done in an attempt to locate the vein at a point sufficiently steep to continue this raise as an ore pass. This was not done, however, and the raise was stopped to enable diamond-drilling to be done here.

No. 3 Shaft.—During 1953 the necessary preparations were made for deepening No. 3 shaft below the 1,600-foot level, with the hoist installed on the 1,475-foot level.

The shaft was deepened 405 feet, and stations cut at the 1,750- and 1,900-foot levels, with the bottom of the shaft at 142 feet below the 1,900-foot level station and loading equipment installed. A raise was driven from the loading pocket to the 1,900-foot level.

No advance was made on the 1,750-foot level during 1953, but at the year's end the crosscut on the 1,900-foot level was advanced to a point 50 feet from the shaft station. A further advance of approximately 650 feet will be required to contact No. 6 vein on the 1,900-foot level.

Diamond-drilling

No. 1 shaft:	Feet
Exploration on No. 1 vein	179
Exploration on No. 5 vein	1,477
Exploration on iron-formation zone	1,111
Total No. 1 shaft	2,758

No. 3 shaft:	
Testing for water on 250-foot level	248
Exploration on No. 2 vein	493
Exploration on No. 6 vein above 1,475-foot level	1,853
Exploration on No. 6 vein	687
Total No. 3 shaft	3,281
Total diamond-drilling	6,039

Exploration for No. 5 vein and on the iron-formation zone gave inconclusive results or generally low values in the case of the iron-formation zone.

No. 6 vein was located on the 1,225-foot level, but on the 975- and 1,100-foot levels results were inconclusive.

Stoping

During the year, 90,051 tons were hoisted of which 86,054 tons were obtained from the stopes. No. 1 shaft stoping operations supplied 21,396 tons of which 16,073 tons were extracted from No. 1 vein, and 5,323 tons from the stopes in the iron-formation zone.

No. 3 shaft stoping operations supplied 64,658 tons of which 52,373 tons were extracted from No. 2 vein and 12,285 tons from the stopes in No. 6 vein.

The balance of 3,997 tons was obtained from development.

Ore Reserves

Ore reserves amounted to 475,391 tons of an average grade of $12.37 per ton.

Milling

A summary of mill operations follows:

Milled	tons	90,056
Recovered per ton milled	ounces	0.4675
Recovered	ounces	42,106

Costs

	Cost	Per ton	Per ounce
Development, including shaft-sinking	$ 227,922.00	$ 2.531	$ 5.413
Mining	608,861.75	6.760	14.460
Milling	189,143.98	2.100	4.492
Shipping and marketing	13,698.66	0.152	0.325
General mine expenditure	148,298.51	1.647	3.522
Total	$1,187,924.90	$13.190	$28.212
Depreciation	44,483.67	0.494	1.056
Total	$1,232,408.57	$13.684	$29.268

All values in this report are based on gold at $35 per ounce.

An average of 217 men was employed, of whom 124 were underground and 93 on the surface. A. G. Hattie is manager.

Plator Gralouise Gold Mines, Limited

Plator Gralouise Gold Mines, Limited, was incorporated in 1948 to succeed Plator Porcupine Gold Mines, Limited. The authorized capitalization is 3,500,000 shares of $1 par value, of which 2,122,109 have been issued. The officers and directors are: E. W. Shaw, president and managing director; R. H. Killebrew, vice-president; J. C. Hill, treasurer; M. G. Lee, secretary; I. W. Shaw and G. V. Munroe, directors. The head office is at 217 Bay Street, Toronto. The mine address is Atikokan.

The company holds nine claims, six of which are patented, on an island in Marmion Lake, north of Schwenger township, Rainy River district, about ten miles north of Atikokan.

Mining operations began on March 1, 1953. A two-compartment, vertical shaft was sunk to a depth of 275 feet on claim F.F.3,704, and levels were cut at 125 and 250 feet. No lateral development work was done.

The following buildings were erected: headframe, hoist-house, powder-house, cap-house, two-storey office building, bunk-house, and cook-house.

A used portable Schram compressor and a 24- by 20-inch single-drum Mead-Morrison air hoist were bought and installed.

Operations were suspended at the end of October. The company hopes to resume work in 1954.

An average of 16 men was employed, of whom 3 were underground and 13 on the surface.

Preston East Dome Mines, Limited

Preston East Dome Mines, Limited, was incorporated in January, 1911, and reorganized by supplementary letters patent in February, 1936. The authorized capitalization is 3,000,000 shares of $1 par value, all of which have been issued. The officers and directors are: W. H. Bouck, president; G. B. Langford, vice-president; L. I. Hall, secretary-treasurer; J. B. Allen, J. W. Ecclestone, S. A. Hayden, F. R. Joubin, C. F. W. Burns, R. A. Jodrey, and J. H. Hirshhorn, directors. The executive office is at 10 Adelaide Street East, Toronto. The head office and mine office are at South Porcupine.

The company owns seven claims immediately south and east of the Dome mine, in Tisdale township, Porcupine area, district of Timiskaming.

Mining and milling continued from January 1 to July 12, 1953, when a labour strike caused the suspension of operations. The strike lasted for the rest of the year.

The following table shows the depths of the shafts in the mine:

Shaft	Inclination	Number of compartments	Total depth from surface
			feet
No. 1	63 degrees	2	95
No. 2	vertical	5	2,388
No. 3 internal (below 18th level)	vertical	3 from 18th level to 69 feet above 28th level 4 to bottom	3,658

The following table shows the development work done in 1953 and the total amount at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st	.....	1,422	.....	805	.....	146
2nd	.....	5,245	33	1,979	.....	1,491
3rd	91	6,774	195	2,070	.....	1,483
4th	.....	5,321	.....	1,091	.....	1,947
5th	278	6,389	55	3,935	486	2,305
6th	.....	4,914	.....	3,112	.....	1,631
7th	677	6,272	158	3,604	88	1,830
8th	48	4,267	303	2,364	.....	1,575
9th	.....	4,977	.....	7,402	.....	1,932
10th	.....	2,576	.....	1,985	.....	1,093

DEVELOPMENT WORK IN 1953—*Continued*

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
11th	.....	1,708	.....	1,379	.....	1,232
12th	.....	3,814	.....	7,363	.....	2,170
13th	.....	1,976	.....	4,202	20	1,366
14th	53	3,011	56	5,067	67	1,217
15th	.....	3,599	236	7,126	.....	1,365
16th	68	1,501	363	6,828	.....	1,360
17th	.....	1,380	97	3,024	226	1,996
18th	.....	3,329	.....	9,119	.....	3,324
19th	432	2,115	638	4,724	151	1,612
20th	461	2,040	1,150	3,833	122	1,364
21st	73	1,568	99	3,285	221	1,362
22nd	188	1,891	496	2,214	45	1,092
23rd	191	2,438	732	5,356	.....	1,162
24th	20	1,242	60	2,162	116	876
25th	118	178	329	1,937	262	574
26th	.....	780	.....	295	.....	451
27th	.....	72	.....	1,519	.....	369
28th	.....	.....	.....	758	.....	332
29th	.....	.....	.....	176	15	312

Diamond-drilling in 1953 consisted of 168 holes totalling 27,154 feet, all from underground.

The following is taken from the manager's report for the year ending December 31, 1953:

Production

During the year, operations were restricted to a six-month period because of a strike that suspended production from July 12, 1953. Milling results for the period prior to the strike are shown in the table below:

Ore hoisted.....tons	128,779
Total dry tons milled.....	128,720
Average dry tons milled per day.....	667
Average mill heads.....ounces gold per ton	0.3344
Average net recovery.....ounces per ton milled	0.3271
Average gold in tailings.....ounces per ton	0.0073
Average recovery.....percent	97.82
Gold produced.....fine ounces	42,107.326
Silver produced.....fine ounces	4,683.340

The grade of ore treated and the average milling rate was somewhat above that of the previous year, but owing to the time lost as a result of the strike, production at the year's end was down by 39 percent.

The increase in the grade of ore treated yielded a slightly higher percentage recovery and at the same time a somewhat higher tailings loss per ton compared with 1952.

Costs

The total mine operating costs for the period prior to shutdown in 1953 were $8.533 per ton milled, exclusive of administration, write-offs, depreciation, and taxes. Detailed costs are shown in the following table:

Development and diamond-drilling.....	$2.272
Mining.....	5.241
Milling.....	1.020
Total.....	$8.533

Compared with the first six months of 1952, operating costs showed a minor increase of $0.104 per ton owing to further increases in labour and supply costs.

Apart from the above, expenditures on maintenance during the last half of the year totalled $173,791.27, bringing the total operating cost for the year up to $9.88 per ton milled.

Development

A total of 9,506.5 feet of development work was completed, of which 2,695.5 feet was done in drifts; 4,995.5 feet in crosscuts, and 1,815.5 feet in raises.

Of the total lateral development of 7,691 feet, 1,486 feet or 19.3 percent was in ore grading 0.40 ounces per ton uncut and 0.21 ounces per ton cut. This compares with a total of 1,205 feet grading 0.38 ounces per ton uncut and 0.19 ounces per ton cut developed in the corresponding period in 1952.

Lateral development accomplished during the year was distributed throughout the main producing zones as follows:

Zone	Lateral development	Percentage of total
	feet	
West porphyry	3,797	49.4
Preston porphyry	395	5.1
North greenstone	924	12.0
Porphyry greenstone	2,575	33.5
Total	7,691	100.0

West Porphyry.—In the west porphyry area, 921 feet of ore, grading 0.23 ounces per ton uncut and 0.20 ounces per ton cut, were developed during the year.

A new vein in a porphyry body lying north of the west porphyry was under development during the year on the 7th and 8th levels. To date, this work has produced a total length of 364 feet of ore. Previous to the shut-down, the extensions of this zone were under investigation on adjacent levels.

On the lower levels a new vein system lying south of the veins developed previously near the hanging wall contact has been indicated on the 21st and 24th levels. To date, 192 feet of ore has been disclosed in this area on the 22nd level.

Preston Porphyry.—No new ore was developed in the Preston porphyry area during the year. Prior to suspension of operations at mid-year, the drive on the 19th level had reached the Porphyry, and the productive zone on this level will be within reach of detailed development in 1954.

North Greenstone.—Development in the north greenstone area on the 21st and 23rd levels produced 91 feet of ore grading 0.25 ounces per ton uncut and 0.21 ounces per ton cut. Further detailed development is planned on these two levels to complete the exploration of the favourable area.

Porphyry Greenstone.—This area, which has been under development on the 19th, 20th and, 23 levels, produced 474 feet of ore grading 0.68 ounces per ton uncut and 0.22 ounces per ton cut.

The total ore disclosed to date on the 19th level is 492 feet. The 20th level, with numerous intersections yet to be investigated, has produced 163 feet of ore, and the limited work done thus far on the 23rd level has outlined another orebody 154 feet in length of better than mine average-grade ore.

Diamond-drilling

The total footage drilled during the period was 27,154 of which 65.6 percent was drilled in the west porphyry; 4.5 percent in the Preston porphyry; 13.6 percent in the north greenstone; 12.3 percent in the porphyry greenstone and 4 percent in other areas.

Mining

During the year the mine produced 126,431 tons of ore. Of this total the stopes produced 113,626 tons, and the balance, 12,805 tons, came from development.

Broken ore remaining in stopes at the year's end totalled 36,200 tons, as compared with 36,220 tons for the previous year.

The table below gives a record of ore trammed for the year 1953:

Mining method	Trammed	Percentage of total
	tons	
Open stopes	5,781	4.6
Square-set pillar recovery	5,806	4.6
Shrinkage	9,939	7.9
Cut-and-fill	47,459	37.6
Intermittent cut-and-fill	1,178	0.9
Stull	36,473	28.8
Miscellaneous	6,990	5.5
Development	12,805	10.1
Total	126,431	100.0

The following table gives a record of production by zones for the year 1953:

Source	Ore trammed	Percentage of total	Grade	
			Uncut	Cut
	tons			
Preston porphyry	23,728	18.8	0.45	0.22
West porphyry	58,165	46.0	0.36	0.21
Porphyry greenstone	6,097	4.8	0.33	0.15
North greenstone	25,636	20.3	0.64	0.26
Development	12,805	10.1	0.39	0.13
Total	126,431	100.0	0.44	0.21

Ore Reserves

Ore reserves as of December 31, 1953, are estimated at 500,250 tons with a grade of 0.275 ounces per ton after allowance for dilution. Compared with the previous year, this represents a small decrease of 1,520 tons in the total reserve and an increase of 0.009 ounces per ton in the grade. This can be considered satisfactory, particularly in view of the fact that development was not sufficiently advanced by mid-year to permit taking full advantage of the ore exposed for the reserve calculations.

Construction

A start was made on an addition to the mill providing for two additional agitators. It has been evident for some time that the higher grade of ore being treated required additional agitation to maintain maximum recovery.

In addition, the foundations were poured for a twenty-foot, one-storey addition to the main office.

Capital Expenditures

Capital expenditures for the year totalled $18,570. The principal items included a new drill repair shop on the 18th level, office equipment, foundations for the addition to the office and mill extension, and a half-ton pickup truck.

Outside Exploration

During the year, a total of 26 properties were submitted to the company. Of these, eleven were examined, and one was taken under option. Six other properties were staked by the company's field staff.

The highlight of the year's activities was the company's participation, through the courtesy of J. H. Hirshhorn, in important developments in the Blind River uranium area.

A total of 34 claims to the east and 36 claims to the west of Pronto Uranium Mines, Limited, were staked, and preliminary diamond-drilling amounting to 2,844 feet was done on these claims to cover assessment work for the coming year.

In addition, the company under an agreement with J. H. Hirshhorn and associates, staked 626 claims covering about 25 miles of the favourable contact, which claims are now owned and being actively developed by Algom Uranium Mines, Limited. The expense of staking was shared equally by the company and J. H. Hirshhorn and associates.

Diamond-drilling has provided impressive results to date, indicating that at least two groups have orebodies of sufficient size and grade to warrant production.

At year's end, an intensive development program was being continued employing seven diamond-drills.

Cincinnati Property

No work was done on this property during the year, as the development planned to provide entry into this ground on the 5th level was interrupted when operations ceased at mid-year.

Midcamp Property

During the year, the drive on the 23rd level on the Midcamp property was extended westerly for 588.5 feet. In addition, 11 holes, totalling 7,190 feet, were drilled.

An average of 241 men was employed, of whom 165 were underground and 76 on the surface. W. A. Hutchison is 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 have been issued. The company is a subsidiary of Macassa Mines, Limited. The officers and directors are: R. A. Bryce, president; L. Soliague, vice-president; H. W. Salthouse, secretary-treasurer; J. D. Bryce, G. A. Howes, and H. M. Porteous, directors. The head office is at 85 Richmond Street West, Toronto. The mine address is Renabie.

The company owns 32 claims in Leeson and Rennie townships, district of Sudbury.

Mining and milling continued throughout 1953. Operations are conducted through two vertical, three-compartment shafts; No. 1 shaft is 281 feet deep, and No. 2 shaft is 1,430 feet deep.

The following table shows the development work done in 1953 and the total at the end of 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
125-foot	.....	3,965	.....	104	.....	1,025
250-foot	53	3,508	.....	729	.....	1,057
375-foot	.....	1,429	.....	698	.....	957
525-foot	135	897	59	529	298	883
675-foot	.....	817	149	2,203	254	908
800-foot	137	1,755	1,310	1,425	382	1,135
925-foot	.....	879	.....	154	111	549
1,100-foot	20	108	345	561	722	782
1,250-foot	.....	.....	261	327	176	176
1,400-foot	.....	.....	.....	13	87	87

Diamond-drilling in 1953 consisted of 67 holes, totalling 16,687 feet, all from underground.

There were 168,043 tons of ore hoisted. The mill treated 168,243 tons, operating at an average daily rate of 460.9 tons.

A 25- by 40-foot concrete-block assay office was built in the No. 2 shaft area. A dust-control system was installed in the crusher-house.

The following is taken from the mine manager's report for the year ending December 31, 1953:

Production

The following figures show the production for 1953 with comparable figures for 1952 and for 1951 (197 days):

	1953	1952	1951 (197 days)
Gross recovery	$1,429,648.79	$1,406,342.51	$873,084.19
Tons milled	168,243	169,674	88,736
Recovery per ton	$8.50	$8.29	$9.84

The average mint settlement value per ounce of gold was $34.39 compared with $34.21 in 1952. Under provisions of The Emergency Gold Mining Assistance Act, it is estimated the company is entitled to receive $202,098.16 for the year, which is $1.20 per ton milled, or $4.90 per ounce of gold recovered. Of this amount, $120,995.46 has been received on account.

Milling

The average tons milled per day for 1953 was 460.9 as compared with 463.6 in 1952. The extraction for the year was 92.1 percent. Bullion recovery comprised 41,248.379 ounces of gold and 13,235.36 ounces of silver. From the commencement of milling operations (July, 1947) 865,465 tons of ore have been milled from which have been recovered 204,044.277 ounces of gold and 65,897.68 ounces of silver having a gross value of $7,324,002.32, equivalent to $8.46 per ton milled, exclusive of cost-aid.

Development

Work was confined to the development of known orebodies between the 250-foot and 1,250-foot level. The ore-pass system was completed between 925-foot level and 1,345-foot elevation at No. 2 shaft. A new orebody, designated *J* orebody, was developed for mining between the 675- and 800-foot levels; it lies 400 feet south of *D* orebody and is estimated to contain 135 tons per vertical foot and grade 0.29 ounces of gold per ton. By-pass drifts were driven on the 800-foot level to permit recovery of floor-sill pillars at this horizon.

Comparative figures for development footages for the years 1953 and 1952, and the total to date, are shown in linear feet as follows:

	1953	1952	Total to date
	feet	feet	feet
Drifting	1,539.0	1,955.0	11,909.3
Crosscutting	1,311.0	556.0	11,105.9
Raising	2,246.5	1,372.0	7,141.0
Shaft-sinking	.....	.....	1,733.3
Station-cutting (shaft equivalent)	0.4	105.9	716.5
Diamond-drilling	16,687.0	12,151.0	66,226.0

Ore Reserves

The technical position of ore reserves at the year's end, after allowing for dilution, was as follows:

	Tons	Ounces per ton	Value (gold at $35 per ounce)
Unbroken ore	414,000	0.252	$8.82
Broken ore	90,000	0.239	8.38
Total	504,000	0.250	$8.75

Operating Costs

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

	1953		1952	
	Per ton milled (168,243 tons)	Per ounce recovered (41,248.379 ounces	Per ton milled (169,674 tons)	Per ounce recovered (40,818.602 ounces)
Development and exploration	$0.865	$ 3.527	$0.721	$ 2.996
Mining	2.678	10.922	2.398	9.968
Milling	1.458	5.946	1.359	5.650
Undistributed operating charges including administration and head office	0.571	2.331	0.689	2.866
Total operating costs	$5.572	$22.726	$5.167	$21.480
Depreciation	$1.554	$ 6.340	$1.496	$ 6.218
Preliminary exploration and development write-off	0.654	2.668	0.648	2.696
Provision for municipal, federal, and provincial taxes	0.166	0.677	0.140	0.580
Total costs	$7.946	$32.411	$7.451	$30.974

Capital Expenditure

The total capital expenditure amounted to $56,252.24 and, briefly summarized, was as follows:

Mill	$ 8,777.21
Mine equipment	9,983.73
Dwellings	9,661.29
Assay office	16,881.19
Miscellaneous	10,948.82
Total	$56,252.24

General

The community of Renabie comprised 72 families, 76 houses, and a total population of 344. The present enrolment at the public school is 53 pupils.

An average of 163 men was employed, of whom 76 were underground and 87 on the surface. A. A. McCloskey is mine manager.

Rowan Consolidated Mines, Limited

Lake Rowan (1945) Mines, Limited, was incorporated in July, 1945. In January, 1951, the name was changed to Rowan Consolidated Mines, Limited. The authorized capitalization is 3,500,000 shares of $1 par value, of which 2,182,000 have been issued. The officers and directors are: A. W. White, president; R. A. Jodrey, vice-president; T. M. Fyshe, secretary; L. W. McIlmurray, treasurer; B. M. Hill, director. The head office is at 145 Yonge Street, Toronto. The mine address is Red Lake.

The company owns 49 claims in Todd township, Red Lake area, Patricia portion of Kenora district.

There is a vertical three-compartment shaft, 433 feet deep, on the property, with levels at 100, 250, and 400 feet.

Operations in 1953 were carried on from May 18 to October 15.

A 12- by 12-foot frame pump-house was built. Two aluminium cages, a 0 -B Eimco rocker shovel, twelve one-tone Wabi mine cars, and a Little Mancha trammer were bought.

The following table shows the development work done in 1953, and the total when operations were suspended:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
100-foot (adit)	....	624	.....	45	.....	.....
250-foot	.....	735	.....	99	.....	75
400-foot	1,507	2,251	714	832	104	104

Diamond-drilling consisted of 38 holes totalling 6,053 feet, all from underground.

An average of 17 men was employed, of whom 5 were underground and 12 on the surface. E. O. B. Hallett was manager.

Starratt Olsen Gold Mines, Limited

Starratt Olsen Gold Mines, Limited, was incorporated in June, 1945, with an authorized capitalization of 3,000,000 shares of $1 par value, all of which have been issued. The officer and directors are: J. E. Hammell, president and managing director; C. S. Hamilton, vice-president; A. G. Hattie, director of mining;

G. M. Huycke, secretary-treasurer; John Bland, assistant secretary-treasurer. The head office is at 25 King Street West, Toronto. The mine address is Madsen.

The property consists of 18 claims in Baird township, Red Lake area, Patricia portion of Kenora district, and is just west of the Madsen Red Lake mine. It is reached by an eight-mile road from Red Lake.

Mining and milling continued throughout 1953. The vertical, three-compartment main shaft was sunk a further 154 feet to a total depth of 2,129 feet. A loading-pocket was cut at 2,050 feet.

The following table shows the development work done in 1953 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
175-foot	.....	1,845	.....	243	.....	520
300-foot	.....	2,387	.....	609	.....	394
550-foot	.....	2,557	.....	272	.....	1,193
675-foot	.....	357	.....	.....	.....	135
800-foot	101	4,794	.....	86	184	1,291
1,000-foot	44	2,758	.....	18	235	1,760
1,150-foot	1,158	4,486	.....	.....	.....	417
1,325-foot	756	3,715	.....	.....	159	1,320
1,475-foot	2,925	4,664	.....	.....	1,070	1,070
1,660-foot	.....	28	.....	.....	.....	561
1,810-foot	.....	.....	.....	.....	.....	.....
1,960-foot	1,588	1,588	.....	.....	120	120

Diamond-drilling consisted of 134 holes, totalling 21,778 feet, all from underground.

There were 156,433 tons of ore hoisted; the mill treated 156,139 tons.

The following is taken from the manager's report for the year ending December 31, 1953:

Mine Development

On the bottom level at the 1,960-foot horizon, the west drift was driven to a position 1,130 feet west of the shaft. Diamond-drilling along this length encountered no ore sections, although some erratic assays were cut.

On the east side of the shaft, exploration drifts were driven at two horizons. The east drift on the 1,475-foot level was advanced 504 feet, and the east drift on the 1,960-foot level was advanced 406 feet. This work encountered several sections of interesting mineralization, but failed to outline any ore shoots. One mineralized section on the 1,960-foot level will be further tested with a small trial stope.

West of the main-mine stoping area, exploration drifts were driven at the 1,150-foot, and 1,475-foot horizons. The 1,150-foot-level drift was driven 1,118 feet, to a position 2,540 feet west of the shaft. The 1,475-foot-level drift was driven 1,523 feet, to a position 2,810 feet west of the shaft. This work outlined three new ore shoots, and made accessible the previously known No. 10-50 ore zone.

On the 1,150-foot level a length of 85 feet averaged $9.03 cut, and $9.66 uncut across an average width of five feet. This zone is now No. 11-50 stope, it occurs under No. 10-50 ore zone at 2,425 feet west of the shaft.

The downward extension of the above ore zone was encountered at 70 feet above the 1,475-foot level. Subsequent development and stope preparatory work shows this zone to contain 4,700 tons averaging $7.68 per ton. This section is now the 14-50 stope.

At 2,725 feet west of the shaft, drifting on the 1,475-foot level encountered No. 14-54 ore zone. This section averaged $10.18 for a length of 90 feet across an average width of 5.4 feet. Stope preparatory work shows this zone to persist to a height of 200 feet above the level. Subsequent stoping in this zone disclosed the ore zone above the level to be badly shattered by numerous faults, and much dilution was encountered.

Stope Preparation

Total stope preparation consisted of 2,389 feet of advance and 22,995 cubic feet of slashing, in drifting, subdrifting, and raising.

Diamond-drilling

Type of drilling	Number of holes	Footage
Exploration	134	21,778
Blast holes	509	50,465

Exploration drilling was continued throughout the year and closely followed drift headings as they were advanced.

Ore Reserves[1]

	Total	Grade	
		Cut	Uncut
	tons		
Mine total above the 1,475-foot level	52,230	$5.18	$6.23

Milling and Production[2]

Ore milled	tons	156,139
Average milled per day	tons	426.6

	Value per ton		Total value	
	ounces		ounces	
Head assays	0.148	$5.18	23,115.580	$809,045.30
Heads calculated	0.157	5.51	24,596.516	860,878.09
Tailings	0.0142	0.497	2,218.800	77,658.00

Mint Settlement Values

	ounces	
Gold	22,377.717	$770,985.02
Silver	4,318.240	3,622.87

Recovery	percent	91.0

Summary of Operating Costs

	Cost	Per ton	Per ounce
Development, including diamond-drilling	$176,958.20	$1.134	$ 7.908
Stope preparation	65,298.32	0.418	2.918
Stoping	256,936.06	1.645	11.481
Milling	203,131.54	1.301	9.077
Marketing charges	6,916.42	0.044	0.310
Surface and general	40,350.36	0.258	1.803
Administration at mine	50,591.96	0.324	2.261
Total	$800,182.86	$5.124	$35.758

Capital Expenditures

The following tabulation shows the additions made to Capital Accounts during the year under review:

Deferred development	$41,320.87
Buildings	
Machinery and equipment (disposals)	3,036.33
Total	$38,284.54

An average of 116 men was employed, of whom 63 were underground and 53 on the surface. Alexander Watt is manager.

[1]All grades and tonnages include 10 percent dilution at $1.05 per ounce.
[2]All values in this report are based on gold at $35 per ounce.

Sylvanite Gold Mines, Limited

Sylvanite Gold Mines, Limited, was incorporated in June, 1913, with an authorized capitalization of 3,300,000 shares of $1 par value, of which 3,299,500 have been issued. The officers and directors are: W. V. Moot, president and managing director; K. C. Gray, vice-president and general manager; W. S. Walton, secretary-treasurer; A. H. Sharpe, Harry Yates, L. R. Gulick, and A. F. Osborn, directors. The executive office is at Erie County Bank Building, Buffalo, N.Y. The secretary's office is at 44 King Street West, Toronto. The head office and mine office address is Box 670, Kirkland Lake.

The main property is in Teck township, Kirkland Lake area, district of Timiskaming.

Mining and milling continued throughout 1953. The table below shows the depths of the shafts on the property and the number of compartments in each. The shafts are all vertical.

Shaft	Number of compartments	Total depth from surface
		feet
No. 1[1]	2	125
No. 2	3	3,642
No. 3[1]	2	118
No. 4	2	1,762
No. 5 (winze, below 3,150-foot level)	4	5,400

The following table shows the development work done in 1953 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
125-foot	.....	2,030	.....	356	.....	232
250-foot	244	8,591	102	2,522	.....	1,130
375-foot	.....	11,059	.....	2,959	.....	2,619
500-foot	191	13,230	83	4,168	283	2,294
625-foot	105	11,667	128	2,967	.....	2,595
750-foot	54	14,285	.....	3,722	32	2,906
875-foot	146	15,822	.....	4,709	354	3,744
1,000-foot	.....	15,671	.....	5,456	102	5,767
1,125-foot	.....	10,026	49	2,935	72	3,151
1,250-foot	191	8,983	96	3,727	88	2,790
1,375-foot	37	5,921	.....	2,403	.....	1,705
1,500-foot	51	5,864	.....	2,538	.....	1,911
1,625-foot	799	6,007	132	2,045	152	1,297
1,750-foot	816	8,910	282	2,971	222	1,879
1,875-foot	.....	6,520	.....	1,942	77	1,528
2,000-foot	33	5,717	.....	2,071	177	1,508
2,125-foot	150	1,305	.....	430	.....	522
2,250-foot	.....	4,836	.....	1,831	.....	1,651
2,375-foot	.....	4,481	7	2,187	.....	777
2,500-foot	40	5,881	.....	2,008	135	2,220
2,625-foot	.....	4,646	57	1,535	.....	1,191
2,750-foot	.....	3,287	.....	1,849	.....	1,174
2,875-foot	.....	3,238	257	1,404	4	520
3,000-foot	.....	4,265	4	1,646	80	1,170
3,150-foot	.....	2,977	7	1,219	149	1,223
3,300-foot	.....	.....	.....	23	.....	355
3,450-foot	223	2,146	.....	552	73	73
3,600-foot	.....	2,551	.....	1,051	86	363

[1]Not used for hoisting.

DEVELOPMENT WORK IN 1953—*Continued*

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
3,750-foot		3,025		341	15	356
3,900-foot		755		283		151
4,050-foot						
4,200-foot		1,591		433		378
4,350-foot		3,271		636	176	498
4,500-foot	52	2,983		660	184	582
4,650-foot		2,448		176	195	346
4,800-foot		2,865		384		320
4,950-foot		1,655		213	71	283
5,100-foot		1,149		149		
5,250-foot		411				
5,400-foot		1,947		28		
5,550-foot		1,040		98		12

Diamond-drilling in 1953 consisted of 184 holes, totalling 13,296 feet, all from underground.

An employees' dwelling and an addition to the employees' recreation hall were built.

There were 170,147 tons of ore hoisted. The mill treated 170,032 tons, at an average daily rate of 465.8 tons.

The following is taken from the report of the vice-president and general manager for the year ending December 31, 1953:

Production

During the year, 170,032 tons were milled, producing 53,865.208 ounces of gold and 13,604.62 ounces of silver with a value of $1,864,940. The mill averaged 465.8 tons per day, which is 3.8 tons less per day than in the previous year.

SUMMARY OF PRODUCTION

Year	Milled	Gold produced	Average price per ounce	Total production gold and silver	Average gold recovery
	tons	fine ounces			ounces per ton
1949	171,442	47,841.222	$36.17	$1,738,606	0.28
1950	170,552	48,034.186	38.00	1,833,687	0.28
1951	171,017	46,573.063	36.80	1,722,843	0.27
1952	170,868	54,249.834	34.20	1,866,401	0.32
1953	170,032	53,865.208	34.41	1,864,940	0.32

Mining

SUMMARY OF ORE AND WASTE BROKEN

Year	Ore broken in stopes	Ore from development	Total ore broken	Waste broken and used for backfill	Total ore and waste broken
	tons	tons	tons	tons	tons
1951	148,257	18,923	167,180	23,610	190,790
1952	176,233	19,732	195,965	15,384	210,349
1953	154,022	15,391	169,413	23,655	193,068

Broken Ore Reserves

Broken ore reserves amounted to 96,888 tons at the end of the period, a decrease of 734 tons for the year.

Development

Total development footage was 10,972.5 as compared with a total of 11,398 for the previous year.

Class of work	1951	1952	1953	Total from beginning of operations to December 31, 1954
	feet	feet	feet	feet
Drifting	4,329.5	2,027.0	3,128.5	213,047.0
Crosscutting	1,337.5	887.5	1,202.5	66,615.5
Raising	2,387.0	2,700.5	2,808.0	51,211.0
Sublevel drifting	2,953.5	4,368.5	2,539.5	43,440.5
Box-hole raising	1,177.0	1,414.5	1,294.0	20,056.5
Shaft-sinking	.....	.....	.....	8,090.0
Total	12,184.5	11,398.0	10,972.5	402,460.5
	percent	percent	percent	percent
Proportion of crosscutting to total of crosscutting and drifting	23.6	30.5	27.8	23.8
	cubic feet	cubic feet	cubic feet	cubic feet
Shaft stations, stations and sump excavations, etc	.....	.....	.....	395,964
	feet	feet	feet	feet
Diamond-drilling	13,933	12,492	13,296	399,813

Development Summary

During the year, 2,162.5 feet of ore was developed in drifting and development subdrifting.

In drifting, 829 feet of ore was developed in a total advance of 3,128.5 feet. The work was done chiefly in the upper section of the mine from the 250- to 2,250-foot level. The ore footage developed by drifting was located in the various vein systems as follows: north vein, 76 feet; north *A* vein, 559 feet; north *B* vein, 96 feet; incline vein, 46 feet; and south vein, 52 feet.

Half the total drifting was done on the 1,625- and 1,750-foot levels. Here 470 feet of ore was found on the north *A* vein, a steeply inclined fracture that is in sediments and 300 feet north of the main north vein at these horizons. This north *A* vein is known to exist for a length of 1,500 feet in the area west of the main shaft. It has been found in past mining to yield more ore than that first indicated by drifting. A 76-foot ore length was also found in this vein on the 250-foot level.

On the 2,125-foot level a 96-foot ore length was developed on the north *B* vein with values above the mine average.

In development subdrifting 1,333.5 feet of ore was developed in a total of 2,539.5 feet of advance. This work was distributed throughout the mine from the 250- to the 4,900-foot level. It consisted of extending lengths of orebodies between levels, in developing faulted sections of ore that could not be mined from existing stopes, and in silling out orebodies that bottomed above the drift. In one orebody a 140-foot length of ore, 8 feet wide, was opened up on the south vein just 20 feet above the drift, which did not show any ore.

In No. 5 interior-shaft-section development work consisted chiefly of 725 feet of raising through known orebodies to provide ventilation and prepare them for stoping. Actual stoping was increased towards the end of the year, but only 7.2 percent of the mill tonnage was taken from this section. This will be increased in the coming year.

The source of ore milled was as follows:

Level	Tons	Percent
125- to 1,125-foot	77,808	45.8
1,250- to 1,875-foot	52,315	30.8
2,000- to 2,875-foot	22,547	13.2
3,000- to 3,600-foot	5,062	3.0
No. 5 shaft:		
3,750- to 5,500-foot	12,300	7.2
Total	170,032	100.0

Operating Costs

Operating costs per ton milled were 7.8 cents lower than last year

	Total 1953	Per ton ore milled	Per ounce fine gold produced
Development and exploration	$ 236,387	$1.390	$ 4.388
Mining	873,525	5.138	16.217
Milling (including tailings disposal expense)	253,248	1.489	4.701
General charges, after deducting sundry revenue	79,269	0.466	1.472
Administration expense	51,114	0.301	0.949
Bullion-selling expense:			
Insurance, shipping, and mint-refining charges	3,476	0.021	0.065
Mint-handling charges	10,773	0.063	0.200
Total	$1,507,792	$8.868	$27.992

The main charges to operations in the fiscal year were:

Wages and mine salaries	$938,988
Supplies, including power and water	411,571
Provision for taxes on mining income	135,000

Capital Expenditures for Buildings, Improvements and Equipment Replacement, and Additions.—A total of $30,477 was spent on capital account during the year of which $9,445 was expended on buildings and $21,032 on equipment. The rebuilding of one residence and an addition to the recreation hall were the main building changes. Plant and mine-equipment items covered a considerable list of which the main items were a new feed head for a tube mill, replacement of worn parts in the crusher-house, and the purchase and installation of additional pumps for underground This latter item was made necessary due to the extra water draining into Sylvanite workings when Toburn Mines ceased operations.

General Summary.—The average price received for an ounce of gold in 1953 was $34.41 compared with the average received in 1952 of $34.20. This was a slight improvement, but it must be remembered that the average price received in 1952 was the lowest in 19 years, and also that the price at the end of 1953 had declined to about $34.00.

The 1953 net profit was above the previous year owing in part to slightly lower costs on both "per ton milled" and "per ounce produced" basis.

Labour costs continue to rise, but improved machinery and drilling practice compensated to a considerable extent for the increase applicable to 1953. There was some levelling off in material costs.

The average gold recovered, in ounces per ton milled, was the same in 1953 as in 1952 disregarding a small fraction. For some time before 1952 the average recovery had been held between 0.27 and 0.28 ounces per ton milled. This had been considered the advisable grade for the mine to produce considering the type and grade of the orebodies, but because of increased costs of labour and supplies, the policy was changed, and the grade of the ore going to the mill was increased by selective mining in order to maintain a reasonable margin between receipts and expenditures. It will be realized of course that the life of the mine is thereby correspondingly shortened.

An average of 284 men was employed, of whom 189 were underground and 95 on the surface. W. S. Maguire is general superintendent.

Teck-Hughes Gold Mines, Limited

Teck-Hughes Gold Mines, Limited, was incorporated in March, 1923, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 4,807,144 have been issued. The officers and directors are: Dr. D. L. H. Forbes, president and general manager; H. C. McCloskey, vice-president; P. N. Tapley, treasurer; J. W. Stephenson, secretary; R. A. Jodrey, W. H. Keith, G. A. La Bine, and C. G. Williams,[1] directors. The head office address is Woodstock. The executive office is at 25 King Street West, Toronto. The mine address is Kirkland Lake.

The main property is in Teck township, Kirkland Lake area, district of Timiskaming.

[1] Died August 14, 1953.

Mining and milling continued throughout 1953. The new No. 4 winze between the 30th and 36th levels was completed by sinking 306 feet and raising 198 feet. Connections to the other mine workings were made at the 33rd, 34th, 35th, and 36th levels.

The following table shows the development work done in 1953 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st		1,477		827		252
2nd		2,227		872		453
3rd		1,081		462		335
4th		2,682		2,170		1,760
5th		4,456		2,254		1,296
6th		5,437		1,305		2,240
7th		3,465		1,120		1,936
8th		3,421		1,915		2,291
9th		3,191		887		2,029
10th		4,462		3,598		2,127
11th		2,764		481		558
12th		3,021		480		901
13th		2,655		1,033		958
14th		2,292		590		1,129
15th		2,318		378		930
16th		2,156		423		948
17th		2,614		837		691
18th		1,117		182		711
19th		1,932		1,112		705
20th		1,816		489		1,130
21st		2,213	100	691		977
22nd		2,114		384		2,055
23rd	66	2,563		643	15	2,417
24th		3,006		1,663		2,100
25th	44	3,958		1,321		2,963
26th		4,007		1,330		3,427
27th		3,579		731		3,307
28th		2,352		1,312		1,371
29th		2,246		890		1,603
30th		5,250	17	3,540		2,546
31st		2,955		648	19	2,743
32nd	334	2,360	20	486	653	2,335
33rd		2,105		599	29	1,352
34th		3,422	50	921	26	1,211
35th		2,857		895	102	1.861
36th	38	2,577		1,177	74	1,339
37th		2,673		627		1,615
38th	11	3,485	16	942	114	2,099
39th		2,188		671		1,513
40th		3,154		1,844	23	1,478
41st		2,014		328	15	981
42nd		1,558		189	25	869
43rd		1,914		517		400
44th		2,526		762		1,757
45th		3,496		1,495		2,590
46th		2,731		1,054	25	2,117
47th		1,815		423	21	1,781
48th		1,314		270		475
49th		1,499		333		298
50th		1,477		947		567

Diamond-drilling in 1953 consisted of 33 holes, totalling 1,666 feet, all from underground.

There were 227,355 tons of ore hoisted. The mill treated 228,425 tons, operating at an average daily rate of 626 tons.

The following table shows the depth, inclination, and number of compartments of the active shafts and winzes:

Shaft	Inclination	Number of compartments	Total depth from surface
			feet
Central shaft	Vertical	4	3,014
South shaft	Vertical	4	3,690
South-shaft extension (below 30th level)	Vertical	4	5,546
No. 3 winze (below 40th level)	60 degrees	3	6,182
No. 4 winze (below 30th level)	Vertical	3	4,457

The following is taken from the manager's report for the year ending December 31, 1953:

During the year, 228,425 tons of ore from the mine were milled. Recovery of bullion amounted to 38,770.175 ounces of fine gold and 7,572.86 ounces of fine silver. The value of bullion production was $1,492,870.58 or $6.54 per ton, which includes estimated cost-aid of $156,187.48 and premium on gold sales of $4,340.72, less reduction in value of refined gold in storage amounting to $9,107.96. Income from general investments and profit from investments sold amounted to $64,567.77 making a total revenue of $1,557,438.35 or $6.82 per ton. Operating costs amounted to $1,252,583.54 or $5.48 per ton, leaving an operating profit of $304,854.81 or $1.34 per ton.

Income from dividends on shares of Lamaque Gold Mines, Limited, amounted to $533,104.00. Net profit for the fiscal year was $837,958.81.

Operating Costs

An analysis of operating costs follows:

	Total	Per ton of ore treated	Per ounce of gold produced
Development	$ 179,489.45	$0.79	$ 4.630
Mining	688,032.91	3.01	17.746
Milling	289,103.67	1.26	7.457
General expense	92,763.11	0.41	2.393
Depreciation	3,194.40	0.01	0.082
Totals	$1,252,583.54	$5.48	$32.308

Development

Ore production from drifting and cross-cutting amounted to 3,874 tons.

New ore found totalled 330 feet or 55.0 percent of all drifting, nearly all in the *T* vein, 32nd level.

Ore Reserves

Ore reserves at December 31, 1953, were as follows:

	Tons	Gold content in troy ounces	Average grade in pennyweights per ton
Positive ore:			
Blocked	27,339	11,234.3	8.22
Broken	35,021	7,749.9	4.43
Total	62,360	18,984.2	6.09
Potential ore:			
Blocked	214,920	48,102.4	4.48
Broken	23,901	6,692.4	5.60
Total	238,821	54,794.8	4.59

Potential ore includes all proven ore that may not be recovered because of the unusual expense or hazard involved or the disturbing effect its removal might have on important development openings.

General Observations

Production during 1953 was derived from the following sources:

Source	Tons		Gold content in troy ounces		Average grade in pennyweights per ton	
	1953	1952	1953	1952	1953	1952
Surface stock pile	987	.....	187.6	.....	3.80	.....
Surface to 20th level	.....	.....	.....	.....	.....	.....
20th to 30th level	136,647	105,564	17,504.8	15,615.1	2.56	2.96
30th to 40th level	54,854	39,805	16,870.1	12,643.8	6.15	6.35
40th to 47th level	35,937	73,561	7,157.9	15,148.4	3.98	4.12
Total	228,425	218,930	41,720.4	43,407.3	3.65	3.97

Branch veins in the hanging wall supplied 10.1 percent of the above tonnage and 20.9 percent of the gold content. Most of this came from the new *T* vein.

Nearly all the production from 20–30th levels came from the 21st and 24th levels where extraction of low-grade, caved ore lying immediately south of the main north vein continued. A small block of high-grade ore remaining in the main break between the 30th and 28th levels has been recovered for cut and fill mining, which is now under way.

Of the total produced from the section between the 30th and 40th levels 18,639 tons, containing 7,335.3 ounces at an average grade of 7.87 pennyweights per ton, came from the new *T* vein, 32nd level. Although discovered last year, this vein was nearly all developed during 1953. Unfortunately it did not contain a large tonnage and is now about 75 percent mined out. The balance of the production from the 30th–40th levels came from continued cut-and-fill mining of the main break, 33rd–30th levels, near the south extension shaft and from a number of small blocks and remnants scattered throughout the area.

No. 4 vertical winze, started last year to provide hoisting facilities for the extraction of south extension shaft pillars, 33rd–36th levels, has been completed. It extends from 68 feet below the 36th level, for sump and loading pocket, to 71 feet above the 30th level, for headframe and ore pocket, a total distance of 888 feet. Some mechanical and electrical accessories remain to be installed, including skip and skip dump, power and signal lines, and pump and water lines. An ore-pass to the 35th level with grizzlys on the 35th and 36th levels and an ore pocket below the 36th level is nearing completion.

The levels below the 42nd are worked out except for a little clean-up on the 46th. There are a few small quantities of ore remaining on or above the 42nd and 41st levels. These are being mined, or will be shortly.

Operating results for 1953 compare with those of 1952 as follows:

Year	Tons milled per day	Average grade, pennyweights per ton	Bullion production per ton	Investment income per ton	Operating cost per ton	Profit per ton
1952	598	3.97	$6.64	$0.29	$5.68	$1.25
1953	626	3.59	6.54	0.28	5.48	1.34

During 1953 our gold and silver was sold to the Mint at Ottawa. The average price for silver was 83.91 cents per ounce compared with 82.71 cents during 1952. The average value of the gold produced in 1953 including estimated emergency assistance earned during the year was $38.46 per ounce, compared with an estimated return of $36.52 per ounce during 1952 when our gold was sold on the free market.

There was little change in the cost of operating supplies during the year. Cyanide and explosives were slightly reduced in price. Freight rates were again increased bringing the total average increase over 1948 rates to 98.2 percent.

During the midsummer holiday season the usual labour shortage developed for two or three months. An adequate supply of miners was available during the rest of the year. Wages remained the same.

In order to provide more storage space for mill tailings three new claims were purchased adjoining the northwest corner of our north group.

Buildings, plant, and equipment were maintained in good condition. No important additions or changes were made.

A few rockbursts occurred in the lower part of the mine, but there were no injuries. Resulting damage was not severe and has been repaired.

An average of 218 men was employed, of whom 143 were underground and 75 on the surface. G. G. Gilchrist is manager.

Theresa Gold Mines, Limited

Theresa Gold Mines, Limited, was incorporated in April, 1938, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,299,620 have been issued. The officers and directors are: A. Caouette, president; M. D. Caouette, secretary-treasurer and manager; Michel Hallé, director. The address of the head office and the mine is Theresa, via Longlac.

The company holds a group of claims east of the Making Ground River, about seven and a half miles south and slightly east of Longlac in the district of Thunder Bay.

Mining continued throughout 1953. The operation is conducted through a vertical, three-compartment shaft, 986 feet deep. The following table shows the development work done during 1953, and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st				87		
2nd				78		
3rd	24	1,509	97	5,912		760
4th		470		1,460		120
5th (station only)						
6th				600		

Five diamond-drill holes, totalling 1,708 feet, were drilled from underground

There were 5,638 tons of ore hoisted.

The mill operated for 62½ days and treated 5,638 tons of ore at an average daily rate of 90.2 tons.

An average of 27 men was employed, of whom 13 were underground and 14 on the surface.

Toburn Gold Mines, Limited

Toburn Gold Mines, Limited, was incorporated in January, 1931, with an authorized capitalization of 2,000,000 shares of $1 par value, of which 1,850,000 were issued. The company went into voluntary liquidation on March 31, 1953. The officers of the company ceased to hold office on April 16, 1953, and the Toronto General Trusts Corporation, Bay and Melinda Streets, Toronto, was appointed liquidator.

Underground operations at the property in Teck and Lebel townships, Kirkland Lake area, district of Timiskaming, were discontinued on April 16, 1953. No development work was done in 1953. The operation consisted of salvage work underground and a mill clean-up. The mill continued to operate until June 30, and treated 7,400 tons of ore.

Concrete bulkheads were constructed underground to reduce the inflow of surface water. The hoisting installation at the subshaft below the 1,090-foot level was removed, but the hoisting equipment on surface at No. 3 shaft was left intact.

The following table shows the main shafts from which the mine was developed:

Shaft	Inclination	Number of compartments	Total depth from surface
			feet
A shaft	58 degrees	2	319
No. 3 shaft	Vertical	3	1,105
Subshaft (below 1,090-foot level)	Vertical	2	2,498

There are a number of other shallow shafts, sunk during very early operations, which have been used as man-ways in recent years.

The following table shows the total development work when operations ceased:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
A SHAFT (inclined):			
85-foot (A-100)	383	.....	133
171-foot (A-200)	2,361	291	897
247-foot (A-300)	1,010	232	275
319-foot (A-400)	6,836	1,109	1,197
No. 3 SHAFT:			
200-foot	732	326	63
400-foot	1,510	1,185	465
542-foot	5,559	1,962	3,718
667-foot	5,359	1,521	1,699
792-foot	5,074	1,597	1,813
893-foot	6,463	2,534	1,288
1,018-foot	3,839	1,489	1,698
1,090-foot	3,354	3,352	718
SUBSHAFT (below 1,090-foot level):			
1,210-foot	1,124	1,372	329
1,325-foot	1,041	723	617
1,430-foot	516	389	232
1,550-foot	481	815	772
1,710-foot	165	208	178
1,850-foot	938	1,557	33
1,975-foot	.....	102	.....
2,100-foot	799	519	83
2,225-foot	261	361	301
2,350-foot	.....	57	.....
2,475-foot	4,994	1,283	115

An average of 28 men was employed, of whom 16 were underground and 12 on the surface. M. W. Hotchkin was general manager.

In August the property and assets of the company were acquired by Albert Metals, Limited, a subsidiary of Ascot Metals, Limited. The new owners did not do any operating. A caretaker staff was employed on general maintenance work.

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 3,274,827 have been issued. The officers and directors are: R. R. Brown, president; J. A. W. Brown, vice-president; G. F. Summers, secretary-treasurer; T. J. Day,

Oliver Hall,[1] Dr. J. A. Dickson, and J. W. McBean, directors. The head office is at 85 Richmond Street West, Toronto. The mine address is Dobie.

The company's property consists of 35 claims in Gauthier township, Kirkland Lake area, district of Timiskaming.

Mining and milling continued throughout 1953. The mine has been developed through two vertical shafts. The depths of the shafts and the number of compartments are shown in the following table:

Shaft	Number of compartments	Depth from surface
		feet
No. 1	3 to 1,750-foot level 4 to bottom	2,889
No. 2	3	1,877

The shafts are connected on the 375- and 1,000-foot levels.

The following table shows the development work done in 1953, and the total at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
125-foot	.....	3,336	.....	1,068	.....	491
250-foot	.....	4,285	.....	839	.....	1,049
375-foot	.....	6,597	.....	2,771	.....	998
500-foot	.....	7,930	.....	1,850	41	1,117
625-foot	.....	6,879	13	821	.....	1,974
750-foot	.....	5,567	.....	1,045	.....	1,384
875-foot	126	4,993	19	1,889	12	1,937
1,000-foot	2,967	12,338	206	1,860	.....	1,874
1,125-foot	199	4,200	29	1,322	197	1,815
1,250-foot	12	5,597	.....	1,280	298	1,713
1,375-foot	49	3,672	56	665	77	1,510
1,500-foot	69	3,566	29	699	405	1,653
1,625-foot	392	3,502	.....	967	44	726
1,750-foot	652	9,503	6	2,242	364	1,790
1,875-foot	.....	.....	.....	.....	.....	.....
2,000-foot	799	1,784	19	183	86	86
2,125-foot	.....	.....	.....	21	163	163
2,250-foot	552	3,041	.....	162	456	676
2,375-foot	1,013	1,606	29	122	164	337
2,500-foot	590	1,359	44	280	140	282
2,625-foot	475	1,525	27	304	160	449
2,750-foot	1,443	5,140	729	1,114	219	687

Diamond-drilling consisted of 5 holes, totalling 5,473 feet, from surface, and 486 holes, totalling 48,923 feet, from underground.

Extensions to the assay office and core-house were built.

The following is taken from the report of the general manager for the year ending December 31, 1953:

Exploration

The 1,000-foot level was driven as a line drive to a point 3,700 feet west of the No. 2 shaft, *L* zone workings, and the area thus opened is now being tested by diamond-drilling and drifting on favourable showings. Structural conditions appear excellent, and work so far has indicated several ore sections. Much work remains to be done before this ground is thoroughly explored.

At No. 1 shaft, an exploration drive east on the 2,750-foot level encountered a new ore zone commencing 1,400 feet east of the shaft. The ore resembles the *H* zone more than it does the *L* or *M* zones, which project several hundred feet to the north. This new zone has been drifted on for 424 feet of which 116 feet has made ore.

[1]Died February 15, 1954.

Diamond-drilling to test the *L* zone below the 2,750-foot horizon has shown excellent ore intersections down to a depth of 500 feet below the present bottom level.

Early in the year, a cross-section was drilled along the west boundaries of claims Nos. 9526 and 9530, which lie adjacent to property of Queenston Gold Mines, Limited. No ore indications were disclosed.

An idea of the size of the area under detailed exploration may be gained from the fact that it is over 9,500 feet from the farthest east to the farthest west workings of the mine, and that ast year ore was handled from sources 9,200 feet apart.

Mine Production[1]

Zone	Tons	Grade	Value
No. 1 shaft:			
L zone	27,100	$ 8.17	$ 221,275
H zone	740	7.08	5,242
M zone	95	3.98	379
Total	27,935	$ 8.12	$ 226,896
No. 2 shaft:			
L zone	103,381	$11.59	$1,198,419
B zone	50,441	7.03	354,262
K zone	1,156	5.22	6,031
Total	154,948	$10.06	$1,558,712
Total mine	182,883	$ 9.76	$1,785,608

Production from the No. 1 shaft development work and from the mining of *B* zone stopes increased, while the tonnage drawn from No. 2 shaft *L* zone stopes decreased over that of the previous year. This resulted in lowering the average grade of ore sent to the mill from $10.52 to $9.76. Approximately 85 percent of ore milled over the year's operation came from No. 2 shaft area.

Milling

Comparative mill figures for the past three years are tabulated below.

	1953	1952	1951
Total milled, tons	182,883	177,468	151,568
Average per day, tons	501.0	484.9	415.3
Heads at $35 per ounce gold	$9.764	$10.522	$10.642
Total tails	$0.677	$0.753	$0.766
Recovered	$9.087	$9.769	$9.876
Recovery, percent	93.07	92.84	92.80
Possible running time, percent	96.55	97.55	97.65
Cost per ton	$1.15	$1.22	$1.24

The success of the mill in handling increased tonnage, without loss in extraction, has been an important factor in our efforts to prevent a rise in over-all costs.

Operating Costs

Cost per ounce of fine gold produced before depreciation, taxes, etc., was $32.27, compared with $29.63 in 1952. Operating costs per ton milled over the last four years are tabulated below.

	1953	1952	1951	1950
Diamond-drilling and development	$2.42	$2.13	$1.22	$2.08
Mining	3.86	3.92	3.89	3.74
Milling	1.15	1.22	1.24	1.19
General expense and head office	0.86	0.91	0.99	0.95
Total	$8.29	$8.18	$7.34	$7.96

As a result of the increase in tons milled and the greater amount of low cost ore taken from the *B* zone, costs other than development and exploration dropped slightly; the greater amount of development and exploration, however, resulted in an increase in the total cost per ton milled of eleven cents.

[1]Gold at $35 an ounce

Development

Total footage of drifting, crosscutting, and raising exceeded that of any previous year, and the length of ore developed is the greatest since 1946.

Operations at No. 1 shaft consisted mainly of developing the *L* productive zone below 1,750 feet. The work has shown a somewhat complex system of branching veins with some unusually wide widths at vein intersections. Selective mining does not seem feasible in all sections, and it is probable that when the development of this area is completed there will be a substantial tonnage of low-grade ore in addition to that developed by drifting. Although work on levels about the 2,750-foot is not completed, ore conditions generally seem strongest in the 2,750-foot level.

At No. 2 shaft, a section of better than average grade was proved on the east end of the 1,625-foot horizon. Much new ore was again developed in parallel orebodies and sublevels.

Development Summary[1]

Zone	Level	Exposed length	Drifting	Ore developed			Ore milled from lateral development		
				Length	Width	Estimated stoping grade	Tons	Grade	Total value
	No. 1 shaft:	feet	feet	feet	feet				
	2,000-foot	700	798.7	301.0	6.5	$ 8.12	1,899	$ 7.15	$ 13,585
	2,250-foot	320	552.0	100.0	6.0	7.80	1,090	7.62	8,310
	2,375-foot	820	1,012.5	290.0	6.7	8.90	2,599	7.81	20,289
	2,500-foot	460	589.6	238.0	6.8	9.85	2,447	7.40	18,120
	2,625-foot	260	475.1	300.0	7.0	9.50	2,357	8.16	19,236
	2,750-foot	840	1,019.1	173.5	6.7	10.90	2,597	8.08	20,994
H	2,750-foot		424.1	116.0	5.7	7.50	740	7.08	5,242
	Total	3,400	4,871.1	1,518.5	6.7	$ 9.20	13,729	$ 7.70	$105,776
	No. 2 shaft:								
	625-foot						39	$ 1.70	$ 66
L	750-foot						89	6.92	615
	875-foot		15.5				300	5.30	1,591
B	875-foot		110.0	64.0	6.0	$ 8.00	665	6.62	4,401
L	1,000-foot	2,700	30.0	30.0	6.2	7 50	163	10.00	1,631
K	1,000-foot		2,937.3	248.0	3.0	7.00	980	4.83	4,735
L	1,125-foot		32.8						
B	1,125-foot		166.0				938	6.33	5,935
	1,250-foot		12.0						
	1,375-foot		49.4				130	4.24	550
L	1,500-foot		69.0				206	4.29	883
	1,625-foot	370	391.8	175.0	6 2	14.00	625	14 51	9,069
K	1,750-foot	570	651.6						
	Total	3,640	4,465.4	517.0	4 6	$10.36	4,135	$ 7.12	$ 29,476
	Total mine	7,040	9,336.5	2,035.5	6 2	$ 9.44	17,864	$ 7.57	$135,252

An average of 225 men was employed, of whom 149 were underground and 76 on the surface. J. H. Botsford is 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 no par value, all of which have been issued. The officers and directors are: E. L. Miller, president; J. Y. Murdoch, vice-president; G. F. Miller, treasurer; P. H. Gerhard, secretary; W. E. Kreiner, W. J. Craig, R. L. Healy, and F. V. C. Hewett, directors. The head office is at Fort Erie. The mine address is Kirkland Lake.

The company's main property is in Teck township, Kirkland Lake area, district of Timiskaming.

Diamond-drilling during 1953 consisted of 123 holes, totalling 15,430 feet, all from underground.

There were 192,390 tons of ore hoisted and milled during the calendar year.

[1]Gold at $35 an ounce

The following table shows the development work done during 1953, by levels, the total since January 1, 1930, by levels, the total footage prior to January 1, 1930, and the total footage at December 31, 1953.

Level	Drifts		Crosscuts		Raises	
	1953	Jan. 1, 1930, to Dec. 31, 1953	1953	Jan. 1, 1930, to Dec. 31, 1953	1953	Jan. 1, 1930, to Dec. 31, 1953
	feet	feet	feet	feet	feet	feet
100-foot	42	542	205	263	.....	58
200-foot	.....	3,498	.....	868	.....	16
300-foot	.....	2,534	.....	824	.....	525
400-foot	58	4,251	.....	1,553	.....	904
550-foot	237	6,017	251	1,592	245	2,059
700-foot	21	4,217	.....	1,072	223	936
850-foot	.....	5,843	.....	2,055	.....	1,306
1,000-foot	.....	4,753	.....	1,826	.....	1,310
1,125-foot	.....	6,702	.....	2,211	.....	657
1,250-foot	.....	3,820	.....	1,519	.....	369
1,375-foot	.....	7,667	.....	2,617	.....	1,122
1,500-foot	98	7,028	.....	1,648	44	1,087
1,625-foot	38	8,836	.....	3,563	344	2,321
1,750-foot	.....	6,236	.....	1,397	242	1,347
1,875-foot	24	9,652	.....	2,646	129	1,279
2,000-foot	.....	7,511	.....	2,736	.....	1,246
2,125-foot	38	10,334	.....	2,749	69	1,820
2,250-foot	.....	11,809	.....	3,413	.....	1,577
2,400-foot	89	9,793	31	3,119	.....	1,817
2,550-foot	.....	6,712	.....	2,789	116	2,030
2,700-foot	.....	8,726	.....	2,599	18	1,483
2,850-foot	.....	2,872	.....	2,627	.....	2,016
3,000-foot	.....	3,793	.....	2,767	382	2,020
3,150-foot	.....	6,673	.....	1,879	.....	1,602
3,300-foot	.....	6,694	.....	1,618	609	2,659
3,450-foot	.....	5,749	.....	1,641	.....	1,422
3,600-foot	64	2,956	41	1,949	259	1,511
3,750-foot	49	4,263	.....	1,483	.....	1,337
3,900-foot	34	4,697	.....	1,435	202	828
4,050-foot	185	5,627	.....	2,343	182	2,312
4,200-foot	.....	5,238	.....	1,871	.....	1,789
4,350-foot	.....	5,892	.....	1,718	202	2,888
4,500-foot	.....	5,727	.....	2,314	.....	2,447
4,650-foot	165	6,097	55	1,463	172	1,577
4,800-foot	.....	4,718	.....	1,648	157	1,510
4,950-foot	.....	3,102	.....	2,071	292	1,920
5,100-foot	.....	5,297	.....	1,390	143	2,018
5,250 foot	.....	2,127	.....	1,101	154	886
5,400-foot	105	1,721	22	795	208	524
5,550-foot	.....	2,554	.....	734	90	662
5,700-foot	201	737	151	417	.....	147
5,850-foot	.....	2,279	.....	542	.....	142
6,000-foot	272	718	41	410	.....	233
6,150-foot	.....	3,258	.....	846	81	227
6,300-foot	.....	711	.....	812	.....	184
6,450-foot	.....	.....	.....	154	.....	.....
6,600-foot	.....	926	.....	711	.....	36
6,750-foot	394	1,547	.....	650	.....	147
6,900-foot	.....	929	.....	565	123	446
7,050-foot	700	1,894	117	799	234	732
7,200-foot	.....	2,181	.....	1,486	.....	376
Total	2,814	237,454	914	83,293	4,920	59,867
Total footage prior to Jan. 1, 1930	.....	61,459	.....	12,301	.....	942
Total footage to Dec. 31, 1953	.....	298,913	.....	95,594	.....	60,809

Mining and milling continued throughout 1953. The following table shows the depths of the shafts and the winze that serve the mine:

	Number of compartments	Depth from surface
		feet
No. 1 shaft[1]	2 to 2,000 feet 3 to bottom	2,285
No. 2 shaft[2]	2	319
No. 3 shaft	3 to 1,200 feet 4 to bottom	4,089
No. 4 shaft	3	4,000
No. 5 winze (below 3,600-foot level)	4 to 6,450 feet 3 to bottom	7,272

The following is taken from the general manager's report for the twelve months ending August 31, 1953:

Some 191,870 dry tons of ore, averaging 0.446 ounces gold, were milled from which were recovered 82,551.115 ounces gold and 16,440.65 ounces silver; $2,845,995.97 was received from marketing this bullion. In addition to the bullion produced, $188,197.26 is estimated as receivable under The Emergency Gold Mining Assistance Act for the fiscal year 1953. An average price for gold of $34.33 per ounce was received from the Royal Canadian Mint as compared with $35.70 in the previous fiscal year. This difference was largely owing to the appreciated Canadian dollar in terms of the United States dollar; $0.83 per ounce was received for silver.

Total cost of supplies consumed for the year, plus power, services, and freight, increased; they amounted to $608,681.84 as compared with $603,251.17 last year.

The over-all production record shows that, from the commencement of operations in 1921, a total of 7,858,773 tons of ore was milled at a value per ton of $17.40 for a gross value of $136,750,122, a recovery per ton equal to $16.61 and bullion produced of $130,501,265.

Operating Costs

Description	Total cost	Cost per ton milled
Development, exploration, and pumping	$ 226,188.25	$ 1.179
Stoping	945,981.81	4.930
Transporting ore, hoisting, etc.	348,176.47	1.815
Milling charges	289,156.08	1.507
General surface, store-house, and miscellaneous mine-buildings charges	98,609.08	0.514
Stock transfer, dividend, excise stamps, annual report expense, property taxes, and fire protection	71,576.60	0.373
Unemployment and employees' group life insurance, silicosis, workmen's compensation, and hospitalization	101,626.42	0.530
General and miscellaneous undistributed charges	93,602.13	0.488
Financial and corporate expense	6,853.96	0.035
Marketing bullion	6,695.91	0.035
Total	$2,188,466.71	$11.406
Provision for taxes	$ 230,000.00	
Royal Mint special bullion handling tax	16,491.37	$ 1.396
Depreciation, buildings, and equipment	21,406.01	
	$2,456,364.09	$12.802
Less estimated assistance	188,197.26	0.981
Estimated total	$2,268,166.83	$11.821

[1]Now used for ventilation.
[2]Now used as a sand pass.

Milling Statistics

(September 1, 1952, to August 31, 1953)

Ore milled	tons	191,870
Average grade per ton		$15.27
Average grade gold	ounces	0.446
Gross value	$2,929,524.41	
Loss in tailings	83,528.44	
Net value recovered		$2,845,995.97
Average tons milled per day		525.67
Solution precipitated	tons	764,140
Solution precipitated per ton of ore	tons	3.98
Recovery	percent	97.15
Zinc consumed per ton of solution	ounces	0.188
Zinc consumed per ton of ore	ounces	0.751
Cyanide consumed per ton of ore	pounds	0.510
Lime consumed per ton of ore	pounds	4.784
Steel balls consumed per ton of ore (ball mills)	pounds	1.228
Average peak load, crushing and milling	horsepower	1.426
Average peak per ton milled per day, crushing and milling	horsepower	2.71
Power cost per horsepower year		$28.53
Yield per ton of ore		$14.83
Value per ton in tailings		$0.435
Average grade in ounces gold in tailings		$0.013
Average value of pregnant solution per ton		$3.72
Cost of flotation reagents consumed per ton of ore		$0.009
Cost of crushing per ton of ore milled	$0.114	
Cost of ball milling per ton of ore milled	$0.220	
Cost of tube milling per ton of ore milled	$0.152	
Cost of all other milling per ton of ore milled	$0.872	
Total milling costs per ton of ore milled		$1.358

Development and Exploration

(August 31, 1953)

Ore disclosed on the 7,050-foot level was on the north *D* vein structure above ore opened by drifting the year previous on 7,200-foot level. Both the north vein and the north-heading vein were further explored by additional raising and sublevel drifting, and ore was partially blocked out in localized areas between the 7,200- and the 6,900-foot levels. Following the completion of this, stope preparation will follow. Diamond-drilling totalled 7,120 feet in 36 holes as compared with 5,969 feet in 34 holes the previous year. This exploratory drilling continues.

The mill operated continuously at an average daily rate of 525.671 tons and treated 191,870 tons of ore, 1,240 tons greater than the previous year. The average grade was 0.446 ounces or $15.27 per ton (at $34.33, the average gold price received). Tailings loss was 0.013 ounces or $0.435 per ton, an extraction of 97.15 percent. The wood tailings line conveying current mill tailings to the Lake Shore mill was replaced with a new 8-inch line.

Experienced miners were in short supply although there was ample supply of labour inexperienced in underground work.

With the complete adoption of tungsten-carbide detachable bits and longer rods, and with lighter pusher-type rock-drills, an appreciable increase in efficiency has been effected, both in stoping and in development work of all classes.

In the No. 5 winze deep levels (7,200- to 6,750-foot), the blocking out of ore by raises and subdrifts continued. Production of ore and waste from the winze horizons was held to capacity of the facilities of this section of the mine.

In New Brunswick, two groups of 30 and 40 claims were staked in the Bathurst area and explored by reconnaissance geological surveys. Most of the area is heavily overburdened. In east-central Manitoba, 27 claims were staked at Utik Lake and prospected throughout the open season.

In Saskatchewan, east of Beaverlodge on the north shore of Lake Athabaska, an 11-claim group on which uranium-bearing mineral had been located, was optioned, and an additional 17 claims adjoining on the north and south were staked. Prospecting was followed by diamond-drilling, which is still in progress. In the middle Foster Lake district, 9 claims were acquired by purchase on which radioactive sections were found. A detailed geological and rate-meter survey is currently being completed.

In Quebec, in the southern Chibougamau section, further surface work was continued on a 14-claim group staked the previous year; the two optioned groups to the west that had been intensively explored last season were idle.

In western Ontario, Kenora district, an optioned group was relinquished after completion of surface-trenching and sampling. A geological and geo-magnetic survey was done under an examining option on ground east of Kirkland Lake. Claims were staked in the area for further examination.

Some 198 claims are held by patent or location, comprising 17 groups, and an additional 26 claims in 3 groups, by option; 115 claims in 6 groups were staked, and 74 claims in six groups were abandoned. An 8-claim group under option was relinquished.

An average of 438 men was employed, of whom 287 were underground and 151 on the surface. R. L. Healy is general manager.

Young-Davidson Mines, Limited

Young-Davidson Mines, Limited, was incorporated in April, 1926, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,584,108 have been issued. The officers and directors are: A. R. McKay, president; W. T. Davidson, vice-president; G. W. Adams, secretary-treasurer; A. C. Ross and A. R. W. McKay, directors. The head office is at 320 Bay Street, Toronto. The mine address is Matachewan.

The property, consisting of 13 claims and surface rights to part of 5 claims, is in Powell township, Matachewan area, district of Timiskaming. It is operated under agreement by Hollinger Consolidated Gold Mines, Limited. A reference to the 1953 operations appears on page 30 of this report.

Mining and milling operations continued throughout 1953. The mine is served by a vertical shaft and winze, as shown in the following table:

Shaft	Number of compartments	Depth below surface
No. 1	3	1,075
No. 2 winze (below 463-foot level)	2	1,530

The following table shows the development work done in 1953 and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st		2,290		1,055		1,271
2nd		3,032		1,048		2,001
3rd		1,597		1,256		2,081
4th		1,265		1,054		1,894
5th	43	1,043		813	105	1,263
6th		713	6	852	135	943
7th		347			8	291

Mining above the fourth level (865-foot) is completed, and an open pit extends from surface to this level.

Exploratory diamond-drilling in 1953 consisted of two holes, totalling 889 feet, from underground. In addition, 32,103 feet of diamond-drilling was done for blast-hole mining.

There were 323,206 tons of ore hoisted. The mill treated 323,100 tons at an average daily rate of 888 tons.

An average of 135 men was employed, of whom 80 were underground and 55 on the surface. J. G. Sparrow is resident manager.

GRAPHITE

Frobisher, Limited

(Black Donald Graphite Division)

Frobisher, Limited, carried on surface operations in 1953 at the Black Donald mine on lots 17, 18, and 19, concession III, and lots 15 and 16, concession IV, Brougham township, Renfrew county.

The graphite ore on the surface of the orebody at the old mine was excavated. About 30,538 tons of ore from this operation were milled.

A Leahy vibrating screen manufactured by the Deister Concentrator Company, and an air skimmer made by the American Air Filter Company, were added to the mill circuit.

B. G. Edward was manager, employing an average of 68 men. The mine address is Black Donald Mines. The company's head office is at 25 King Street West, Toronto.

GYPSUM

Canadian Gypsum Company, Limited

The Canadian Gypsum Company, Limited, was incorporated in September, 1907. The authorized capitalization is 3,000 shares of $100 par value, of which 2,710 have been issued. The officers and directors are: O. M. Knode, president; H. F. Sadler and Edward Rembert, vice-presidents; F. L. Stellner, secretary-treasurer; S. L. Avery, J. E. MacLeish, and F. B. Gibbs, directors. The head office is at Windsor, N.S. The business office is at 170 Bloor Street West, Toronto. The mine address is Box 99, Hagersville.

The company operates a gypsum mine and plant near Hagersville, in Oneida township, Haldimand county.

The mine is operated through a main, vertical shaft, 102 feet deep. There is also a vent and escapement shaft, 90 feet deep.

The mine and mill operated throughout 1953. A total of 173,254 tons of gypsum ore was hoisted. The mill treated 170,669 tons, and 2,585 tons were sent to the stockpile. About 21,851 tons of ore from the stockpile were crushed and shipped.

R. J. Burns is works manager. An average of 50 men was employed, of whom 48 were underground and 2 on the surface.

Gypsum, Lime and Alabastine, Canada, Limited

Gypsum, Lime and Alabastine, Canada, Limited, was incorporated in July, 1927, with an authorized capitalization of 500,000 shares of no par value, of which 440,043 have been issued. The officers and directors are: P. P. Tyler, president; J. E. McConnell and S. G. Dixon, vice-presidents; C. G. Cockshutt, chairman of the board; K. P. Hayes, treasurer; S. H. J. Reid, secretary; J. H. Robinson, director and general manager; R. W. Cooper, R. A. Bryce, and G. H. Dobbie, directors. The head office is at Paris. The Toronto office is at 57 Maitland Street. The mine address is Caledonia.

The company has two gypsum properties and a mill in Seneca township, Haldimand county.

The old mine, on lot 10, range 1, was operated from January 1 to September 30, 1953, and produced 64,687 tons of gypsum. Operations at the new mine on lot 8, range 2, were begun in May, 1953, and continued until the end of the

year. The production amounted to 99,643 tons. The total production from both mines was 164,330 tons.

A 40- by 50-foot dry-house and an addition to the lamp room were built at the new mine. The Joy shuttle buggy formerly used in the old mine was transferred to the new mine, and a new similar unit was bought. Both are used for the transfer of ore in the new mine.

An average of 61 men was employed. J. E. Gillespie is manager.

IRON

Algoma Ore Properties, Limited

Algoma Ore Properties, Limited, was incorporated in February, 1936, with an authorized capitalization of 50,000 shares of no par value, all of which have been issued. The officers and directors are: Sir James Dunn, president; D. S. Holbrook, executive vice-president; G. W. MacLeod, vice-president and general manager; J. A. McPhail, vice-president; H. G. MacAdam, secretary; W. E. Morley, treasurer; J. B. Barber, comptroller; Lady Marcia Dunn, E. G. McMillan, G. C. Bateman, H. S. Hamilton, and E. W. Shell, directors. The head office is at Sault Ste. Marie. The mine address is Jamestown.

The company, which is a wholly owned subsidiary of the Algoma Steel Corporation, Limited, holds various iron properties in the district of Algoma, including the Helen, Victoria, and Alexander mines.

Mining operations on the Helen orebody continued throughout 1953. A vertical, two-compartment winze, known as No. 4, was collared on the second level and sunk to a point 282 feet below the third level. The winze will be used to service stope development work.

A new vertical, three-compartment shaft, known as No. 5, was collared and sunk a distance of 40 feet. The sinking will be continued in 1954. It is planned to use the new shaft for servicing deep development.

The drive from the second level of the Helen orebody to the Alexander orebody, which was started in 1952, was completed in 1953.

The following table shows the amount of development work done in 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
1st	5,177	.....	2,135
subdrifts	2,773	.....	.....
2nd	3,330	.....	3,490
subdrifts	1,170	2,886	.....
3rd	.....	.....	.....

Diamond-drilling during the year consisted of 15 holes totalling 4,996 feet, from surface, and 317 holes totalling 43,749 feet, from underground.

A boiler-house, compressor-house, and powder-house were built at the mine. Construction at the sinter plant included an addition to house No. 5 sintering machine, a Euclid garage, additions to the coke plant and the storage-bin, and a new compressor-house.

A 53- by 36-inch double-drum Canadian Ingersoll-Rand hoist was installed at No. 4 winze. A 948- by 126-inch Elliptex dewatering screen, manufactured by Hewitt-Robins (Canada), Limited, was added to the No. 1 crusher circuit. Other new equipment included two, No. 8603 Waterous boilers in the mine boiler-house, and a 600-horsepower XVHE-2 Canadian Ingersoll-Rand com-

pressor in the mine repair shop. A sinter machine, 6 feet by 76 feet 6 inches, made by the American Reclamation Company, was installed in the sintering plant, raising the capacity of the plant to 1,500,000 tons yearly.

Production came from Nos. 1, 2, 3, 4, 5, and 6 blocks of the orebody. A total of 1,822,392 tons of siderite ore was hoisted.

The sinter plant at Jamestown operated throughout 1953, and produced 1,224,746 tons of sinter.

An average of 109 men was employed, of whom 317 were underground, 341 on the surface, and 109 in the sintering plant. R. F. Palmer is manager.

Bethlehem Mines Corporation

Bethlehem Mines Corporation is a wholly owned subsidiary of the Bethlehem Steel Corporation. It was incorporated in West Virginia, U.S.A., in 1916, with a capitalization of 2,000 shares of $100 par value. The officers and directors are: A. F. Peterson, president; N. Berkeley, S. J. Cort, P. S. Killian, J. M. Larkin, and P. B. Entrekin, vice-presidents; R. E. McMath, secretary and vice-president; J. P. Bender, treasurer; R. H. Schlottman, auditor and director. The head office and mine office are at Marmora.

The corporation operates property in Marmora and Rawdon townships, Hastings county, under lease from Marmoraton Mining Company, Limited.

The work of stripping the overlying sedimentary limestone from the iron orebody in preparation for open-pit operations was continued in 1953. A total of 9,500,936 tons of limestone was stripped during the year.

The combination office, change-house, shop, and warehouse building, begun in 1952, was completed in 1953. The building has a floor area of 43,000 square feet. A concrete-block oil-house was built. A 25,000-gallon steel water-storage tank, 80 feet high, was erected. The construction of the concentrating and pelletizing plant was begun.

Boat-loading facilities for the transportation of the iron product were constructed on a high bluff at the end of a railway spur, on the shore of the Bay of Quinte, about two miles north of the town of Picton, in Prince Edward county.

An average of 209 men was employed. H. O. Olsen is general superintendent.

Caland Ore Company, Limited

Caland Ore Company, Limited, is a wholly owned subsidiary of the Inland Steel Company, of Chicago. It was incorporated in 1949 with an authorized capitalization of 1,000 shares of no par value. The officers and directors are: C. B. Randall, chairman; P. D. Block, Jr., president; C. B. Jacobs, vice-president; A. J. Cayia, vice-president and general manager; R. L. Peters, treasurer; Graydon Megan, secretary; J. L. Block, director. The executive office is at 38 South Dearborn Street, Chicago, Illinois, U.S.A. The mine address is Atikokan.

The company holds a 99-year lease from Steep Rock Iron Mines, Limited, on a section of the *C* orebody at the east end of Steep Rock Lake.

Late in 1953 a contract was let for the removal of silt from *C* orebody. The dredging operation is thought to be the largest ever undertaken. The initial contract is for the removal of 160,000,000 cubic yards of material. Two 36-inch, hydraulic dredges, capable of moving 5,000 cubic yards of silt an hour, will be built.

P. D. Pearson is manager.

Mag-Iron Mining and Milling, Limited

Mag-Iron Mining and Milling, Limited, was incorporated in April, 1949, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 2,560,786 have been issued. The officers and directors are: A. L. Laing, president; W. G. Chipp, secretary-treasurer; F. N. McCallum and H. C. Elliott, directors. The head office is at 80 King Street West, Toronto. The mine address is Millbridge.

The property, consisting of seven claims, is in Lake and Wollaston townships, Hastings county.

Operations were carried on until October 23, 1953, on an open cut along the magnetite-bearing zone. About 9,375 tons of crushed ore and 125 tons of concentrate were shipped before the operation was suspended for the winter.

Stanley Lavender was superintendent. An average of 10 men was employed.

Steep Rock Iron Mines, Limited

Steep Rock Iron Mines, Limited, was incorporated in February, 1939. The authorized capitalization is 10,000,000 shares of common stock of $1 par value, and 30,000 shares of preferred stock of $100 par value. The number of shares issued at the end of 1953 was: common, 7,360,444; preferred, 20,000. The officers and directors are: C. S. Eaton, chairman of the board; M. S. Fotheringham, president and general manager; Neil Edmonstone, secretary-treasurer and controller; W. R. Daley, J. G. Cross, D. H. McDougall, Hon. G. E. Allen, Mark McKee, John Paterson, F. H. Black, and C. J. Burchell, directors. The head office and mine office are at Steep Rock Lake.

The company owns 161 claims in Freeborn and Schwenger townships, district of Rainy River.

Operations continued throughout 1953. The amount of ore mined from the *A* and *B* orebodies in 1953 is shown in the following table:

	Tons
B orebody:	
Open pit	755,143
Underground	29,014
A orebody:	
Open pit	795,434
Total	1,579,591

Diamond-drilling in 1953 consisted of 37 holes totalling 14,262 feet, from surface, and 110 holes, totalling 13,593 feet, from underground.

B (Errington) Orebody

Open pit mining on the *B* orebody was completed in 1953, and the pit was closed on December 5. The total number of cubic yards of material removed from the open pit since the start of operations is shown in the following table:

Material	Cubic yards
Ore mined	3,734,233
Waste in ore	1,380,779
Overburden (silt and boulders)	28,464,098
Rock	5,308,492
Total	38,887,602

A total of 9,165,844 tons of ore has been mined from the open pit since the start of operations.

Underground development work on the *B* orebody is done from the vertical, three-compartment, No. 1 Errington (or Float Ore Island No. 1B) shaft, 1,263 feet deep. The following table shows the amount of development work done during 1953 and the totals at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
175-foot	171	333	.....	.....	549	1,182
500-foot	.....	.....	.....	536	709	1,460
700-foot	2,630	2,822	1,883	3,250	356	920
900-foot	1,036	1,681	1,778	2,458	1,222	1,510
1,100-foot	920	1,048	892	2,307	697	1,000

A 76- by 20-foot steel and cement-block, portal building at No. 1 Errington shaft, and an 80- by 36-foot concrete building to house the mine air-heating plant were erected. A 36-inch by 3,744-foot conveyer belt, capable of carrying 400 tons per hour, was installed underground. Pending completion of the underground crusher, ore will be loaded directly on to the conveyer belt.

A (Hogarth) Orebody

Stripping operations on the *A* orebody continued throughout 1953.

The total number of cubic yards of material removed from the *A* orebody since the start of operations is shown in the following table:

Material	Cubic yards
Ore mined	324,066
Waste in ore	73,476
Overburden (silt and boulders)	46,971,838
Rock	578,622
Total	47,948,001

The dredging of the *A* orebody will probably be completed late in 1954.

G Orebody

The *G* orebody lies between the *A* and *B* orebodies. When the dredging of the *A* orebody is completed, the dredges will be moved south to the *G* zone. Removal of the silt from the *G* orebody is expected to take four years. A tunnel is being driven from the *G* zone to the west arm of Steep Rock Lake to supply water for the dredging.

C Orebody

A 99-year lease on a section at the east end of Steep Rock Lake, in *C* zone, has been given to the Caland Ore Company, Limited, a Canadian subsidiary of the Inland Steel Company, Limited, of Chicago. Further details appear on page 107 of this report under Caland Ore Company, Limited.

The following is taken from the president's report to the shareholders for the year ending December 31, 1953:

> The company has just completed the most successful year in its history. Shipments of 1,301,688 tons of high-grade iron ore produced an operating profit of $4,791,000 before interest and write-offs, and a net profit of $3,450,000 after all charges.

Production Progress

> The year 1953 marked the commencement of open-pit mining on the Hogarth orebody and underground mining on the Errington orebody, while open-pit mining on the Errington orebody was completed.

The new Hogarth mine came into commercial production on August 1. Actual operations during the balance of the shipping season proved the ore in the sections mined to be at least as extensive and as high in quality as pre-operating estimates. Substantial shipments from the Hogarth open pit are planned for the 1954 season.

The new Errington No. 1 underground mine will also be the source of substantial production in 1954. Small initial shipments were made in 1953 from the development headings on this mine, now being readied for full-scale operation. Development work to date has revealed underground ore widths to be greater than those experienced in the open pit, with ore of comparable high quality.

The company's large-scale development program contemplates an annual productive capacity of 3,500,000 tons for these two new mines alone.

Ore Reserves

The Steep Rock iron range has approximately seven miles of contact zone favourable for iron ore deposition. Exploration to date along three and a half miles of this zone has resulted in the discovery of four large orebodies (the *A*, *B*, *C*, and *G*) having an annual production potential of 8,500,000–10,000,000 tons.

Further confirmation that the Steep Rock orebodies extend to great depths was obtained in 1953 when deep drilling intersected the downward extension of the Errington ore zone at 2,100 feet below the original surface and revealed ore of the same high quality as that mined from the open pit above. The new deep drill hole was put down from the 1,100-foot level of the Errington No. 1 underground workings. Previous drilling had confirmed ore to 1,300 feet of depth on the Hogarth zone. The new deeper drill hole on the Errington zone affirms the extension of the Steep Rock orebodies to great depths, assuring the continuity of large-scale production for many decades.

The Community

The community of Atikokan has grown from a population of 300 in 1943 to 4,500 in 1954. The Inland Steel development, in addition to the Steep Rock company's own program, will expand the population to three or four times the present figure. The community has been greatly assisted and benefited by the Ontario Department of Planning and Development and the Central Mortgage and Housing Corporation of the Canadian Government in acquiring several hundred acres for building sites, in planning the most economic and aesthetic utilization of the land, and in making mortgage loans available to prospective home builders.

The Ontario Department of Highways has filled a vital need of the community by completing a 75-mile road linking Atikokan with the Trans-Canada Highway and giving motor access to the Lakehead cities of Port Arthur and Fort William.

An average of 1,027 men was employed, of whom 457 were underground and 570 on the surface. W. E. Bennett is general superintendent.

LEAD AND ZINC

Consolidated Matarrow Mines, Limited

Matarrow Mines, Limited, was incorporated on July 26, 1948, with an authorized capitalization of 4,000,000 shares of $1 par value. On November 15, 1948, the name was changed to Matarrow Lead Mines, Limited. On March 9, 1953, the company was reorganized and the name was changed to Consolidated Matarrow Mines, Limited. The capitalization was decreased from 4,000,000 shares to 1,000,000 shares of $1 par value by the cancellation of 3,000,000 shares. It was then increased to 4,000,000 shares of $1 par value by the creation of an additional 3,000,000 shares. The shareholders of Matarrow Lead Mines, Limited, received one share of the new stock for four shares of the old. The officers and and directors are: John Pump, president; C. A. Martin, vice-president; J. C. Rodgers and E. R. Sugarman, directors. The head office is at 50 King Street West, Toronto. The mine address is Matachewan.

The property is in Yarrow township, Matachewan area, district of Timiskaming.

The mine is served by a vertical, three-compartment shaft, 347 feet deep, with levels at 150 and 300 feet.

Mining operations continued, under the direction of Matachewan Consoli-

dated Gold Mines, Limited, from January 1 to February 11, 1953. No development work was done during the period. The following table shows the total amount of development work when operations were suspended:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
150-foot	1,542	61	165
300-foot	1,028	255	355

Three diamond-drill holes, totalling 855 feet, were drilled from surface in 1953.

There were 6,295 tons of ore hoisted; 6,022 tons were treated in the Matachewan Consolidated mill.

G. H. McDougall was manager and was succeeded by A. A. Dundas. An average of 36 men was employed during the period of operation.

Jardun Mines, Limited

Jardun Mines, Limited, was incorporated in October, 1951, with an authorized capitalization of 4,000,000 shares of $1 par value, of which 2,725,007 have been issued. The officers and directors are: Steven Yackso, president; J. L. Elliott, vice-president; R. A. Whitely, secretary; I. A. MacDonald, W. W. Dennis, and J. H. Parsons, directors. The address of the head office and mine office is Box 141, Sault Ste. Marie.

The company owns 2 claims and leases 11, in Jarvis and Duncan townships, district of Algoma.

Operations were resumed on May 1, 1953, and continued for the rest of the year.

The underground workings of the old Victoria and Cascade mines were not dewatered.

A new vertical, two-compartment shaft, No. 4, was sunk to a depth of 251 feet on mining location No. 37H. Levels were established at 125 and 225 feet. The following table shows the amount of development work done from the new shaft in 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
125-foot	16	88	.....
225-foot	.....	44	.....

Construction work in 1953 included a 60-foot timber headframe at No. 4 shaft, hoist-room, temporary compressor-house, ore bin, powder-house, fuse- and cap-house, shed for water tank, and five-room dwelling house. A 10- by 12-inch Jenckes air hoist and a 236-cubic feet-per-minute, type HRV4, Atlas diesel portable air compressor were installed.

There were 187 tons of ore hoisted.

An average of 22 men was employed, of whom 4 were underground and 18 on the surface. M. C. Halstead is manager.

Saratoga Exploration Company, Limited

The Saratoga Exploration Company, Limited, was incorporated in February, 1947, with an authorized capitalization of 3,000,000 shares of no par value. In

1953 the capitalization was raised to 4,000,000 shares of no par value, of which 2,280,005 have been issued. The officers and directors are: R. F. Hardy, president; W. J. Wilson, vice-president; J. M. Anderson, secretary-treasurer; J. F. McGinn and A. W. Symons, directors. The head office is at 22 Toronto Street, Toronto. The mine address is Ripple.

The company's main property is a lead-zinc-silver prospect, consisting of 15 claims, in township 80, district of Thunder Bay, about 25 miles east of Schreiber, on the Canadian Pacific railway. Its holdings also include 5 claims in Hearst township, district of Timiskaming, and 11 claims in Dent township, Patricia portion of Kenora district.

Mining operations were continued in the early part of 1953 at the property in township 80, Thunder Bay district.

The workings, on claim T.B.38060, consist of an adit 154 feet long in the side of a hill and a vertical, two-compartment shaft, 51 feet deep, collared a few feet east of the mouth of the adit. There is a level 47 feet below the collar of the shaft, on which 70 feet of drifting has been done. No work was done from the shaft in 1953. About 100 feet of the drifting on the adit level was done in 1953. The operation was then suspended.

W. S. Rice was superintendent, employing 3 men, 2 on surface and 1 underground.

MAGNESIUM

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 412,220 have been issued. The officers and directors are: R. J. Jowsey, president; Maurice Crabtree, secretary; H. B. Clearihue, treasurer; L. G. White, director and general manager; W. B. Maxwell, J. G. Weir, C. C. Calvin, Thayer Lindsley, H. D. Scully, and Dr. L. M. Pidgeon, directors. The head office is at 320 Bay Street, Toronto. The mine address is Haley.

Operations continued throughout 1953 at the company's quarry and plant about three miles from Haley in concessions V and VI, Ross township, Renfrew county.

An average of 398 persons was employed. D. J. McPhail is manager in charge at the property.

MICA

J. C. Donnelly (Otty Lake Mine)

J. C. Donnelly, Stanleyville, and one assistant operated the Otty Lake mine on lot 1, concession 8, North Burgess township, Lanark county, for two months in 1953. About 3,300 pounds of mine-run mica and 25 tons of scrap mica were produced.

William Herald and Associates

William Herald of Sundridge and associates operated a mica pit on lots 4 and 5, concession 13, Croft township, district of Parry Sound, for about two months in 1953. About 6,500 pounds of mica was mined and shipped to the Spruce Pine Mica Company, Spruce Pine, North Carolina, U.S.A.

Clarence Sparks was in charge of operations, employing three men.

North Bay Mica Company, Limited[1]

The North Bay Mica Company, Limited, was incorporated under Dominion charter in January, 1950. The authorized capitalization is 50,000 shares of no par value, all of which have been issued. The officers and directors are: H. L. Roscoe, president; J. R. Bradfield, secretary-treasurer; G. A. Reynolds and N. C. Urquhart, directors. The head office and mine office are at North Bay.

Purdy Mine

The company owns three claims, including the Purdy mine, in Mattawan township, district of Nipissing.

Work was carried on at the Purdy mine from January 1 to September 30, 1953. A total of 161 tons of crude mica was obtained from the mining of 5,934 tons of rock in open stoping above the adit, and from Nos. 1, 3, and 8 pits. It was trucked to North Bay for processing.

Brent Property

The company took an option on claim E.O.5654, Deacon township, Algonquin Park, known as the Brent property, and carried on surface operations from April to June, 1953. About 560 tons of rock, yielding 1½ tons of rough mica, were mined. The option was then dropped.

George Miller was manager of both operations, employing 13 men.

NEPHELINE SYENITE

American Nepheline, Limited

American Nepheline, Limited, was incorporated in January, 1945, with an authorized capitalization of 3,000,000 shares of no par value, all of which have been issued. The officers and directors are: Thayer Lindsley, president; Ernest Craig, vice-president and general manager; H. R. Deeth, vice-president; M. R. Jennings, secretary; J. C. Rix, treasurer; C. R. Archibald, W. G. Hubler, A. L. A. Richardson, and C. J. Koenig, directors. The head office is at Lakefield. The mine address is Nephton, via Lakefield.

The mine is on lot 14, concession IX, Methuen township, Peterborough county.

Operations continued throughout 1953. The ore was mined by benching methods from the open pit in the Cabin Ridge section of the property. A total of 157,556 tons of ore was mined, and 154,152 tons were milled after sorting.

Diamond-drilling consisted of 10 holes, totalling 2,815 feet, from surface.

Additional dust-collection equipment was installed in the mine plant during the summer.

An average of 119 men was employed, of whom 35 were in the pit. E. B. Wright is superintendent.

[1]Owing to an error, the report on this company was omitted from Vol. LXII, part 2, *Mining Operations in 1952*. Operations at the Purdy mine were carried on throughout 1952. Some development work was done on the adit level. A total of 176 tons of crude mica was mined by open stoping and from the No. 1 pit.

NICKEL AND COPPER

East Rim Nickel Mines, Limited

East Rim Nickel Mines, Limited, was incorporated in October, 1950, with an authorized capital of 3,500,000 shares of $1 par value. In September, 1952, the capitalization was increased to 4,500,000 shares of $1 par value, all of which have been issued. The officers and directors are: G. H. Johnson, president; N. F. Tisdale and W. C. Campbell, vice-presidents; G. M. Marshall, secretary-treasurer; Fernand Dufresne, Hector Authier, J. H. Westell, and E. M. Cohan, directors. The head office is at 100 Adelaide Street West, Toronto. The mine address is Box 93, Sudbury.

The company owns 23 claims in Maclennan township, district of Sudbury, including the former Ontario Nickel property.

Operations continued throughout 1953.

There are two vertical shafts on the property, as shown in the following table:

Shaft	Number of compartments	Depth
		feet
No. 1	2	265
No. 2	3	728

The present development is being done from No. 2 shaft. The workings from No. 2 shaft are connected on the 250-foot level with the old workings from No. 1 shaft. The following table shows the development work done during 1953, and the total amounts done by the present operators to the end of 1953:[1]

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
1st	334	1,186	268	642	....	123
2nd	70	1,255	83	718	744	1,038
3rd	252	671	240	608	.....	.....

Raises for ore-pass and waste-pass systems were driven during 1953.

Diamond-drilling in 1953 consisted of 93 holes, totalling 12,346 feet, from underground.

There were 40,373 tons of ore hoisted, and 35,229 tons of sorted ore were crushed and shipped to the Falconbridge smelter for treatment.

Construction during 1953 included a crusher-house, a screen-house, a mill building for grinding and concentrating, an addition to the substation building, a 100,000-gallon wooden water-tank, a magnetics bin, a coarse-ore bin, and a waste bin. Three, 600-kilovolt-ampere (22,000/575 volts) English Electric transformers were installed. The following additions were made to the crushing and screening plant equipment: a 30- by 42-inch Birdsboro Buchanan jaw crusher, a 4-foot Symons cone crusher, a 42- by 60-inch Jeffrey feeder, two 36- by 26-inch Dings magnetic pulleys, two, 4- by 8-foot double-deck Tyler screens, and a conveyer system.

An average of 78 men was employed, 45 underground and 33 on the surface. J. M. Kilpatrick is general manager.

[1]The former operators did 2,980 feet of drifting, 700 feet of crosscutting, and 380 feet of raising on the 1st level, from No. 1 shaft.

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 3,676,272 have been issued. The officers and directors are: Thayer Lindsley, president; H. J. Fraser, vice-president and general manager; R. Campbell, secretary; A. W. Coome, treasurer, W. B. Maxwell, W. S. Morlock, J. M. Cunningham-Dunlop, and W. F. James, directors. The head office is at 44 King Street West, Toronto. The mine address is Falconbridge.

The company operates nickel-copper mines, a concentrator and smelter in the Sudbury area, and a refinery at Kristiansand, Norway.

The following is taken from the annual report of the company for the year ending December 31, 1953:

The First Twenty-five Years

Falconbridge Nickel Mines, Limited, was incorporated in Ontario on August 28, 1928. To many observers, this appeared to be an event of only passing interest since the history of newcomers to the nickel industry was almost entirely one of failure. Success in the nickel business required money, ore, proven smelting and refining processes, and markets as well as good management. During 1928, Ventures, Limited, purchased from the Bennett-Longyear interests of Minneapolis, the Falconbridge property, first explored by Thomas A. Edison in 1901. This and other mining properties, together with some cash, were given by Ventures to Falconbridge at its incorporation, in exchange for stock. From Raffineringsverket Aktieselskap, the Falconbridge Company purchased the existing 1,250-ton Norwegian nickel refinery along with the Hybinette process rights. This nickel refinery had been operating at Kristiansand, Norway, for some years but had been dependent, in part, on purchased or custom ores—not always available.

Ore in Canada and a refinery in Norway may have appeared then, as it may still appear to some, as an unusual if not unsatisfactory combination. However, the original decision to refine in Norway was predicated not only on an existing refinery with treatment rights and know-how, but also on lower indicated operating costs, largely owing to low-cost power, a major factor in electrolytic metal refining. Furthermore, there was an expanding European market, in which at that time and for many years thereafter, the nickel price was considerably higher than in America. Brandeis, Goldschmidt and Company, experienced London metal brokers, were commissioned to develop this European market.

Camp construction was commenced in 1928 in the relative wilderness of Falconbridge township, followed by shaft-sinking, mine preparation, and later, construction of a smelter. The newly purchased refinery was enlarged to double its existing capacity. In spite of the stock market crash in 1929 development continued. On February 4, 1930, the smelter was "blown in" and shortly thereafter the mine was placed on a production rate of 250 tons a day. The first metal sales were achieved in late 1930 when European industry was deep in depression. In spite of the difficulties and skeptics, metal deliveries continued at an increasing pace throughout the thirties, and the company continued to operate profitably.

Initially, only high-grade direct smelting ore was mined from a proven reserve of 1,367,000 tons of 2.97 percent nickel and 0.97 percent copper. Such ore did not require fine crushing and concentration prior to smelting. As European industry recovered from the depression, and nickel demand increased, ore production was expanded. Increased production required mining lower-grade ores, which in turn necessitated an ore-dressing plant, concentrator, and sintering plant, along with a new production shaft to handle the larger tonnage from underground. Up until 1940, growth in production and facilities was continuous, and metal deliveries were almost wholly to European customers.

In 1940 the Norwegian refinery fell into enemy hands and in the national interest of expediting the production of nickel, International Nickel Company of Canada, Limited, began to customs refine Falconbridge matte. The metals so produced were sold by Falconbridge either to governmental agencies, or to industry under governmental allocation. During the war, production was expanded to the maximum and caused a serious drain on the higher-grade ore reserves, as well as creating later mining problems.

In 1945, with the Kristiansand refinery back in Norwegian hands, badly in need of repair and stripped of metal, with European industry in a war-torn chaotic state, with currency convertibility blocked, and governmental contracts cancelled, the company faced difficult conditions. Because of these factors, as well as the equalization of European and American nickel prices, it was necessary to seek markets elsewhere. Canadian operations require dollars, hence the company entered the United States market. Fortunately there was no post-war recession as expected, but instead a dynamic, inflationary expansion developed.

In 1947 the company entered a new phase of development with the decision to open the McKim mine, the first outside property to be placed in production. This additional mine permitted increased production and at the same time allowed the Falconbridge mine a respite to recover from wartime excesses and to facilitate its depth development.

As the European market revived owing to financial and technical assistance from America, currency restrictions were modified to permit increased nickel sales. At the same time sales were gradually increased in America until about 50 percent of the company's output was sold there. This fundamental shift in marketing pattern was due in part to deliveries to the United States government under a substantial five-year contract signed in 1948.

The outbreak of war in Korea in 1950 brought about rigid international distribution controls on nickel. This seriously curtailed commercial sales despite increasing demand. Agencies of the United States government, wishing greatly increased nickel production, urged nickel producers to expand output as rapidly as possible and made incentive contracts for this purpose. As a result a new wave of nickel expansion is now underway and Falconbridge's share in this expansion is large.

In 1952 Falconbridge contracted with the United States government to expand quickly to 35,000,000 pounds annual capacity and to deliver 50,000,000 pounds of nickel by 1962. Early in 1953 another contract was signed requiring delivery of an additional 100,000,000 pounds of nickel by 1962. Both contracts have stipulated cumulative deliveries, both carry an option for additional deliveries by the company, and the second contract gives an option to the buyer for additional quantities after 1962. If all options are exercised by both parties the total nickel deliveries will be 275,000,000 pounds. Under the first contract, the company receives financial assistance in the form of an advance repayable by production performance; under the second contract an allowance for amortization is included in the payment for firm nickel deliveries.

These long-term contracts are very significant to all concerned. They provide for a stability of production over the next decade that is unusual in the metal industry characterized by its cyclical nature. They have provided, and will continue to provide, a great stimulus to the company's expansion.

The first 25 years have witnessed growth from a 250- to a 4,000-ton-a-day mining operation; from a 1,250- to an 18-000-ton-annual-capacity nickel refinery; from a prospect to a nickel company that has returned $19,868,801 to its shareholders, and which enters the next 25 years with a solid foundation upon which to build for the future.

Revenues and Expenses

The company marked its 25th anniversary by recording the largest profit of any year in its history. Net profits of 1953 amounted to $3,867,069, equivalent to $1.04 per share of outstanding capital. This profit compares with $2,535,241 in 1952 and $3,010,975 in 1951. Dividends at the established rate of 50 cents per share amounting to $1,861,886 were paid during the year.

Sales and other operating revenues of $29,219,724, which include the results of the treatment of ores from outside properties, were higher than those of the previous year by $4,379,851. Improved revenues from nickel sales, resulting from an increase in price of 3½ cents per pound, effective in January, 1953, were more than offset by the lower prices prevailing for copper in our markets. The volume of deliveries of finished metals obtained from company mines was about 6 percent greater than in 1952.

Costs of sales were affected by higher wage and material costs, more difficult mining conditions, and by a lowering in the grade of ore processed. Charges to operations for development, preproduction, and depreciation were determined on the same basis as in the preceding year, but the amounts charged were higher because of the larger figures for tonnages of ore treated and asset values on which the charges were calculated. The total of these provisions amounted to $4,373,934 in 1953, an increase of $1,023,254 over 1952.

The effect of the favourable and larger-scale production from McKim mine, the income from which operation was free of tax, was reflected in a lower provision for taxes based on income.

Operations

For the fourth successive year records were established for the output of ore, matte, and refined metals, although production of metals in matte from company mines fell slightly below that of 1952. To meet customer demand and to fulfil our government contracts, both new and old facilities were taxed to their limit. Underground development, development of new mines and surface plant construction also set new records and continued to gain momentum throughout the year.

External conditions affecting our operations were the best of any year since before World War II. Semi-skilled and skilled workmen became available in ample supply. However, the supply of qualified technical personnel and specialists continued acute. Procurement of supplies and equipment showed a marked improvement.

To maintain metal deliveries to our customers, as well as meet our contractual commitments, we have revised our expansion goal upwards and are currently going ahead with expansion on the basis of 55,000,000 pounds nickel capacity. This increase will take place more or less in two steps; the first will see a production level of 40,000,000–45,000,000 pounds within the next two years, and the second increase will occur in 1959 or 1960. As will be apparent in more detail later in this report, the development of new mines and construction of new milling, smelting, and refining facilities are well underway to provide the necessary capacity.

There are many problems associated with the program upon which we have embarked. With the co-mingling of construction and production at some operations, a major problem exists in keeping construction moving without unduly interfering with the upswing in production. Similarly, we have the major problem of modernizing and instituting new processes at a time when

technological changes in both pyrometallurgy and hydrometallurgy are rapid. In the district of Sudbury the dispersion of operations over 40 miles and the increase in the number of mines has necessitated the division of operations into eastern and western sections. Such problems, along with expanding production and construction, have taxed our entire organization to the utmost. Together all personnel have performed excellently, and progress has been noteworthy throughout 1953.

Mines

At present we have two producing mines and six mines at various stages of development. In 1954 three new mines will come into partial production.

COMPARATIVE MINES STATISTICS

Year	Ore hoisted	Development advances		Diamond-drilling	
	tons	feet	miles	feet	miles
1952	1,114,566	28,080	5⅓	94,069	18
1953	1,163,986	50,014	9½	138,480	26

Falconbridge and McKim mines contributed the bulk of the ore produced. At the Falconbridge mine a slight reduction in production was necessary to cope with heavier ground conditions. Deepening the main production shaft was completed to 4,347 feet, and when ore-pass and crushing facilities are completed early in 1954 it will greatly facilitate depth development, production, and the sequence of mining. This shaft will permit a single lift of ore from the 4,200-foot loading pocket. The filling of stopes with tailings sand was instituted in several areas during the year, and experiments were conducted with roof bolting and new types of production equipment.

At McKim mine 262,957 tons were produced and delivered to treatment plants compared with 224,774 tons in 1952. Underground crushing commenced during the year. Both productivity and costs showed an improvement.

Six new mines were simultaneously under development during 1953. These are the East mine, about ½ mile to the east of the main Falconbridge mine; Mount Nickel mine between Falconbridge and McKim; Hardy and Boundary mines about 1 mile south of Levack and 30 miles from the Falconbridge treatment plants. Also in the Levack area is the Fecunis mine and the Longvack open-pit mine, both to the north and east of Hardy and Boundary. Mount Nickel and Longvack are low-grade mines and will have a relatively short life as ore reserves are small. However, these two operations play an important role in maintaining production until the big Fecunis orebody is fully developed in 1958.

At Falconbridge East mine the shaft was completed to 2,720 feet below collar. Development advanced 11,506 feet, and several stopes were being readied for production.

At Mount Nickel the shaft was collared in April and completed to 327 feet in September. Development headings reached the orebody by the year's end. All major mine surface plant was completed during the year. A four-mile road connecting this mine to the McKim railway spur was completed.

At Hardy, where development has been underway for three years, all surface mining-plant construction was completed, and the ore pass system, loading pocket, fill pass, and ventilation systems, pump and crusher stations, and installations were completed during the year. Underground development included 11,842 feet of drifting, 3,665 feet of raising, and 28,864 cubic feet of station excavation. From this development work 17,839 tons of ore were shipped to Falconbridge for treatment.

From the 1,000-foot level at Hardy a drive was completed to the Boundary orebody internal winze location. Preparation for shaft-sinking was underway at the end of the year.

The East, Mount Nickel, and Hardy mines will likely commence initial production during 1954.

At Fecunis Lake mine there was also intense activity. A road over very rugged topography was commenced in February and was at the property in March. Temporary camps and site clearing occupied April and May when power reached the property.

The main production shaft (No. 1) at Fecunis is of unique design. Access is by means of an adit in the side of a hill. This hill will act as the headframe. There will be no conventional hoisthouse, as the shaft will be equipped with a friction-winding hoist set directly over the top of the vertical shaft opening. On top of the hill a 5-foot and an 8-foot hoist installation to sink the main production shaft was complete at the year's end. The adit along with its ventilation raise, ore-pass and waste-pass system above the adit level were completed, and the shaft was 96 feet below the adit or 286 feet below the collar.

The supply shaft follows conventional design and is located at the foot of the hill. The permanent headframe over this service shaft and its 8-foot hoist installation were nearly completed by the year's end. The task of sinking these shafts will take about 2½ years.

Twelve miles of access roads were completed connecting Hardy and Longvack to Fecunis. Foundations were underway at Fecunis for the permanent combined services building.

At Longvack, during the year, 19,590 feet of shallow diamond-drilling were completed to define and sample this open-pit orebody in detail. A bunkhouse and cookery were underway by the end of the year.

Treatment Plants

Treatment plants handled 1,298,116 tons of ore, an increase of 168,627 tons over 1952. Of this increase 133,517 tons of ore were provided by three independent shippers in the Sudbury district: Milnet Mines, Limited; East Rim Nickel Mines, Limited; and Nickel Offsets, Limited. In addition to ore, these three companies provided 6,388 tons of magnetic and 818 tons of flotation concentrates.

The Falconbridge mill, besides handling a record tonnage, produced special concentrates to feed an experimental pilot plant and also provided the mine with specially prepared sand tailings for underground fill. During the year a sampling plant for outside ores and additions to receiving and thawing facilities were put into operation. Incomplete construction includes enlarging of the fine-crushing plant and ore-storage bins and a major addition to the concentrator at Falconbridge. By the year's end construction was commenced on a concentrator at Hardy mine with a designed capacity of 1,500 tons a day.

The smelter processed 637,982 tons of ore and concentrates, an increase of 11 percent over 1952. This production record was made possible by the completion of the third blast furnace, which commenced operating on October 20. A new matte-casting unit started July 16. Under construction at the end of the year were a Cottrell dust-collection plant, a pelletizing plant, and a chemical laboratory.

Refinery

Refined metal output was up 23 percent over 1952. The first full year of operations with the new chloride process has proven successful, and the many difficulties accompanying a process change-over have been largely overcome. Up until September the refinery increased production and consumed all the available matte from the smelter as well as a fairly substantial matte inventory accumulated in 1952 as a result of the process change. After September the refinery lowered production to the level of the smelter output.

Cobalt of high quality was produced in substantially greater amounts.

As a result of the upward revision in expansion plans the refinery is currently proceeding with additions to provide a capacity of 45 million pounds of nickel annually. Corresponding capacity is being added for copper, cobalt, and precious metals.

New construction during the year was continuous and many additions were completed. Unique underground finished-metal storage rooms were completed adjacent to our pier. Underway at the year's end were, a new cobalt refinery, a gas-cleaning plant, and major additions to the smelter building and nickel and copper deposition facilities.

Marketing

During 1953 the international allocation controls governing nickel, copper, and cobalt were abandoned by the International Materials Conference. Also during 1953 sales of these metals in the United States were removed from price controls. Subsequently, the United States prices of copper and cobalt increased, but the price of nickel remained unchanged from that established on January 14, 1953, when it was increased by 3½ cents per pound.

The demand for nickel and nickel sulphate continued unabated and greatly in excess of supply. Deliveries of these products were substantially higher than in 1952, the best previous year in the company's history. However, all additional nickel was delivered against our government contracts, and we continued to allocate the remaining nickel to customers on a quota basis. This situation is not likely to change materially throughout 1954.

The demand for copper and cobalt was not as strong as for nickel and showed some slackening at the year's end. However, cobalt deliveries were far greater than in 1952, and our high-quality electrolytic cobalt continued to receive excellent trade acceptance.

New Construction

Total expenditures for capital account, excluding development and preproduction expenditures of $4,139,247, amounted to $6,924,496 of which $5,820,822 was for Canadian additions and $1,103,674 for new plant at our Norwegian refinery.

The major construction projects and their locations have been mentioned elsewhere within the report. In addition to these larger specific projects, capital expenditures were made for additions to shops, garages, employee change-houses, offices, warehouses, railway equipment and trackage, power lines, and all manner of utilities and service facilities for expanded operations.

Ore Position

Significant changes in the ore position resulting from the year's activities were as follows:

Despite the extraction of 1,163,786 tons during the year, the total developed, plus indicated ore reserves at the year's end, was increased by 1,584,000 tons or more than an additional year's requirements.

Developed ore reserves increased by 3,201,100 tons as a result, in part, of the transfer from "indicated" to "developed" category of some ore in the Hardy and East mines, as warranted by underground development. Indicated ore reserves were thereby decreased by a net total of 1,884,600 tons.

As a result of experience in deeper orebodies it was decided to increase the dilution factor applied to the grade of developed ore.

Detailed shallow surface drilling at the Longvack orebody indicated a substantial tonnage of low-grade ore that can be extracted by cheap mining methods. The addition of part of this tonnage to the reserves, plus the above mentioned change in dilution factor, accounts for most of the over-all change in grade.

During the year an independent consulting mining engineer reviewed the ore reserve estimates. His report indicated that the following figures are conservative.

Ore	Tons	Percentage	
		nickel	copper
Developed (Falconbridge, East, McKim, and Hardy mines)	13,560,200	1.58	0.83
Indicated (Sudbury District holdings)	21,010,900	1.57	0.83
Total	34,571,100	1.57	0.83

Exploration and Research

Activity in both exploration and metallurgical research was intensified during 1953.

In the Sudbury area 112,000 feet of surface diamond-drilling was completed along with airborne and ground geophysical surveys. Most of this drilling was done in search for new nickel-copper ore-bodies around the periphery of the Sudbury basin. Drilling encountered some encouraging results, particularly at depth, between Fecunis and Boundary orebodies in the Levack area. The significance of these findings can only be ascertained by further deep drilling.

In the 1,700-square-mile concession area in Newfoundland, a large program of surface investigation was carried on during most of the year. A considerable number of new mineralized showings were found, but subsequent testing or drilling proved disappointing. At the Tilt Cove property diamond-drilling results were encouraging but inconclusive.

A number of nickel prospects in the Yukon, Northwest Territories, Quebec, Manitoba, and Ontario were given preliminary examination, with options being taken up on a few to permit further examination.

Further drilling on the properties of Maskwa Nickel Chrome Mines, Limited, in southeastern Manitoba contributed an additional tonnage of medium- to low-grade ore. Further investigations are required as conditions permit.

Metallurgical research has been given increasing attention during recent years. Research on a pyrrhotite process reached the point during 1953 where it appeared desirable to construct a pilot plant with units of full commercial size. Construction of this plant at Falconbridge was underway at the end of the year, and it is hoped the plant will be operating on an experimental basis before the end of 1954.

For several years a study of methods to improve precious-metal analyses and recoveries has been carried on at several places. To facilitate this work a precious-metal research laboratory was equipped and staffed in a purchased building at Richmond Hill. The company has also purchased a metallurgical plant site for possible future expansion in Humberstone township, near the Welland canal. A new precious-metal laboratory has also been completed at the refinery. Research at the refinery since the end of the war has resulted in the regular production of two new products, namely high purity electrolytic cobalt and refined nickel sulphate.

Employees

To assist with employee housing the company built 86 new family dwelling units, including both houses and apartments, 64 of these being located at the Hardy townsite. This townsite is being developed to service all our new Levack area operations. At Hardy a four-room private school was built to accommodate employees' children. During the year Falconbridge Realty, Limited, gave assistance to employees wishing to build their own homes in company areas.

An average of 1,731 men was employed in the Sudbury area operations in 1953. Of these, 217 were on the surface and 757 were underground at the company's mines, and 757 were in the concentrator and smelter. R. C. Mott is manager of the Sudbury area operations.

International Nickel Company of Canada, Limited

The International Nickel Company of Canada, Limited, was incorporated in 1916 under Dominion of Canada charter. The authorized capitalization is $27,679,900 in preferred shares of $100 and $5 par value and 15,000,000 shares of common stock of no par value, of which 14,548,025 have been issued.

The officers, as of January 1, 1954, are: J. F. Thompson, chairman of the board; P. D. Merica, president; H. S. Wingate, J. R. Gordon, and L. H. Cooper, vice-presidents; W. F. Kennedy, secretary; W. J. Hutchinson, treasurer; C. R. Whitehorne, comptroller.

The directors whose term expires in 1954 are: I. C. R. Atkin, G. R. Ball, J. S. Duncan, W. J. Hutchinson, Rt. Hon. Lord McGowan, D. H. McLaughlin; P. D. Merica, Sir O. E. Niemeyer, L. S. Rockefeller, G. B. Shipley, R. E. Stavert, J. C. Traphagen, and H. S. Wingate.

The directors whose term expires in 1955 are: E. G. Baker, L. W. Douglas, J. R. Gordon, H. R. MacMillan, Rt. Hon. Viscount Margesson, R. S. McLaughlin, H. C. F. Mockridge, R. L. Prain, G. C. Sharp, J. F. Thompson, and Rt. Hon. Viscount Weir.

The executive office is at 67 Wall Street, New York 5, N.Y., and the general offices are at Copper Cliff. The Toronto office is at 25 King Street West.

The company and its subsidiary companies operate hydro-electric plants at High Falls, Big Eddy, Wabageshik, and Nairn Falls, Ontario: nickel-copper mines in the district of Sudbury, Ontario: smelters at Copper Cliff and Coniston, Ontario: refineries at Copper Cliff and Port Colborne, Ontario; Acton, England; and Clydach, Wales: rolling mills at Birmingham, England; Huntingdon, W. Va.; and Glasgow, Scotland: and a foundry at Bayonne, N.J.

The following is taken from the annual report of the company for the year ending December 31, 1953:

A Quarter Century of Progress

The principal predecessor companies of the International Nickel enterprise were organized towards the end of the last century when the Canadian nickel industry began, but one of our British subsidiaries traces its establishment as far back as 1833. The International Nickel Company of Canada, Limited, was itself organized in 1916, as a subsidiary of the then parent New Jersey company, and it was not until 1928 that it became the parent company.

The company and its predecessors have over the years engaged in research on an expanding scale. During the past quarter century we have, in addition to developing major changes in processes such as those noted in this report, developed and adapted new and lower-cost mining procedures that have effected the addition of millions of tons of nickel-copper ores to our proven ore reserves.

We have expanded our knowledge of the properties of nickel, copper, the platinum metals, and their alloys and compounds, and made this information broadly available to industry. Industrial research is effective and is justified only if the results are converted into practical applications. We have, therefore, stressed both research, which constantly adds to our knowledge, and development, which continually puts this knowledge into useful practice.

Out of our laboratories in Canada, the United States, and the United Kingdom have come new alloys and new information on old alloys. The increase in the free world's consumption of nickel in the past quarter century reflects both this research and parallel research in which industry throughout the world has been continuously engaged.

Over the past 25 years, the company has supplied the world with nearly 5,000,000,000 pounds of nickel, over 5,000,000,000 pounds of copper, and over 5,000,000 ounces of the platinum metals. We mined 187,000,000 tons of ore from 1929 through 1953. Over the course of that period we were able to replenish all of this ore mined and at the end of the period we were able to show a reserve that is 59,000,000 tons over the amount at the beginning of the period. The total of 246,000,000 tons of ore resources that we thus provided in 25 years was made possible by continued exploration and continued mining and process research directed towards the economic use of ores.

The quarter century of operations resulted in the realization by the company of aggregate net earnings of $794,655,445 and the receipt by the common and preferred shareholders of dividends aggregating $623,118,235.

Ore Mined

The following table presents the tonnages of ore mined from underground and surface during 1953, with comparative data for the previous year:

	1953	1952
	tons	tons
Underground	11,095,199	10,196,068
Surface	2,571,896	3,052,525
Total mined	13,667,095	13,248,593

Our production of ore from underground in 1953 was at a new high, reflecting the progress of our major program of underground mining expansion that has been under way for more than a decade. During World War II, our production of ore from underground averaged 5,900,000 tons per year. The tonnage mined from underground in 1953 was almost twice that amount, and we produced more ore, from underground and surface combined, than in any previous year.

Ore Reserves

Proven ore reserves stood at 261,541,259 tons at December 31, 1953. This compares with 256,355,903 tons at the end of 1952. The nickel-copper content at the year's end was 7,816,669 tons, compared with 7,795,326 tons at the end of 1952.

Mines

The underground development in the producing mines advanced 142,302 feet, or approximately 27 miles, compared with 132,435 feet in 1952. The distance of the advance during the past year is 12 times that of the longest highway tunnel in the world, which is under the Mersey at Liverpool. Total underground development in our operating mines now stands at 1,860,283 feet, or 352 miles.

Substantial progress was made in expanding our underground operations. A second crusher installation to serve the caving area at Creighton mine was put into operation. Daily production from the Stobie section of the Frood-Stobie mine attained a rate of 7,000 tons of ore, compared with 4,500 tons at the end of 1952. Regular ore hoisting operations were begun in the new No. 8 shaft at Stobie mine.

Extension of the No. 2 shaft at Garson mine below the 3,200-foot level was completed to a depth of 4,243 feet, while shaft stations were established on the 3,800- and 4,000-foot levels, and ore-loading and spillage stations were excavated and concreted below the 4,000-foot level. At the Levack mine, excavations at the 2,650-foot level for temporary hoist-rooms for sinking to the 4,000-foot level were completed at the No. 3 shaft and started at No. 2 shaft. Construction of crusher and pumping stations was begun at the 2,650-foot level. Production was maintained and development work extended at the Frood section of the Frood-Stobie mine and at the Murray mine.

Plants

The concentrating and smelting plants and the refineries again handled record tonnages. In November we completed the program to increase to 12,000 tons per day the capacity of the Creighton concentrator, originally designed for 6,000 tons and subsequently increased to 10,000 tons.

Large-scale oxygen flash smelting of copper concentrates was carried on throughout the year. At the year's end a unit was put into operation permitting treatment in a single furnace of all the copper concentrate from our ores. Rich sulphur dioxide gas from this process was delivered to the adjacent plant of Canadian Industries, Limited, for production of liquid sulphur dioxide. Approximately 37,000 tons of liquid sulphur dioxide were produced and shipped to paper plants in Ontario and Quebec.

In September we began construction of the plant near Copper Cliff, which will initially treat 1,000 tons a day of nickel-bearing pyrrhotite. This plant, estimated to cost $16,000,000, is the first unit of an operation that will ultimately recover 1,000,000 tons per year of iron ore in addition to nickel. This iron ore will be higher in grade than any now recovered in quantity in North America, and will command a premium price for direct use in open-hearth and electric-furnace steel production in Canada and the United States.

At Huntingdon, West Virginia, the production rate was increased and is being supported by a 50 percent increase in warehouse and shipping facilities, an addition to the cold-draw department, and the expansion of electric-transformer capacity. The capacity of the reduction pilot plant that we operate at Huntingdon for the United States Atomic Energy Commission was expanded.

In England, Henry Wiggin and Company, Limited, completed construction of new works under arrangements with Her Majesty's Government. The works are equipped to produce bar and sheet in heat-resisting alloys, particularly the well-known nimonic series of alloys widely used in aircraft and turbine jet engines. Production started during the year. At Wiggin's Birmingham plant a new laboratory was brought into operation, and at the Birlec, Limited, plant, furnace manufacturing capacity was substantially increased.

Research

Research was continued throughout the year, both to establish new processes to counteract increasing production costs and also to develop new or improved products to widen the usefulness of nickel.

Two major research developments now in full plant operation are the separation of copper and nickel by controlled cooling and flotation of matte and the oxygen flash smelting of copper concentrates. The pyrrhotite process referred to in this report represents another major advance in the treatment of nickel ores. Until now, world nickel production has been based on processes in which the iron content of the nickel ore is rejected in slag and tailings. The new process recovers the iron content in the form of high-grade iron ore.

Our laboratories devoted to product research spent much time on problems of metal users, including problems growing out of restrictions on the applications of nickel. We also carried forward certain long-term projects that are yielding information and test results that should facilitate the broadening of applications for nickel when the metal is again in free supply.

Exploration

The search for ore is essential to the maintenance of our ore reserves. In search for new sources of nickel, the company in 1953 spent $6,084,742. We believe that this was the largest expenditure for exploration in any year by any mining company in Canada. Cost of the program in 1952 was $4,967,450. In 1953 we were able to replace the 13,667,000 tons that were mined and to add to our reserves an additional 5,185,000 tons, making a total of 18,852,000 tons of ore resources added for the one year.

In the Sudbury district of Ontario, extensive exploratory drilling was continued in our operating mines, and further work was carried on at our Crean Hill mine. Surface exploration of our non-operating mining properties involved almost 300,000 feet of diamond-drilling.

Our exploration activities outside the Sudbury basin were again centered in western Canada, particularly in Manitoba and in the Northwest Territories. As indications of the scope of the work, we staked out more than 1,000 claims in two areas alone, and our airborne geophysical surveys covered a total distance of over 24,000 miles. The year was devoted mainly to consolidation of projects started in former years, but new areas in Canada were examined, and prospecting, geological and geophysical work were carried on in a number of locations as well as in other countries.

Extensive work was continued on the company's holdings at Mystery Lake, Manitoba, where a large, low-grade nickel deposit is indicated. A portion of the deposit at this location being covered by claims held by others, the company entered into an agreement towards the end of the year enabling it to acquire these holdings through purchase of and option on shares of Mystery Lake Nickel Mines, Limited.

During the year, Smith and Travers Company, Limited, became a wholly-owned subsidiary through acquisition of its capital stock. This firm has for many years carried out under contract the greater portion of our exploration diamond-drilling operations.

Management

J. R. Gordon of Copper Cliff, was elected vice-president and general manager of Canadian operations, and a director of the company, succeeding R. L. Beattie who died on June 10. Formerly assistant general manager of Canadian operations, Mr. Gordon joined the company 18 years ago as director of the research department at Copper Cliff.

L. H. Cooper, of London, chairman of The Mond Nickel Company, Limited, and in its employ for 27 years, was elected a vice-president of the company, effective January 1, 1954, following the death of Reg. Halladay on December 31, 1953.

J. R. Gordon is general manager; R. D. Parker, general superintendent; C. H. Stewart, superintendent of the Frood-Stobie mine; H. J. Cullen, superintendent of the Frood-Stobie open pits; E. E. Mumford, superintendent of the Creighton mine; F. M. McAteer, superintendent of the Levack mine; N. H. Wadge, superintendent of the Garson mine; H. W. Smith, superintendent of the Murray mine; R. H. Brown, superintendent of the Crean Hill mine; E. G. Stoneman, superintendent of the Copper Cliff and Creighton concentrators; F. J. Morrow, superintendent of the Copper Cliff smelter; F. G. Murphy, superintendent of the Coniston smelter; R. Hewgill, superintendent of the Copper Cliff refinery; R. G. Dow, superintendent of the Lawson quarry; and R. C. McQuire, superintendent of the Port Colborne nickel refinery.

During 1953 an average of 4,629 persons was employed at the Copper Cliff concentrator and smelter; 682 at the Copper Cliff refinery; 1,402 at the Port

Colborne nickel refinery; 548 at the Coniston smelter; 2,164 at the Creighton mine; 2,779 at the Frood-Stobie mine; 235 at the Frood-Stobie open pit; 841 at the Garson mine; 662 at the Levack mine; 392 at the Murray mine; 35 at the Crean Hill mine; and 31 at the Lawson quarry.

Milnet Mines, Limited

Milnet Mines, Limited, was incorporated in November, 1951, with an authorized capitalization of 40,000 shares of no par value, all of which have been issued. The officers and directors are: Dr. F. R. Burton, president; John Drybrough, vice-president; E. E. Ritchie, secretary-treasurer; A. W. Burt, C. C. Calvin, and E. C. MacLeod, directors. The head office is at 320 Bay Street, Toronto. The mine address is Capreol.

The company has a lease on part of the Jonsmith property, on lot 5, concession II, Parkin township, district of Sudbury.[1]

Operations continued throughout 1953. The mine is being developed from a vertical, three-compartment shaft, 478 feet deep. A new level was opened up at a depth of 465 feet in 1953. The development work done in 1953 and the total amount at December 31, 1953, are shown in the following table:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
190-foot	205	299	320	437	220	220
300-foot	63	121	409	495	57	179
425-foot (loading pocket)	.....	.....	.....	21	96	219
465-foot	.....	.....	515	515	100	100

Diamond-drilling during 1953 consisted of 57 holes, totalling 2,383 feet, from underground.

A total of 104,603 tons of ore was hoisted, crushed, and shipped to the Falconbridge Nickel reduction plant for treatment.

An average of 60 men was employed, 43 underground and 17 on the surface. C. E. Bowker is mine manager.

Nickel Offsets, Limited

Nickel Offsets, Limited, was incorporated in April, 1938, with an authorized capitalization of 3,000,000 shares of no par value, of which 2,667,457 have been issued. The officers and directors are: D. W. Lang, president; Albert Wende, vice-president; Edith M. Simmons, secretary-treasurer; Ralph Hochstetter, H. H. Wende, and S. H. Knox, directors. The head office is at 50 King Street West, Toronto. The mine address is Chelmsford.

The company owns 51 claims in Foy and Bowell townships, district of Sudbury.

Mining operations continued throughout 1953. The new 300-ton concentrator commenced operation on September 16 and continued for the rest of the year.

There are two vertical, three-compartment shafts on the property: No. 1 is 1,600 feet deep, and No. 2 is 1,106 feet deep. No. 2 shaft, which had not been

[1]The location given in Vol. LXII, part 2, 1953, was in error.

used for several years, was reopened in 1953 as far as the 300-foot level. The following table shows the development work done in 1953 and the total amount at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
No. 1 shaft:						
200-foot	...	454	.....	186	133	271
350-foot	.....	1,029	.....	165	57	217
500-foot	28	28	.....	266	.....	143
650-foot	.....	1,021	.....	265	200	200
800-foot subdrift	44	44	.....	.....	.....	.....
950-foot	.....	1,486	483	723	632	632
1,100-foot	.....	.....	.....	123	.....	.....
1,250-foot	.....	1,558	.....	.....	233	233
1,550-foot	211	2,476	.....	67	.....	.....
No. 2 shaft:						
150-foot	145	145	.....	215	.....	156
300-foot	.....	342	.....	90	253	253
450-foot (station only)	.....	.....	.....	.....	.....	.....
600-foot	.....	2,502	.....	65	.....	.....
750-foot (station only)	.....	.....	.....	.....	.....	.....
900-foot (station only)	.....	.....	.....	.....	.....	.....
1,050-foot	.....	2,513	.....	65	.....	.....

Diamond-drilling in 1953 consisted of 68 holes, totalling 1,106 feet, from underground.

The following equipment was installed in the concentrator: an 8- by 6-inch ERI Canadian Ingersoll-Rand compressor; a 30- by 18-inch Blake-type, Allis-Chalmers jaw-crusher; A Wilfley table; a type 2, series 21-40, Hardinge super-thickener; a 150-horsepower English Electric motor and controls for the ball mill; a Dings magnetic pulley; and an Akins classifier used as a concentrate dryer.

There were 16,569 tons of ore hoisted. About 15,267 tons of magnetic and flotation concentrates were shipped to the Falconbridge Nickel reduction plant for further treatment.

An average of 54 men was employed, of whom 17 were underground and 37 on the surface. B. H. Budgeon is general manager.

QUARTZ CRYSTALS

Quartz Crystal Mining Corporation, Limited

Operations at the company's property in lot 9, concession IX, Leeds township, Leeds county, were continuous throughout 1953.

At the end of the year the north pit was about 75 feet long, 40 feet wide, and 35 feet deep.

J. B. Steele is manager. Eight men were employed.

SALT

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 2,000 have been issued. The officers and directors are: Daniel Peterkin, president; N. C. Hobson, vice-president; J. H. Burtch, secretary-treasurer; G. M. Duck, Garfield King, H. R. Milner, G. E. Smith, F. H. Sobey, H. R. Stratford, and R. C. Vail, directors. The address of the head office and the mine office is Ojibway.

The company owns part of lots 36 to 43 inclusive, concession I, township of Sandwich West, Essex county, on the shore of the Detroit river.

Two flat beds of salt, about 25 feet apart and at a depth of about 1,000 feet from surface, are to be mined. Preparations for shaft-sinking were begun in the spring of 1953. The overburden is about 90 feet thick. Because of the heavy water flow and the release of hydrogen sulphide gas, it was decided to freeze a circular block of ground 32 feet in diameter to a depth of 700 feet. Thirty-five 10-inch churn-drill holes, 700 feet deep, were drilled around the perimeter of the circle for the installation of the refrigerating pipes. By the end of the year the drilling had been completed, the refrigerating plant was in operation, and the headframe for the shaft-sinking was being constructed. The work is being done by a contracting company.

M. F. O'Day is manager for the Canadian Rock Salt Company, Limited.

SILVER AND COBALT

Castle-Trethewey Mines, Limited

Castle-Trethewey Mines, Limited, was incorporated in January, 1922, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 2,709,002 have been issued. The officers and directors are: Balmer Neilly, chairman of the board; W. B. Dix, president; D. H. McDougall, vice-president; F. T. McKinney, secretary; S. R. Varley, treasurer; B. E. Smith and Kelley Butler, directors. The address of the head office and the mine is O'Brien. The executive office is at 25 King Street West, Toronto.

The company's property is in Haultain and Nicol townships, Gowganda area, district of Timiskaming.

The property is in two sections, the Castle and the Capitol. All operations at present are in the Capitol section.

Mining continued throughout 1953. The following table shows the depths of the shaft and two winzes that serve the Capitol section:

	Inclination	Number of compartments	Depth from surface
			feet
Capitol shaft	Vertical	2	819
Capitol winze (below 800-foot level)	Vertical	2	1,188
Inclined winze (below 1,125-foot level)	27 degrees	2	1,425

The inclined winze was deepened in 1953 from 1,350 to 1,425 feet below surface, and two new levels were established at 1,350 and 1,425 feet.

The following table shows the development work done in 1953 and the total amount at December 31, 1953:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
160-foot (pump station)	.....	.....	.....	.....	.....	.....
525-foot (pump station)	.....	.....	.....	.....	.....	.....
800-foot	.....	1,305	.....	2,682	.....	233
875-foot	.....	273	.....	198	.....	239
950-foot	.....	33	.....	12	.....	.....
1,025-foot	.....	286	.....	115	.....	24
1,125-foot	45	2,470	248	2,724	.....	553
1,200-foot	258	1,154	75	631	110	382
1,275-foot	638	1,739	.....	269	293	399
1,350-foot	1,059	1,059	340	340	123	123
1,425-foot	290	290	14	14	135	136

Diamond-drilling consisted of 27 holes, totalling 2,514 feet, from underground.

There were 15,439 tons of ore mined during the year.

The mill operated from May 4 to December 16 and treated 16,692 tons of ore, at an average daily rate of 85.6 tons.

Two new dwelling houses for employees were built.

The following is taken from the manager's report for the year ending March 31, 1954:

Production

Concentrates produced and shipped:	
High-grade concentrates, 200 dry tons at....ounces per ton	4,916
Low-grade, flotation concentrates, 257 dry tons at.....ounces per ton	117
Total silver recovered.....fine ounces	1,011,730
Total cobalt recovered.....pounds	25,638
Gross value:	
Silver (1,011,730 ounces at 83.3 cents per ounce).....	$842,945.29
Cobalt (25,638 pounds at 73.3 cents per pound).....	18,782.10
Total value.....	$861,727.38

Development

Underground exploration and development were carried on throughout the year on the 1,200-, 1,275-, 1,350-, and 1,425-foot levels. Of the 3,066 feet of drifting on veins, 1,070 feet was in ore. Due to the nature of the ore shoots, 310 feet of the footage in ore was in sublevels. On the levels, the footage in ore on the various veins was: vein No. 130—225 feet; vein No. 133—262 feet; and the new vein, No. 134, and its branches, Nos. 135 and 137—273 feet. The most productive development was on veins Nos. 130 and 133 on the 1,350-foot level. Although comparatively little ore has been so far developed on the deepest, 1,425-foot level; some exceptionally rich ore is being developed and stoped on vein No. 133 just above that level. Vein No. 130, on the 1,425-foot level, showed only patches of ore, but stoping ground is being developed above it. Two short but rich sections of vein No. 130 show on the floor of the level.

The best new-vein development was on new vein No. 134 and its branches, veins Nos. 135 and 137. Where drifting was done on the 1,275-foot level, good grade ore was mined. The vein is cut at that level and above and below the level by flatly dipping faults of varying strikes in the vicinity of which rich but small amounts of ore are found. Recent development of vein No. 134 on the 1,200-foot level above has been productive and promising.

All the development referred to above has been done in the upper 300 feet of the dipping diabase sill. This has so far been the most favourable area for ore. The overlying Keewatin rock, which had a small silver ore shoot at the Castle shaft, and which was productive at Cobalt and South Lorrain, is from 75 to 125 feet above the 1,200-foot level. Vein No. 133 has been followed by a raise to the contact, but does not enter the Keewatin. Diamond-drilling exploration is projected into this Keewatin but, for the time being, the productive area on Capitol claim H.S.355 has no known ore above a depth of 1,150 feet below surface.

The ore mined during the past year and being mined to a depth of 1,425 feet below surface is the deepest ore that has yet been profitably mined in the Cobalt-Gowganda area.

Promising development work continues.

SOURCE OF ORE FROM THE MINE HOISTED TO SURFACE

	Tons	Ounces per ton	Total ounces
Development	5,561	51.9	288,770
Mining	12,444	71.3	887,100
Total	18,005	65.3	1,175,870

The silver ore shoots in the diabase rock being small in comparison with the extensive vein areas, a high proportion of the work is necessarily in waste rock.

WASTE ROCK

	tons
Hoisted to surface	7,708
Backfill	2,525
Total waste broken	10,233

Mining

All stoping was done from the incline-haulage levels below the 1,125-foot level and to the 1,425-foot level. The ore hoisted for milling was chiefly from veins Nos. 130, 133, and new vein No. 134 and its branches. The silver content was estimated as:

	Ounces
Veins Nos. 122, 124, and 126	29,540
Vein No. 130	295,730
Vein No. 133	688,900
Veins Nos. 134 and branch, veins Nos. 135 and 137	161,700
Total	1,175,870

There is broken, for the commencement of milling, May 1, 7,700 tons of ore estimated to contain 460,000 ounces of silver. Of this, 4,600 tons is on the surface dump.

Milling

Milling was recommenced early in May, 1953, and continued until December 16.

Ore treated from mine and surface dump	tons	16,692
Silver recovered (60.61 ozs. per ton)	ounces	1,011,730
Silver put into the mill (62.6 ozs. per ton)	ounces	1,043,646

Recovery was 96.9 percent as compared with 90 percent in the previous year. The jigs and table recovered 90.7 percent of the silver in the form of high-grade concentrate.

Grades of the concentrate were:

	Ounces per ton
Jigs	5,716
Sand tables	4,558
Fine tables after flotation	2,970
Total average high-grade concentrate	4,916

Since the 200 tons of the above grade contained 981,664 ounces of silver as compared with the previous year's 226 tons containing 728,616 ounces, there was a very material over-all saving in the cost of shipping, sampling, and smelting.

The new flotation equipment, which replaced the fine tabling, was responsible for most of the improved extraction, with only a very minor increase in cost per ton milled.

Operating Costs

With extra development done and greater tonnage of ore mined from small high-grade stopes at an increasing distance from the shaft collar, total costs and costs per ton were necessarily higher. The higher grade ore reduced the cost per ounce.

Operating costs were:

Development and exploration:	
Drifting and crosscutting	$125,823.13
Raising	39,874.66
Diamond-drilling	9,543.14
Total	175,240.93
Mining	148,675.82
Milling	59,165,23
Total production costs	383,081.98
Administration and general expense	8,919.50
Total	$392,001.48

Plant and Equipment

Capital expenditures totalled $45,034.44, chiefly for underground equipment and increased compressor capacity and compressed air delivery lines at the Capitol shaft. Mill equipment to complete the mill flotation unit and some housing were other items.

The expenditures so made were:

Buildings	$ 7,449.79
Mill equipment	10,309.29
Other surface equipment including compressor and transformers	17,315.32
Underground equipment and air lines	9,960.04
Total	$45,034.44

No heavy capital expenditures are contemplated at present.

General

The year's production of 1,011,730 ounces in ounce and dollar value is the highest so far made at the mine.

More ore was broken and hoisted than milled. The broken ore reserves are the highest in tons and ounces of silver since reopening. Ore is being mined above the 1,425-, 1,350-, 1,275-, and 1,200-foot levels of the incline haulage way. Only very small amounts of ore have so far been found on the deepest, 1,425-foot, level though a few rounds above the level, ore of the highest grade yet mined was developed in vein No. 133. Vein No. 134, new during the year, continues promising above the 1,275- and 1,350-foot levels. The future depends on continued success in locating in the extensive calcite vein areas high-grade ore shoots localized by the numerous flatly dipping faults. The price of silver is another important factor.

The average price of silver received for shipments during the past fiscal year was 83.3 cents per ounce. That even with the decrease due to higher Canadian exchange is 1.2 cents per ounce higher than for the previous fiscal year.

An average force of 66 men was employed, of whom 39 were underground and 27 on the surface. A. D. Campbell is manager. G. D. McLeod is assistant manager in charge at the mine.

Cobalt Consolidated Mining Corporation, Limited

The Cobalt Consolidated Mining Corporation, Limited, was incorporated in January, 1953, with an authorized capitalization of 3,500,000 shares of $1 par value, of which 2,429,026 have been issued. The officers and directors are: Leslie Blackwell, president; J. T. Symons, secretary; G. E. Buchanan, treasurer; P. H. Hershey, Dalton Dean, Martial Dumulon, Andrew Robertson, and E. G. James, directors. A. D. Hellens is general manager. The head office is at 100 Adelaide Street West, Toronto. The mine office is at Cobalt.

The company acquired properties formerly held by the 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, in the district of Timiskaming. The total number of claims held, by ownership or lease, is 156, amounting to 5,318 acres.

With the exception of a small amount of work done at the Gilgreer mine in South Lorrain township, all operations in 1953 were confined to the company's properties in the Cobalt area of Coleman and Bucke townships.

Agaunico Mine

The Agaunico property consists of 12 claims in lots 15 and 16, concession I, township of Bucke. Operations were carried on throughout 1953.

The mine is served by a vertical, two-compartment shaft about 400 feet

deep, which is dewatered to the 275-foot level. The following table shows the development work done during the year:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
200-foot	903	324	135
275-foot	802	63	165

Diamond-drilling consisted of 58 holes, totalling 9,717 feet, from underground.

An office building was erected and the change-house was enlarged. A reconditioned compressor and a 42-inch, single-drum Jenckes air hoist were installed to replace the smaller electric hoist.

Production came from Nos. 10, 12, and 14 veins, on the 200-foot level, in the east part of the workings, and from the vein systems on the 200- and 275-foot levels in the southwest section of the mine. No. 10 vein lies under Lake Timiskaming.

There were 47,452 tons of ore hoisted, and 43,126 tons were treated in the Colonial and "104" mills.

G. P. Thoday was mine superintendent, employing an average of 50 men.

Cobalt Lode Mine

This property, recently operated by Cobalt Lode Mines, Limited, was also known at one time as the Adanac mine. It consists of three 20-acre claims on lot 2, concession III, Coleman township.

Operations were continuous throughout 1953. The vertical, two-compartment No. 1 shaft was sunk a further 103 feet to a depth of 622 feet, and a new level was established at 600 feet. The vertical, two-compartment No. 401 winze runs from the 400-foot level to a depth of 480 feet from surface and has levels at 455 and 480 feet which are not connected with the No. 1 shaft workings. The following table shows the development work done in 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
No. 1 Shaft:			
200-foot	98	.....	64
400-foot	80	.....	66
600-foot	314	528	27
No. 401 Winze:			
480-foot	50	102	19

Diamond-drilling consisted of 40 holes, totalling 6,899 feet, from underground.

Production was from stopes on the 200-, 400-, 480-, and 600-foot levels. There were 28,448 tons of ore hoisted, and 26,322 tons were treated in the Colonial and "104" mills.

Roy Stewart is mine superintendent. An average of 40 men was employed.

Colonial Mine

The Colonial mine, which was acquired from the Silanco Mining and Refining Company, Limited, is on lot 3, concession VI, Coleman township.

Mining operations in 1953 were carried on from April to December and were confined to the adit-level workings in the northeastern part of the property.

Development work consisted of 402 feet of drifting and 188 feet of raising. No underground work was done from the shaft. Some exploration and examination were done on a sublevel 50 feet below the adit level, which is only accessible by ladderway.

About 3,082 tons of ore were mined and treated in the Colonial mill.

An average of 10 men was employed. J. H. Price is mine superintendent.

Crown Reserve–Kerr Lake–Penn-Canadian–Foster Group

The Crown Reserve, Kerr Lake, Penn-Canadian, and Foster mines are all part of the group in lots 3 and 4, concession IV, Coleman township, acquired from Penn-Cobalt Silver Mines, Limited.

The Crown Reserve and Kerr Lake are adjoining properties on lot 3. There are connections between the 200-foot level of the Crown Reserve and 225-foot level of the Kerr Lake, and the 100-foot level of the Crown Reserve and 140-foot level of the Kerr Lake.

The vertical, two-compartment Crown Reserve shaft, 315 feet deep, was partially dewatered in 1953, and some work was done on the 250-foot level.

The following development work was done in the Kerr Lake mine in 1953:

Level	Drifts	Raises
	feet	feet
140-foot	155	319
225-foot	211	110

The following diamond-drilling was done from underground in 1953: Crown Reserve, 3 holes, totalling 656 feet; Kerr Lake, 42 holes, totalling 3,672 feet.

The combined operation yielded 10,895 tons or ore from underground and surface stockpile, which were treated in the Colonial mill.

No underground work was done at the Foster or Penn-Canadian properties. About 241 tons of ore from the surface dump at the Foster mine were trucked to the Colonial mill for treatment.

An average of 30 men was employed. L. J. Cunningham is mine superintendent.

Gilgreer Mine

The property in South Lorrain township, operated in recent years by Gilgreer Mines, Limited, is made up of a group of mines originally known at different times as the Canadian Lorrain, Miller-Elliott, and Millwights. It consists of 10 claims, totalling 300 acres.

No mining or development work was done in 1953, but 2,396 tons of previously broken ore were hoisted and sent to the Colonial mill for treatment.

Seven diamond-drill holes, totalling 1,230 feet, were drilled from underground.

Operations were suspended in September.

An average of 20 men was employed. S. B. Bond is mine superintendent.

McKinley-Darragh Mine

The McKinley-Darragh property was acquired with the assets of the Hellens Mining and Reduction Company, Limited. It consists of three small claims, totalling 38 acres, in lot 6, concession V, Coleman township, on the south end of Cobalt lake. The mine has been idle for many years.

During 1953 a small headframe was built over the No. 1 shaft, and the

workings were dewatered to the first level, about 70 feet below surface. A geological examination was made, but no mining was done.

Right-of-Way and Cobalt Lake Mines

The Right-of-Way and Cobalt Lake properties were acquired with the assets of the Hellens Mining and Reduction Company, Limited. The Right-of-Way property consists of one 17-acre claim underlying the right-of-way of the Ontario Northland railway, on lot 5, concession VI, Coleman township. The Cobalt Lake property adjoins it.

Operations were carried on by the new company from June to December, 1953:

The vertical No. 2 North Shaft on the Right-of-Way property, which is about 380 feet deep, was dewatered to the 358-foot level, and the vertical No. 1 winze, below that level, was dewatered to the 410-foot level. Two 5-inch diamond-drill holes, approximately 120 feet long, were drilled to the south from the 410-foot level to connect with the workings on the sixth level of the adjoining Cobalt Lake mine, which underlies Cobalt Lake. The holes were drilled through a stuffing-box in a concreted collar and equipped with valves. A centrifugal pump, having a capacity of 2,400 gallons per minute, was acquired and was ready for installation early in 1954. The pumping operations will lower the water level in the following interconnected mines: McKinley-Darragh, Cobalt Lake, Townsite, City of Cobalt, Buffalo, and Nancy Helen.

Development work in 1953 consisted of 168 feet of drifting and 5 feet of raising on the 358-foot level to the north of No. 2 North shaft.

Exploratory diamond-drilling consisted of 7 holes, totalling 728 feet, from underground.

A 10- by 12-inch, single-drum Canadian Ingersoll-Rand air hoist was installed at No. 2 North shaft, and a small utility hoist at No. 1 winze.

About 759 tons of ore from development work at the Right-of-Way mine and 5,418 tons of ore from the surface dump at the Cobalt Lake mine were sent to the Colonial and "104" mills for treatment.

An average of 12 men was employed. J. H. Price is mine superintendent.

Colonial Mill

The Colonial mill, on the Colonial mining property, lot 3, concession VI, Coleman township, operated continuously throughout 1953, treating ore from the company's own mines. No custom milling was done.

The ore that was predominantly silver-bearing was treated here, and the cobalt ores were sent to the "104" mill. The total amount treated at the Colonial mill was 34,946 tons, an average of 100 tons per day.

An average of 16 men was employed. T. Cawley is mill superintendent.

The "104" Mill

The stamp mill known as the "104" is in the township of Bucke, at mileage 104 on the Ontario Northland railway. It was originally operated by O'Brien Mines, Limited, and later by Cobalt Lode Silver Mines, Limited.

The mill operated throughout 1953, treating 57,293 tons of cobalt ore from the company's various mines, a daily average of 160 tons. No custom milling was done.

An average of 18 men was employed. T. Cawley is mill superintendent.

Tailings Reclamation Plant

The tailings reclamation plant on the McKinley-Darragh property, lot 6, concession V, Coleman township, was acquired with the assets of the Hellens Mining and Reduction Company, Limited. The plant treats tailings from the bed of Cobalt Lake. The tailings are removed from the bed of the lake by a Sauerman dragline and by shovel and truck, and are treated by regrinding and cyanidation.

Operations in 1953 were carried on from January to September, and were suspended for the winter months. There were 86,121 tons of sand tailings treated, a daily average of 320 tons.

An average of 26 men was employed. T. M. Brown is mill superintendent.

Cordon Cobalt Mines, Limited

Cordon Cobalt Mines, Limited, was incorporated in February, 1951, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,955,205 have been issued. The officers and directors are: J. J. Chalmers, president; A. G. Smith, vice-president; D. G. McGowan, secretary-treasurer; E. E. Ott and A. S. Taylor, directors. The head office is at 129 Adelaide Street West, Toronto. The mine address is Cobalt.

The company owns the property formerly known as the Hudson Bay, consisting of two claims on the north half of lot 6, concession VI, Coleman township, district of Timiskaming. In addition, the company owns two claims in block 8 in the Gillies Limit, district of Timiskaming, on which no work was done in 1953.

In 1952 a small, one-compartment shaft, about 90 feet deep, inclined at 75 degrees, on the Hudson Bay mine, was reconditioned and equipped with a utility hoist. A geological examination was made, and some sampling was done.

Work was resumed in May, 1953. Three raises, each about 35 feet long, were driven from the 90-foot level for exploration purposes. About 300 tons of ore were hoisted and stockpiled. Operations were suspended in September.

Two men were employed during the period of operation. A. E. Broadley is general manager, and J. W. Brydges is mine superintendent.

Cotley Mines, Limited

Cotley Mines, Limited, was incorporated in March, 1953, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,250,005 have been issued. The officers and directors are: W. J. Hosking, president and manager; William McKee, vice-president; C. F. Tuer, secretary-treasurer; A. W. Johnston and J. R. Bailey, directors.

The company holds 12 claims in Mickle township, district of Timiskaming, about nine miles from Elk Lake. The property was originally known as the Jubilee. Some surface work had been done in 1952 by Colcourt Mines, Limited.

The present company began operations in July, 1953. A 28-foot test pit, sunk during former operations, was deepened to 79 feet. This opening, which is vertical and has two compartments, is now called No. 1 shaft. A level was established at a depth of 75 feet, and 71 feet of drifting was done.

Diamond-drilling consisted of 26 holes, totalling 3,452 feet, from underground.

About 437 tons of silver ore were hoisted, and 290 tons were taken to the mill at Siscoe Metals, Limited, for treatment.

A single-drum air hoist was used. Power was provided by a diesel-driven compressor with a capacity of 600 cubic feet per minute. Buildings erected during the year included the following: compressor-house, headframe, hoist-house, ore bin, powder magazine, office, bunk-house, cookery, and garage.

Operations were suspended in November.

An average of 10 men was employed.

Harrison-Hibbert Mines, Limited

Harrison-Hibbert Mines, Limited, was incorporated in May, 1935, with an authorized capitalization of 2,000,000 shares of $1 par value. In 1950 the capitalization was increased to 3,000,000 shares of $1 par value, and in 1953 it was increased to 5,000,000 shares of $1 par value; 3,600,000 shares have been issued. The officers and directors are: A. W. White, president; J. D. Reilly, vice-president; L. W. McIlmurray, secretary-treasurer; Matthew Grimes, C. G. Hunter, and H. R. Hurd, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Box 148, Cobalt.

The company owns three claims and has an option on one claim owned by Pittsonto Mines, Limited, near the village of North Cobalt, in Bucke township, district of Timiskaming. Of the three claims owned by the company, the Harrison-Hibbert and the Ruby claims are on lot 13, concession I, and the Law claim is on lot 13, concession II. The Pittsonto claim is immediately south of the Ruby claim.

Operations are conducted through the vertical, two-compartment No. 1 shaft on the Harrison-Hibbert claim, which is 258 feet deep with levels at 150, 190, and 240 feet, and sublevels at 120 and 170 feet. The electric hoisting plant is at this shaft.

On the Ruby claim there is a vertical shaft 150 feet deep, a winze from the 140- to the 220-foot level, and a 50-foot winze below the 220-foot level. No hoisting is done through these shafts. There is a connection between the 190-foot level of the Harrison-Hibbert area and the 220-foot level of the Ruby workings.

Mining continued throughout 1953. The following table shows the development work done during 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
120-foot sublevel	148	12	15
150-foot	120	48	29
170-foot sublevel	.....	15	.....
190-foot	707	13	119
240-foot	1,483	292	504

Diamond-drilling consisted of 75 holes, totalling 9,215 feet, from underground.

Ore was mined from both the Harrison-Hibbert and Ruby sections. A total of 18,674 tons of ore was hoisted. About 18,744 tons were sent to the custom mill of United Cobalt Mines, Limited, for treatment. The ore was about 40 percent cobalt and 60 percent silver.

An average of 39 men was employed, 34 underground and 5 on the surface. J. E. Armstrong is manager.

Holwood Mines, Limited

Holwood Mines, Limited, was incorporated in October, 1951, with an authorized capitalization of 4,000,000 shares of $1 par value. There are 1,345,005 shares issued, of which 720,000 are pooled. C. W. Miller is president and general manager. L. G. Hilts is secretary-treasurer. An office is maintained at 330 Bay Street, Toronto.

The property is a silver-cobalt prospect in the western part of Van Hise township, northwest of Spawning Lake, in the district of Timiskaming. It is about five miles off the Gowganda highway and is accessible by a truck road.

In 1920 and 1921 Alpine Silvers, Limited, drove an adit level about 575 feet westward from the base of a diabase ridge.

The present company has done no further development work. In 1952 and 1953 a small mill was erected, and a few tons of broken rock from old surface trenches were treated. Operations were suspended in October, 1953.

About seven men were employed during the period of operation.

Juno Metals Corporation, Limited

Juno Metals Corporation, Limited, has an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,266,669 have been issued. L. Boutet, 4235 Iberville Street, Montreal, Quebec, is president, and F. Rutherford is secretary-treasurer.

The company acquired the former Reliance property, a 20-acre claim in lot 3, concession V, Coleman township, district of Timiskaming.

Former operators had sunk a vertical, two-compartment shaft to a depth of 60 feet, with a level at 60 feet and a 50-foot vertical winze below the level. There was between 500 and 600 feet of lateral development work on the 60-foot level.

In 1953, Juno Metals Corporation, Limited, dewatered the workings to the 60-foot level, retimbered the shaft, and erected a 33-foot headframe. A 10- by 12-inch, single-drum Jenckes air hoist was installed. The workings were examined, but no development work was done.

A hoist-house, office, change-house, and machine shop were built.

R. Stewart was in charge. Three men were employed.

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, of which 3 are issued. The company is a wholly-owned subsidiary of the Signal Oils and Metals Company, Limited. The officers are: G. H. Wood, president; B. Milrot, 265 Craig Street, Montreal, Quebec, vice-president and managing director; R. Staines, secretary-treasurer.

The company acquired the former Casey Cobalt property in Casey township, district of Timiskaming.

Operations were carried on from June to the end of September, 1953. The inclined, two-compartment No. 1 shaft was dewatered to the 160-foot level, a geological examination was made, and some sampling done.

Robert Raeburn was in charge. Two men were employed.

Lost Lake Mines, Limited

Lost Lake Mines, Limited, was incorporated in August, 1953, to succeed New Morrison Mines, Limited. The company is a wholly-owned subsidiary of Siscoe Metals, Limited. The officers and directors are: J. B. Lynch, president; C. M. Masterman, secretary-treasurer; Thomas Guerin, comptroller; J. G. Ahern, J. G. Carrique, and H. F. Strong, directors. The head office address is Box 1107, Cornwall. The mine address is O'Brien.

The company holds leases on four claims, including the Morrison and W.J.9 properties, four miles east of Gowganda, in Nicol township, district of Timiskaming.

There is a vertical, two-compartment shaft, 590 feet deep, on claim T.C.315 of the Morrison property, through which all the work in the present operation is done. The 400-foot shaft on the W.J.9 is not used.

Operations were continuous throughout 1953. The following table shows the development work done from the Morrison shaft in 1953, and the total at the end of the year:

Level	Drifts		Crosscuts		Raises	
	1953	Total	1953	Total	1953	Total
	feet	feet	feet	feet	feet	feet
175-foot	95	95	32	32	.....	.....
250-foot (station only)	.....	.....	.....	.....	.....	.....
300-foot	6	82	.....	76	.....	.....
375-foot	.....	.....	.....	.....	.....	75
425-foot	37	549	36	36	.....	.....
500-foot	22	762	.....	529	31	57
575-foot	.....	466	.....	35	.....	.....

Diamond-drilling consisted of 75 holes, totalling 6,841 feet, from underground.

There were 9,191 tons of ore hoisted and sent to the Siscoe Metals mill for treatment in 1953.

G. Shartner is manager and E. A. Pearson is general superintendent. An average of 22 men was employed, 14 underground and 8 on surface.

Mayfair Mines, Limited

Mayfair Mines, Limited, was incorporated in May, 1945, with an authorized capitalization of 3,000,000 shares of $1 par value. In February, 1951, the capitalization was increased to 4,000,000 shares, and in February, 1953, to 5,000,000 shares of $1 par value, of which 3,409,910 have been issued. The officers and directors are: N. E. Gough, president and general manager; P. M. Klopstock, Jr., vice-president; W. G. White, secretary-treasurer; A. L. Campbell, A. E. Hilliard, and L. N. Gough, directors. The head office is at 331 Bay Street, Toronto. The mine address is Haileybury.

The company's property is on lot 2, concession II, in the extreme southeast corner of Coleman township, district of Timiskaming, and extends across the Coleman township boundary into Block 6 of the Gillies Limit to the west. It includes the property that has been known as both the John Black and People's mine.

The vertical, two-compartment No. 1 shaft is 420 feet deep. The two-compartment No. 3 winze is collared at the 400-foot level, approximately 1,500

feet west of No. 1 shaft, and runs at an angle of 20 degrees to a depth of 557 feet below surface.

The mine was kept unwatered during 1953, but no mining or development work was done. Six diamond-drill holes, totalling 2,214 feet, were drilled from underground.

Four men were employed. W. R. Garbutt is manager.

Mensilvo Mines, Limited

Mensilvo Mines, Limited, was incorporated in November, 1946, with an authorized capitalization of 2,000,000 shares of $1 par value, of which 1,881,525 have been issued. The officers are: L. C. Herdman, president; H. D. Baker, vice-president; J. C. Wylie, secretary-treasurer. The head office is at 73 King Street West, Toronto. The mine address is Cobalt.

The company owns a property consisting of 25 acres in lot 5, concession IV, Coleman township, district of Timiskaming, formerly known as the Silver Bar mine.

Operations continued throughout 1953. The work was done from the vertical, two-compartment No. 7 shaft, which is 157 feet deep. The collar of the shaft is on a hill, approximately 50 feet above the collar of No. 1 shaft. About 120 feet of drifting was done on the 105-foot level.

A total of 12,000 tons of ore was hoisted. An addition to the mill had been built in 1952. The new circuit operated from February 2 to the end of 1953 and treated 10,800 tons of ore, at an average daily rate of 30 tons.

An average of 18 men was employed, 7 underground and 11 on surface. W. D. Taylor is manager.

Nipissing-O'Brien Mines, Limited

Nipissing-O'Brien Mines, Limited, was incorporated in January, 1952, with an authorized capitalization of 2,500,000 shares of $1 par value, of which 1,600,005 have been issued. The officers and directors are: B. A. O'Brien, president; J. M. Cunningham-Dunlop, vice-president; C. C. Calvin, secretary-treasurer; W. H. Woods and Alan Scott, directors. The head office is at 25 King Street West, Toronto. The mine address is Cobalt.

The company acquired the properties of M. J. O'Brien, Limited, and Nipissing Mines Company, Limited, in the township of Coleman, district of Timiskaming.

Mining operations continued throughout 1953. The Main and No. 2 shafts on the O'Brien property have hoisting installations. No. 14 shaft is used as a manway but has no hoisting equipment. The following table shows the depths of the three shafts:

Shaft	Inclination	Number of compartments	Depth
			feet
Main	vertical	3	345
No. 2	vertical	2	250
No. 14	vertical	2	176

Operations at the No. 2 shaft were suspended in January, 1953, but the workings were kept dewatered. There is no connection between the Main and

No. 2 shaft workings. The work in 1953 was done from the Main shaft. The following table shows the development work done during the year:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
2nd (No. 14 shaft area)	482	120	104
2nd (Main shaft area)	201	75	15
4th (Main shaft area)	1,190	419	190

Some preliminary development work was done on the 5th and 6th levels, which are accessible from the 4th level of the Main shaft workings by way of an inclined manway through an old stope.

Diamond-drilling in 1953 consisted of 16 holes, totalling 3,703 feet, from surface, and 49 holes, totalling 5,144 feet, from underground.

Most of the ore mined was stored underground; 1,031 tons were hoisted and stockpiled on surface. No ore was milled or shipped in 1953.

The vertical, two-compartment No. 81 shaft on the Nipissing property is 581 feet deep, with levels at 150, 425, and 520 feet. It was dewatered in 1953 to the 425-foot level and reconditioned. A new headframe was built. A 36- by 45-inch double-drum Canadian Ingersoll-Rand electric hoist was bought but was not installed. A geological examination was made, and some sampling was done on the 425-foot level. Work from the shaft was suspended for the winter months.

Hydro-electric power is used for hoisting, lighting, and pumping, and hydraulic air for drilling.

B. L. Jackson is mine manager. An average of 30 men was employed, of whom 20 were underground and 10 on the surface.

Roy Silver Mines, Limited

Roy Silver Mines, Limited, was incorporated in July, 1949, with an authorized capitalization of 3,000,000 shares of $1 par value. The capitalization was increased to 4,500,000 shares in 1952 and to 5,500,000 shares in 1953. The number of shares issued at December 31, 1953, was 4,270,575. The officers and directors are: Maurice Marcus, president; S. M. Goldberg, vice-president and treasurer; I. A. Wechsler, assistant secretary; L. S. Joseph and Louis Cohen, directors. The head office is at 357 Bay Street, Toronto. The mine address is Elk Lake.

The company holds claims in Coleman, South Lorrain, Haultain, and Farr townships, district of Timiskaming, and Strathy township, district of Nipissing.

Operations continued throughout 1953 on the cobalt-silver property in Farr township, on the west shore of Hubert Lake, 7 miles west of the town of Elk Lake. The vertical, two-compartment No. 1 shaft, on claim M.R. 12898, was sunk a further 170 feet to a total depth of 290 feet, and two new levels were established at 135 and 205 feet. The following table shows the development work done on the two levels:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
135-foot	67	70	18
205-foot	329	110	117

Diamond-drilling consisted of 8 holes, totalling 835 feet, from surface, and 10 holes, totalling 1,178 feet, from underground.

There were 2,209 tons of ore hoisted and stockpiled.

Power for air hoisting, drilling, and pumping was supplied by diesel-driven compressors, and for lighting by a diesel-driven generator.

A power-house, crusher-house, and ore bin were built during 1953. A 30- by 100-foot, cement-block, mill building and a frame boiler-house were under construction at the end of the year.

An average of 21 men was employed, of whom 5 were underground and 16 on the surface. J. G. Pollard is manager.

Shag Silver Mines, Limited

L. J. O'Shaughnessy, of Shag Silver Mines, Limited, continued operations from January to April, 1953, on the former O'Brien-Cross Lake property on lot 2, concession V, Coleman township, district of Timiskaming. A small amount of development and exploration work was done on the 395-foot level of the Michael shaft.

Five men were employed during the period of operation. The mine address is Cobalt.

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, and in 1953, to 5,000,000 of which 4,589,181 have been issued. The officers and directors are: H. G. Miller, president and general manager; Murray Cooper, vice-president and treasurer; George Scott, assistant treasurer; J. M. Wainberg, secretary; Harry Harris, John Meyers, Maurice Hill, and J. D. Streit, directors. The head office is at 357 Bay Street, Toronto. The mine address is Box 142, Cobalt.

The company owns properties comprising 24 claims, having a total area of 767 acres, in Coleman township and the Gillies Limit, district of Timiskaming. The following properties are in Coleman township: Brady Lake group, lots 2 and 3, concession III, and lot 12, concession IV; Princess, lot 7, concession V; La Rose group, parts of lots 4 and 5, concession VI; Fisher-Eplett-Silver Hill group, lot 1, concession IV; Lawson-University-Silver Mountain group, part of lots 3, 4, and 5, concession IV. The Cleopatra claims lie partly in lot 5, concession IV, Coleman township, and partly in the part of the Gillies Limit immediately to the south.

Brady Lake Mine

The Brady Lake property, which has also been called the Silver-Miller mine, includes the old Lumsden, Rochester, Gillies, Cobalt Central, and Coleman Development (Pan Silver) mines.

Mining operations continued throughout 1953. The work was done from the No. 1 (Lumsden) and No. 4 shafts. The following table shows the development work done during the year:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
No. 1 (Lumsden) shaft:			
285-foot	252	.....	499
No. 4 shaft:			
360-foot	377	.....	112
440-foot	526	.....	287
500-foot	937	186	375
560-foot	143	.....	65
610-foot	.....	688	.....

Diamond-drilling consisted of 45 holes, totalling 6,648 feet, from underground.

Most of the ore was mined from stoping areas on the 440- and 500-foot levels of the No. 4 shaft workings. Some ore was produced from the 285-foot level of No. 1 shaft.

The mill operated from January 1 to November 4, when it was temporarily shut down because of a shortage of water. A total of 26,294 tons of silver-cobalt ore was mined, and the mill treated 29,266 tons, at an average daily rate of 102 tons.

An average of 76 men was employed, 46 underground and 30 on surface.

La Rose Mine

Mining and milling operations at the La Rose property continued throughout 1953. The vertical, two-compartment Main shaft is 250 feet deep, the bottom level being at 240 feet. A vertical, two-compartment winze, collared at the 240-foot level, runs to a depth of about 665 feet from surface. It was dewatered to the 380-foot level, but no mining or development was done below the 240-foot level. The following table shows the development work done on the levels from the Main shaft in 1953:

Level	Drift	Crosscuts	Raises
	feet	feet	feet
62-foot	410	138	83
85-foot	25	101	.....
157-foot	1,030	200	482
165-foot	.....	48	.....
240-foot	194	.....	192

Diamond-drilling consisted of 60 holes, totalling 5,025 feet, from underground.

There were 50,119 tons of ore, mainly cobalt, mined; and 46,149 tons were milled. The mill operated at an average daily rate of 128 tons.

An average of 98 men was employed of whom 58 were underground and 40 on surface.

Lawson Mine

Operations were carried on at the Lawson mine from September 1 to December 31, 1953. The vertical, two-compartment No. 8 Lawson shaft is about 400 feet deep, with levels at 88, 185, 240, 300, and 400 feet. The headframe was rehabilitated, a hoistroom was built, and a 10- by 12-inch, single-drum air hoist was installed. The shaft was dewatered to the 300-foot level, and some box-holing and stope preparation were done, but no other development was carried on.

Thirteen diamond-drill holes, totalling 1,648 feet, were drilled from surface.

The No. 8 shaft workings are connected to those from the old Lawson Main shaft on the 185-foot level. No hoisting equipment was installed at the Main shaft. The Lawson workings are also connected on the 185-foot level to the adjoining University mine. There is a concrete bulkhead across the opening through which a drain pipe has been installed. The University workings were dewatered to the 185-foot level through the bulkhead, but no work was done on the University side.

An old school building on the property was renovated and is used for an office, change-house, and workshop.

About 215 tons of ore, mainly cobalt, were hoisted and sent to the La Rose mill for treatment.

An average of 10 men was employed during the period of operation.

Siscoe Metals of Ontario, Limited

Siscoe Metals of Ontario, Limited, is a wholly-owned subsidiary of Siscoe Gold Mines, Limited. It was incorporated in September, 1950, to succeed Siscoe Metals, Limited. The authorized capitalization is 4,000 shares of no par value. The officers and directors are: J. B. Lynch, president; Auguste Desilets, vice-president; C. M. Masterman, secretary-treasurer; Thomas Guerin, A. K. Cameron, G. C. Smith, W. F. James, and J. G. Ahern, directors. The head office is at 907 Dominion Square Building, Montreal. The mine address is O'Brien.

The company owns 14 claims, approximately 547 acres, in Nicol and Haultain townships, Gowganda area, district of Timiskaming. It also operates the property of its wholly-owned subsidiary, Lost Lake Mines, Limited,[1] in Nicol township, district of Timiskaming.

Mining operations at the Siscoe Metals property continued throughout 1953. No. 11 winze, which is collared at the 850-foot level, was sunk a further 50 feet to a total depth of 1,215 feet from surface, and a new level was established at 1,200 feet. The following table shows the development work done in 1953:

Level	Drifts	Crosscuts	Raises
	feet	feet	feet
350-foot		65	70
525-foot	29		
730-foot	60		
790-foot	11		
850-foot	325	797	23
1,000-foot	163	31	
1,150-foot	233		
1,200-foot	158		

Diamond-drilling consisted of 180 holes, totalling 15,434 feet, from underground.

There were 21,981 tons of ore mined. The mill treated a total of 88,147 tons, from the following sources:

	Tons
Siscoe Metals:	
Mine ore	21,981
Surface rock dump	15,599
Tailings reclamation	41,086
Lost Lake Mines	9,191
Cotley Mines	290
Total	88,147

An average of 75 men was employed, of whom 30 were underground and 45 on the surface. G. Shartner is mine manager.

United Cobalt Mines, Limited

United Cobalt Mines, Limited, was incorporated in April, 1944, to succeed the Ausic Mining and Reduction Company. In June, 1951, the company was reorganized, and new shares were issued on a basis of one new for two old shares. The authorized capitalization is 4,000,000 shares of $1 par value, of which 1,360,973 have been issued. The officers and directors are: A. W. White, president; T. M. Fyshe, vice-president; L. W. McIlmurray, secretary-treasurer; A. B. Pilliner, W. R. Salter, and H. G. Miller, directors. The head office is at 145 Yonge Street, Toronto. The mine address is Box 250, Cobalt.

[1]See report on Lost Lake Mines, Limited, on page 135.

The company owns four claims in lot 9, concession I, Bucke township, district of Timiskaming, known as the Genesee group, and one claim in lot 3, concession VI, Coleman township, district of Timiskaming, known as the Silver Cliff.

No underground work was done in 1953. The mill on the Silver Cliff property was operated from January 1 to February 9 and from June 1 to December 31. During these two periods 18,823 tons of custom ore were treated, of which 18,744 tons came from the property of the affiliated Harrison-Hibbert Mines, Limited. The plant operated at an average daily rate of 74 tons.

J. E. Armstrong is manager. An average of 13 men was employed.

Van Chester Syndicate

J. S. Van Tassel, 318 West Front Street, Findlay, Ohio, a member of a group called the Van Chester Syndicate, acquired three, 20-acre claims in lot 14, concession III, Coleman township, district of Timiskaming. The property, which was formerly known as the Last Chance, is on Highway 11, about 7 miles southwest of the town of Cobalt.

There is an old shaft, about 120 feet deep, on the property. It dips to the south, being almost vertical near the surface and flattening out to approximately 45 degrees. There are no levels from the shaft.

During September and October, 1953, the shaft was dewatered, a 20-foot headframe was built, and the collar was re-timbered. A rented utility hoist and a gasoline-driven compressor were used. Work was suspended on October 15, and the equipment was removed.

Two men were employed.

TALC

Canada Talc Industries, Limited

Canada Talc Industries, Limited, was incorporated in July, 1951, with an authorized capitalization of 1,000,000 shares of no par value, of which 850,007 have been issued. The officers are: H. L. Roscoe, president; N. C. Urquhart, vice-president; C. H. Windeler, secretary-treasurer. The head office and mine office are at Madoc.

The company's property in Huntingdon, Elzevir, and Madoc townships, Hastings county, includes the Conley and Henderson mines.

Operations continued throughout 1953. Production was mainly from the Conley section of the property. The following table shows the development work done during the year:

Location	Drifts	Crosscuts	Raises
	feet	feet	feet
Conley Mine (270-foot level)	23	317	.....
Henderson Mine (443-foot level)	139	55	35

Diamond-drilling consisted of 6 holes, totalling 642 feet, from surface, and 11 holes, totalling 783 feet, from underground.

There were 12,900 tons of ore hoisted and milled. The mill operated at an average daily rate of 50 tons.

H. E. Roscoe is manager. An average of 18 men was employed, 10 underground and 8 on surface.

URANIUM

Centre Lake Uranium Mines, Limited

Centre Lake Uranium Mines, Limited, was incorporated in January, 1953, with an authorized capitalization of 3,000,000 shares of $1 par value, of which 1,700,008 have been issued. The officers and directors are: D. R. Michener, president; J. M. Cunningham-Dunlop, vice-president; R. A. Cranston, secretary; J. T. McWhirter, treasurer; W. H. Woods, managing, director, J. H. Crang, Eric Scott, W. A. Smith, A. G. Fulton, directors. The head office is at 50 King Street West, Toronto. The mine address is R.R.3, Bancroft.

The company owns 54 claims, containing approximately 2,160 acres, in lot 27, concession X, and lot 28, concession XI, Cardiff township, Haliburton county.

Operations were begun in January, 1953, and continued throughout the year.

An adit was driven into a hill on claim E.O.5939 for a distance of 995 feet, and 510 feet of crosscutting was done from it. About 9,000 feet of surface-trenching was done.

Thirty-two diamond-drill holes, totalling 14,242 feet, were drilled from surface.

A residence was built.

S. C. Brown was manager. Eight men were employed.

Pronto Uranium Mines, Limited

Pronto Uranium Mines, Limited, was incorporated in June, 1953, with an authorized capitalization of 5,000,000 shares of $1 par value, of which 1,900,007 have been issued. The officers and directors are: W. H. Bouck, president; F. R. Joubin, vice-president; F. D. Redfern, secretary-treasurer; G. A. Fallis, J. D. Bateman, J. H. Hirshhorn, and D. S. Beatty, directors. The head office is at 44 King Street West, Toronto. The mine address is Algoma Mills.

The company owns 139 claims, approximately 5,560 acres, in Long and Spragge townships, district of Algoma.

During November and December, 1953, an inclined shaft was sunk for a distance of 54 feet on claim S.S.M.23540, and 25 feet of drifting was done about 17 feet from surface. About 200 tons of ore was mined for sampling purposes.

Diamond-drilling consisted of 173 holes, totalling 30,859 feet, from surface.

A headframe, a staff-house, a cookery, and an office were built.

D. E. Smith was engineer in charge. Two men were employed.

METALLURGICAL WORKS

Algoma Steel Corporation, Limited

The Algoma Steel Corporation, Limited, was incorporated in December, 1934. The authorized capitalization is 4,000,000 shares of no par value, 1,650,800 of which have been issued. The officers and directors are: Sir James Dunn, president; H. G. MacAdam, secretary; W. E. Morley, treasurer; J. A. McPhail, E. G. McMillan, J. A. Simard, L. H. Timmins, Hon. T. A. Crerar, H. S. Hamilton, D. S. Holbrook, G. C. Bateman, P. G. Dunn, and T. R. McLagan, directors. The head office and blast furnaces are at Sault Ste. Marie.

Operations continued throughout 1953. The construction of No. 6 blast

furnace was completed, and the furnace was put into operation on July 19. The following table shows the dates of operation of the six blast furnaces:

No. 1	January 1–July 19
No. 2	January 1–January 18 May 14–August 7
No. 3	January 1–September 12
No. 4	January 1–December 8
No. 5	January 1–December 31
No. 6	July 19–December 31

A total of 1,020,504 tons of iron was produced.

The sinter plant operated throughout the year, and produced 438,304 tons of sinter.

O. H. Hugill was blast furnace superintendent until April 15 and was succeeded by Douglas Joyce. An average of 450 men was employed.

Canadian Furnace Company, Limited

The Canadian Furnace Company, Limited, was incorporated in June, 1951, to succeed Canadian Furnace, Limited. The authorized capitalization is 50,000 shares of no par value, of which 25,000 have been issued. The officers and directors are: Sir James Dunn, president; H. J. Allen, vice-president and general manager; D. S. Holbrook and E. G. McMillan, vice-presidents; H. G. MacAdam, secretary; J. B. Barber, treasurer; T. R. McLagan, director. The head office is at Sault Ste. Marie. The plant is at Port Colborne.

During 1953 the No. 1 furnace produced 62,197 tons of pig iron, and the No. 2 furnace 10,553 tons.

Thomas Cordner is superintendent. An average of 159 men was employed.

Canadian Industries, Limited

The sulphuric acid plant of Canadian Industries, Limited, at Copper Cliff, continued to operate throughout 1953, and produced 56,545 tons of sulphuric acid, a daily average of 155 tons.

The liquid sulphur dioxide plant operated for 268 days and produced 36,882 tons of liquid sulphur dioxide.

An average of 65 men was employed. R. W. Allgood is works manager.

Cobalt Chemicals, Limited

The Cobalt Chemical and Refinery Company, Limited, was incorporated in January, 1939. In May, 1952, the company was reorganized, and the name was changed to Cobalt Chemicals, Limited. The authorized capitalization is 3,000,000 shares of no par value, of which 2,500,000 have been issued. The officers and directors are: P. H. Hershey, president; A. D. Hellens, vice-president; Samuel Ciglen, secretary-treasurer; L. J. Lichty, managing director. The address of the head office and plant is Cobalt.

The company's custom smelting and refining plant in the Gillies Limit, district of Timiskaming, about six miles south of Cobalt, was partially destroyed by fire in 1950. The work of reconstruction, begun in 1952, was continued in 1953.

Four new dwelling houses were built on the company's townsite. The smelter

building was completed, and the following equipment was installed: a wet-grinding unit with classifier, thickener and filtering units, a 650-kilovolt-ampere electric smelting furnace, an Edwards roasting furnace, and three Hardinge rotary kilns. The Draco bag-house and arsenic-recovery plant were rebuilt. An arsenic-refining plant was built, and the equipment was installed. A concentrate-storage building, with crushing and blending equipment, was erected. The silver refinery was completed. The cobalt plant was completed, and an electric refining furnace was installed.

The plant is designed to smelt and refine arsenious cobalt-silver and associated ores from the Cobalt area and other sources. The operation will be carried on under contract agreement by Quebec Metallurgical Industries, Limited, an affiliate of Ventures, Limited, and Frobisher, Limited.

No production was undertaken in 1953. Experimental work on the metallurgical problems involved was done at the Ottawa laboratories of Quebec Metallurgical Industries, Limited, under the direction of L. J. Lichty.

An average force of 108 men was employed. C. W. Eggert is general superintendent.

Deloro Smelting and Refining Company, Limited

The Deloro Smelting and Refining Company, Limited, was incorporated under Dominion charter in July, 1916. In November, 1936, it was converted into a private company by supplementary letters patent. The officers and directors are: B. A. O'Brien, president; Alan Scott, vice-president and managing director; N. P. Langford, secretary-treasurer; J. A. O'Brien, M. J. O'Brien Jr., J. S. Carter, and W. S. Kirkpatrick, directors. The head office and plant are at Deloro.

Operations at the plant continued throughout 1953. The following table shows the production during the year:

Silver	ounces	3,184,893
Arsenic	pounds	1,403,740
Cobalt metal	pounds	1,004,100
Black cobalt oxide	pounds	51,900
Amorphous cobalt sulphate	pounds	88,800
Nickel oxide	pounds	218,000

An average of 273 men was employed. R. G. Walsh is general manager.

Dominion Foundries and Steel, Limited

Dominion Foundries and Steel, Limited, was incorporated in May, 1917, with an authorized capitalization of 80,000 shares of preferred stock of $100 par value and 5,000,000 shares of common stock of no par value. There have been 76,742 preferred shares and 2,400,000 common shares issued. The officers are: F. A. Sherman, chairman of the board; A. G. Wright, president and treasurer; F. A. Loosley and F. H. Sherman, executive vice-presidents; R. A. Morris, executive vice-president, secretary, and comptroller; D. F. Hassel, D. A. Davis, A. C. Anderson, and R. R. Craig, vice-presidents. The head office and plant are at Hamilton.

The plant operated throughout 1953.

An average of 72 men was employed. H. C. Taylor is blast furnace superintendent.

Steel Company of Canada, Limited

The Steel Company of Canada, Limited, was incorporated in June, 1910, with an authorized capitalization of 2,000,000 preferred shares of $5 par value, and 3,000,000 common shares of no par value. In April, 1953, the capitalization was changed to 5,133,328 common shares of no par value, of which 3,701,850 have been issued. The officers and directors are: R. H. McMaster, chairman of the board; H. G. Hilton, president; G. B. Elwin, vice-president and treasurer; H. M. Griffith and L. T. Craig, vice-presidents; V. W. Scully, vice-president and comptroller; H. S. Alexander, secretary; E. G. Baker, G. R. Ball, W. Taylor-Bailey, Hon. C. A. Dunning, Frederick Johnson, L. L. Lang, R. A. Laidlaw, R. H. McMaster, Hon. S. C. Mewburn, Rt. Hon. Sir Thomas White, directors. The address is Hamilton.

The following table shows the number of days each furnace operated in 1953 and the number of tons of pig iron produced:

Furnace	Operated	Pig iron produced
	days	tons
A	304	88,280
B	312	203,343
C	365	358,559
D	364	480,849
Total	.....	1,131,031

An average of 304 men was employed. J. S. McMahan was blast furnace superintendent.

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PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

SIXTY-THIRD ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXIII, PART 3, 1954

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Structural Contour Map and Section
(In pocket at back of report)

Map of Aldborough Township, Elgin County, and Part of Mosa Township, Middlesex County, showing Oil and Natural Gas Field. Scale, 1 inch to 1 mile.

Courtesy Canadian Oil Companies, Ltd.



A night view of the Canadian Oil Companies, Limited, refinery at Sarnia. The photo shows the crude-distillation unit (centre) flanked by the catalytic-cracking unit (left) and the catalytic-reforming unit (right).

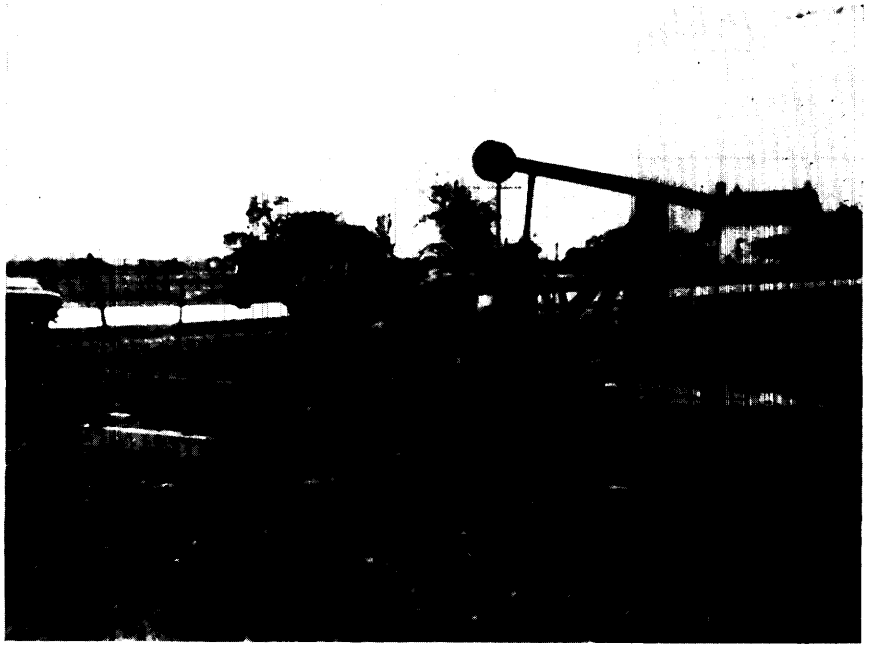
Natural Gas in 1953

By R. B. Harkness

General

The production of natural gas in Ontario in 1953 was greater than in any year since the war years of 1940 and 1914–18, when the fields were called upon to supply much more than could possibly be produced. The production for 1953 was 9,835,469 M cubic feet, and its value $11,694,595, which was 1,533,279 M cubic feet and $1,730,571 more than in 1952. The consumption of natural gas was 15,956,404 M cubic feet. This was greater than in any year since 1917 when, in

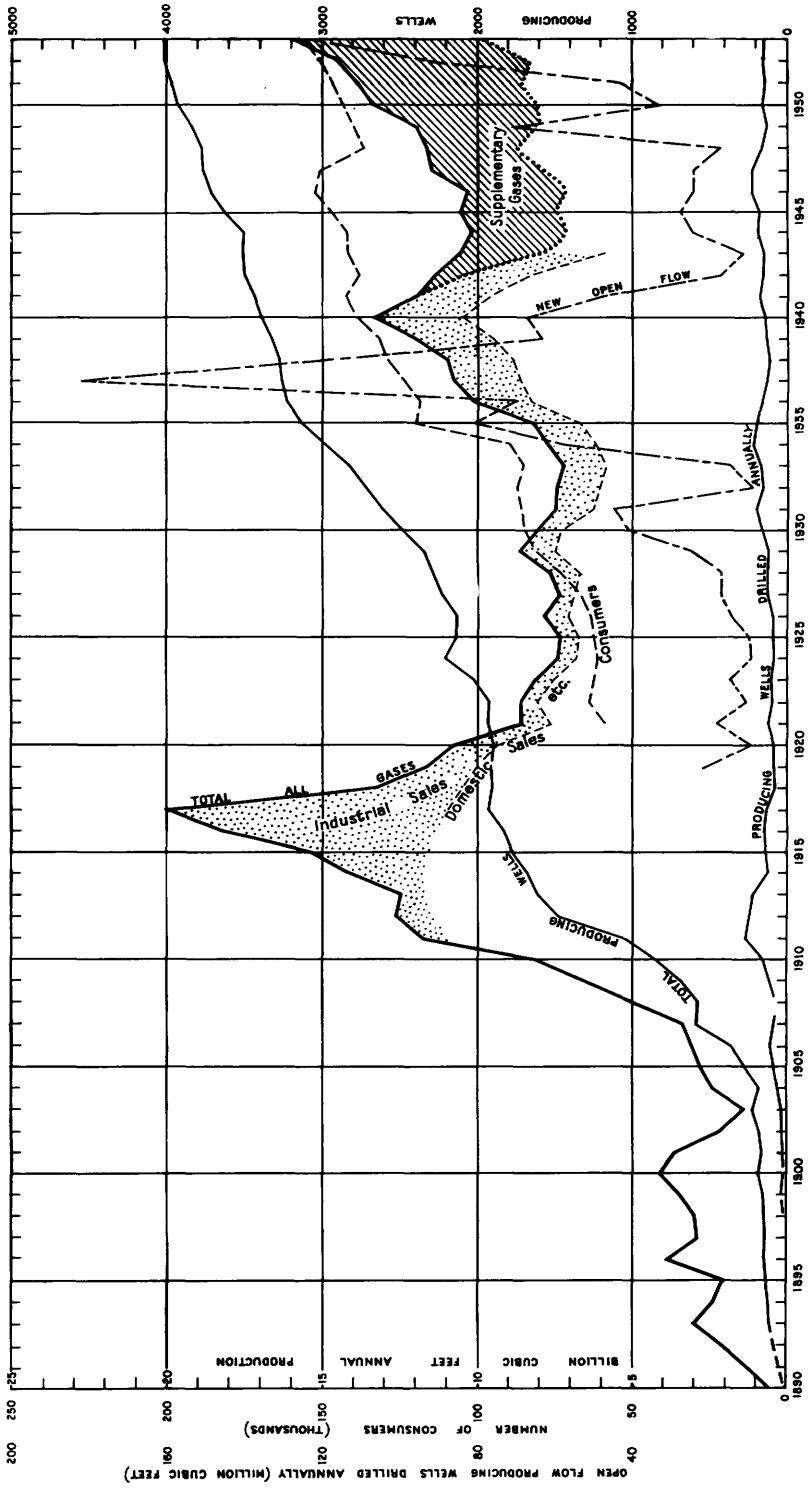
Courtesy Union Gas Co. of Canada, Ltd.



Pumping Gas Wells in the Welland Field

Horsepower is still in use in 1953. The horse pumps perhaps a dozen wells a day. After 65 years' experience, no more efficient means has been found for removing the small quantity of water that accumulates in the gas wells of the Welland field.

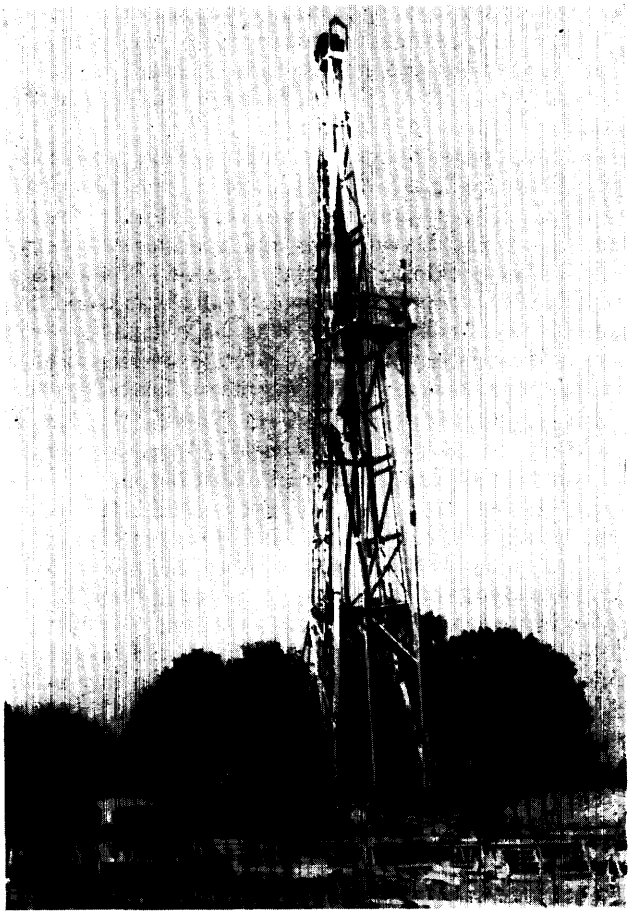
World War I, gas was so cheap and the demand so great that coal merchants of western Ontario had no demand for their fuel, and even brick, tile, and lime were manufactured with gas as fuel. Supplementary gases used show a decrease of 105,169 M cubic feet. This decrease is the result of the termination of a contract between the Union Gas Company of Canada, Limited, and Imperial Oil, Limited, whereby still gas from the Sarnia refinery was reformed from approximately 1,600 B.t.u. per cubic foot to 1,000 B.t.u. per cubic foot and mixed with natural gas for distribution. In the summer months this reformed gas was pumped under-



The Development of the Natural Gas Industry in Ontario, 1890–1953

ground and stored in the depleted Dawn gas field, but it was found to carry a certain quantity of naphthaline that tended to plug the pores of the rock reservoir and for this and other reasons was unsuitable. When new supplies of gas became available through importation from the United States and other Ontario gas fields, this contract for still gas was terminated. Sources of supplementary gas, over and above that from the Ontario fields, are the great gas reserves of Kansas, Oklahoma, and Texas in the United States. These gases are imported through pipelines from Detroit and Buffalo. A very small quantity of liquid petroleum gas is converted

Courtesy Union Gas Co. of Canada, Ltd.



Rotary rig in the Moore field.

into its equivalent natural gas at a mixing station near Brantford; from 1941 to 1948 it was the sole supply of gas to customers in that area in the winter months. The gas-oil plant at Port Stanley is operated a few days each year to keep it in working order.

The two large producing and distributing gas companies in Ontario are the Union Gas Company of Canada, Limited, which supplies most of the customers west of and including London, and the Dominion Natural Gas Company, Limited, which supplies most of the customers east of and including St. Thomas. These have their field and transmission lines so interconnected that gas can be routed from any gas field in any direction. On the outskirts of the city of London there is

a connection between the transmission lines of these companies, and the Dominion company receives gas at this point from the Union company during the winter. This gas supplies consumers in the area from St. Thomas to the southern outskirts of Hamilton, and in times of great demand during the winter, to the north limits of the Haldimand field through an 8-inch pipeline from a point near Ancaster to Caledonia. Compressors at Brantford and Caledonia force the gas in this direction. In the winter most of the gas from the Haldimand field is directed towards St. Catharines through a compressor station at Winger, a few miles east of Dunnville. The rock pressure of the eastern part of the Haldimand field has declined to about 150 or 100 pounds per square inch in the eastern and northern sections; in the winter compressors are necessary to move the gas to any market outside the field. Even with the higher rock pressure in the Norfolk field, a compressor is necessary to move gas to Tillsonburg. A larger pipeline would improve conditions in this area considerably.

In the western counties of Kent and Lambton, field conditions are very much better. The newly discovered gas pools in Lambton county have a rock pressure of 800 pounds and over. The compressor station at Windsor sends the imported Texas gas on its way to the Dawn fields and the markets between. The rock pressure in the old Tilbury field has declined to about 170 pounds per square inch, which is only slightly above pipeline pressure. Little gas could be produced from this field without the aid of compressors. The large-capacity compressor station in the Dawn gas field compresses gas for storage underground in the summer months; in the winter months it reverses the process to send gas to London.

One of the first regulations made under the Natural Gas Act of 1918 was that compressors should not be used in any gas field. A compressor station had been built in the Welland field by the Provincial Gas Company, Limited, and in the Tilbury field by the Union Gas Company of Canada, Limited, in order to force more gas from the Welland field to Buffalo and from the Tilbury field to Windsor and Chatham. Those who marketed gas without the aid of compressors feared that these compressors would drain the gas from under their land. They appealed to the Minister of Mines for protection against this "robbery," citing the experience in the Ohio fields where, after compressors had been installed, the wells were flooded with water. The appeal was successful in impressing the Minister with the danger to the field, and the regulation was put into effect. Since the regulation was made, it has been established that there is no danger of bottom water encroachment in the Welland or Haldimand fields. In the wells of the Tilbury field, bottom water has been plugged back, and any encroachment can be kept under control. In the Welland field bottom water was never a problem. The regulation would now only impede production and was rescinded a few years ago.

This year the Windsor oil-gas plant, which had supplied oil-gas to the border cities at times of peak demand since 1929, was dismantled. Because of increased supplies of natural gas from the Lambton field, but mainly because of imports of gas from Texas, this "stand-by" plant is no longer necessary.

With the enormously increased reserves in Lambton county under contract to the Union Gas Company of Canada, Limited, this company is enlarging its market to take in the areas of expansion in the growing towns and cities that it serves and is preparing for the introduction of Alberta gas. About 49 miles of new distributing lines, exclusive of services, were laid, and 8 miles of existing lines were renewed. Almost 20 miles of new line were laid in the city of Sarnia. W. D. Brittain, gas and oil inspector, has collected all this information in Table I. With all this activity, work on collection and transmission lines was reduced to a minimum. Plans for next year include the laying of a 16- or 20-inch transmission line from the

TABLE I—PIPELINE CHANGES BY THE UNION GAS COMPANY OF CANADA, LIMITED, 1953

	New					Replacement							Abandoned or recovered			
	8-inch pipe	6-inch pipe	4-inch pipe	3-inch pipe	2-inch pipe	16-inch pipe	10-inch pipe	8-inch pipe	6-inch pipe	4-inch pipe	3-inch pipe	2-inch pipe	8-inch pipe	6-inch pipe	3-inch pipe	2-inch pipe
	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet
Production				12,600	515										5,630	13,225
Transmission		5,825				97	7,350		65	2,025						
Distribution: Plant																
Windsor		10,750	28,395	1,175	24,895		1,090	180	1,355	7,210						
Sarnia	35,925	550	12,605	23,950	31,290				3,035	470	1,240	3,150				
London	795	2,985	15,315	5,530	1,855											
Chatham		555	11,215	4,260	11,520					2,800	55		700			
Wallaceburg			1,780	4,405						1,155						
Thamesville			1,095	1,360	655											
Tilbury				1,115	1,190											
Essex			930		1,000					2,315						
Other				1,570	19,700					195	7,190	11,865		655		
Totals (new distribution lines only)	36,720	14,840	71,335	42,365	92,105											
Total	257,365															

Dawn storage pools to Oakville via Guelph and Kitchener. This line will be connected with the proposed 36-inch pipeline from Alberta and make possible summer storage of Alberta gas in the Dawn and other pools when they are depleted.

The delivery of gas from the many scattered fields of the Union Gas Company of Canada, Limited, is directed by a "dispatcher" by means of a short-wave-radio intercommunication system that links all fields to his central office. He has also a mobile unit and can visit all fields or a break in any line and from there direct that a field be shut in and another turned on so that gas may be re-routed to consumers. Thus it is assured that there will be no interruption to the gas service. This interlocking of gas fields makes for much more flexible operation.

The fields operated by the Dominion Natural Gas Company, Limited, extend for about 60 miles along the north shore of Lake Erie. They are interconnected by compressor stations but do not lend themselves to dispatcher control to the same extent as the fields of the Union company.

Gas from Alberta

In view of the publicity being given to, and country-wide preparations being made for, the bringing of a part of the vast surplus resources of natural gas from the province of Alberta to the densely populated provinces of Ontario and Quebec, it would be well to discuss some of the effects that this will have on the industry in Ontario. To sell gas at the lowest possible rate the pipeline must carry its capacity every day of the year. This is called a 100 percent "load factor." In this northern climate, domestic consumers use most of their annual consumption in the winter months. An outlet for surplus gas must be found in the summer months and off-peak intervals. Many industries that use oil for fuel have equipment that can be changed to use natural gas at very short notice. These industries are the principal outlet for surplus or off-peak gas. If all the towns and cities in Ontario and Quebec within reach of a pipeline were supplied, and the domestic load factor was 30 percent in summer, there would be a huge surplus of gas to be disposed of, or stored for future use. Underground storage is the best and cheapest means of storing surplus gas against winter demand.

There has been over 450 billion cubic feet of gas produced from Ontario gas fields since 1890, and theoretically, an equal amount of gas could be returned to these fields. However, when a gas field is depleted a certain amount of moisture is left in the pores of the rock, and this moisture resists the input of gas particularly where the porosity is low. It also retards the flow of gas in the opposite direction. In general, fields like the Welland and Haldimand are not ideal for storing gas although parts of them may be. The Lambton "reef structural" fields on the other hand are highly porous; they might even be called cavernous. Wells of a capacity of up to 60,000 M cubic feet per day have been encountered. These gas fields show no water and are ideal for storage. There are other reefs that are dry, that is, they contain no gas, and some that are full of water. The Leamington, Brownsville, Malahide, Declute, and parts of the Tilbury field are wet fields, that is, the water was below and in contact with the gas. In these fields the wells had a very large open flow and gave up the gas readily. Presumably they would hold gas again. The Tilbury field has produced 220,000,000 M cubic feet; the Leamington field, 28,000,000 M; the Declute, 18,000,000 M; the Malahide, 4,500,000 M; and the Brownsville field, 3,850,000 M cubic feet. Of the Lambton "reef" fields, none are entirely empty. The Dawn field has been in part re-pressured with 9,438,071 M cubic feet. The remaining fields in Lambton have been drawn on very little and are not now available for storage. It is estimated by operators that there is a reserve of 150,000,000 M cubic feet available in these fields. It would therefore

appear that there is room in present fields and the already depleted fields in Ontario for storing Alberta gas that is surplus during the summer months. As suggested in an earlier paragraph, experimentation will be necessary before exact figures can be given.

Conversion from Manufactured to Natural Gas

It is quite possible that, within a year's time, the city of Toronto may be added to the municipalities using natural gas. Permission has now been granted by the United States Federal Power Commission for the export of gas contracted for from Texas by the Consumers' Gas Company of Toronto or its associates. A 20-inch line is planned from Toronto along the lakefront to Queenston on the Niagara River, which will connect with a pipeline laid to meet it at the United States border. Converting the manufactured-gas equipment for the use of natural gas in Toronto is planned for 1954.

Such changes are not new to this Province; there have been many manufactured-gas plants changed over in past years. Windsor was converted to natural gas in 1892 and again in 1909. Chatham was second in 1907, followed by Wallaceburg and Sarnia two years later. The Hamilton plant may have been partially changed over in 1906. The record is not clear whether part of the city used natural gas or whether it was mixed with manufactured gas; the Dundas plant was definitely converted to natural gas in 1906. Simcoe had a struggling manufactured-gas plant that was taken over and converted to natural gas in 1906. It should be noted that the task of "converting" a manufactured-gas plant to the use of natural gas then did not present the many complicated problems that it does today. Most manufactured gas was used for lighting with very little used for cooking. The gas lights needed no conversion, and the gas stoves of those days did not have adjustable spuds (gas ports in the burner); the adjustment was made, if at all, when the consumer raised an outcry about the carbon-encrusted pots and pans that resulted.

Brantford had a manufactured-gas plant, and when natural gas was discovered on Bow Park farm in 1904, a line was laid across the Grand River near the Mohawk church and then westward along the road to the Cockshutt property where it was turned into the mains. When the Bow Park wells failed, gas was brought from the Haldimand field via Hagersville, Villanova, the Indian Line, and Cockshutt Road.

In 1913 when the Southern Ontario Gas Company, Limited, built the 12-inch pipeline from the Tilbury field to Hamilton, manufactured-gas plants in Ingersoll and Woodstock were purchased, converted, and, with Brantford, supplied with sulphur gas from the Tilbury gas field. In those days gas fitters did very careless work, but pressures were very low, about one ounce per square inch, and the leaks that were insignificant at one ounce became of alarming proportions under pressures of from six to ten ounces per square inch. A newspaper report of those days says that, on the introduction of sulphur gas into Brantford, "citizens by common consent threw open window and doors and rushed for the open air." Explosions were numerous, but fatalities very few.

This led to better work being done by gas fitters and, where a municipality had the necessary regulations, to a tightening of them in respect to house piping; but these cases were remarkably rare since regulations needed inspectors to enforce them, and the taxpayers wanted neither regulations nor inspectors.

No further conversion took place until 1935 when the Union Gas Company of Canada, Limited, purchased control of the City Gas Company of London. Manufactured gas was replaced by natural gas, the plant greatly enlarged, and

some 8,000 homes heated by natural gas until 1941. In the following year the Southern Ontario Gas Company, Limited, bought the St. Thomas manufactured-gas plant and converted it to supply natural gas.

Today gas lighting has practically disappeared, and the by-product coke oven has made coke the principal product. This oven so far surpasses the old horizontal oven in efficiency and lower cost that the old manufactured-gas plants are being closed down. Liquid petroleum is rapidly replacing the costly manufactured gas previously sold. All appliances may be converted to use manufactured gas with 500–550 B.t.u. per cubic foot, natural gas with 1,000–1,060 B.t.u. per cubic foot, or liquid petroleum gas with 2,500+ B.t.u. per cubic foot. A change of spud in the mixer and an adjustment of the pilot light and air intake are all that is necessary. Modern gas refrigerators, however, require a change of burner. Without this change, pilot lights may go out, and burners will give trouble. In old appliances with no automatic shut-off in the burner, gas will continue to flow when the burner goes out. Natural gas carries no carbon monoxide, and the hydrogen sulphide has now been removed so that there are no fatalities from escaping gas. Many costly explosions have been caused by escaping gas, but strangely enough, very few fatalities have resulted from these explosions.

Production

Table II shows the quantity of gas produced in each field in Ontario. This table has been published since 1921 in each annual report. In this year's report the Electric field has been deleted as its only well is abandoned. Fields showing an increase of production are Tilbury and Mosald, in Mosa and Aldborough townships, the Kimball-Payne field in Moore township, and the Becher field in Sombra township. The Welland, Haldimand, Norfolk, Brant, Brownsville, and Bayham fields show a decline. The decline in these fields is not great—no more than normal. The Declute and Dover fields also show a decline, but these fields are old and nearly depleted. They are used intermittently, and therefore their production may fluctuate from year to year.

With the availability of imported gas, the depleted Ontario fields are not called upon to deliver their full quota of gas every month of the year. Wells can now be closed in, and the field "rested" in the summer. This applies particularly to the Welland field where gas is imported from Buffalo and stored underground. Many wells in the Welland field are now used only in the winter, and the major part of the Chatham, Camden, and Zone fields is shut in during the summer.

Table III giving production statistics has been published annually since the report of the year 1922, and in its new form contains information about exploration and development drilling as well as the production of all fields. Comparative figures are given on page 1.

Exploration and Development

W. D. Brittain, inspector in the western division of the natural gas district, reports on the year's activities as follows:

> The year 1953 saw wide-ranging testing and development of our natural gas resources, which resulted in substantial additions to the natural gas reserves of the province. The most recent estimate of reserves is about 175,000,000 M cubic feet. Most of the new gas discoveries were in Lambton, with smaller pools in Middlesex, Kent, and Elgin.

In the matter of drilling, Mr. Brittain says:

> The value of rotary drilling has been established; it has been particularly successful in drilling against high-pressure gas in the Lambton county "reef fields" and in drilling wells for storing liquid petroleum gas. These latter were drilled through the Salina salt formations where it was

necessary to secure cores. It seems unlikely that rotary drilling will ever replace cable-tool drilling for exploratory work or in drilling in non-reef-structure gas fields where the flow of gas does not lift the cable tools. In Moore township six wells were drilled in "reef fields" with a rotary rig, and two wells were deepened. In Warwick, one well was completed and a second deepened through a "reef field" with a rotary drill.

The gravity meter continues to be used by the major companies for locating reefs. A number of reefs were located, but only two contained oil or gas. One in Harwich was a gas reef and one in Warwick was classified as "oil" although it had a very large flow of gas. The remainder were either totally dry or else filled with water. Mr. Brittain remarks on this.

The larger operators have confidence in gravimetric surveys; their operations range from Essex country through Kent, Lambton, and Middlesex, to Huron county. In 1953, three parties were employed at one time, and an estimated 2,300,000 acres were covered in the year.

TABLE II—NATURAL GAS PRODUCTION BY FIELDS, 1953

County	Field	Quantity
		M cu. ft.
Essex	Kingsville and Leamington	18,874
Kent	Tilbury	1,726,881
	Dover	79,643
	Declute	232,262
	Chatham	86,495
	Camden gore	11,295
	Zone	99,165
Lambton	Dawn	712
	Moore (Kimball-Payne)	4,247,472
	Sombra (Becher)	102,948
Middlesex and Elgin	Mosald	585,371
Elgin	Bayham and Malahide	16,929
Haldimand, Lincoln, Wentworth	Haldimand	1,313,761
Brant	Brant	18,810
Norfolk	Norfolk	517,872
Oxford	Brownsville	19,676
	Norwich	34,032
Welland	Welland	596,771
Private wells		125,500
Total produced		9,835,469
Retail value		$11,694,595
		M cu. ft.
Gas other than natural gas produced in Ontario:		
Imported mixed gas		613,415
Natural gas imported from U.S.A. (Texas panhandle)		5,497,101
Oil gas		1,260
Propane gas		9,159
Total of other gases		6,120,935
Total of all gases distributed		15,956,404

Wells drilled in 1953 totalled 297 as compared with 288 wells drilled in 1952. There were 66 exploratory wells drilled in 1953: 63, dry; and 3, producers. The producers were in Warwick, Mosa, and Aldborough townships. Of the 231 development wells drilled, 83 were dry and 148, producers. There was a total of 377,671 feet drilled during the year, the dry holes accounting for 58 percent of this footage, and the producers for 42 percent. The open flow of the producing wells was 122,546 M cubic feet, which exceeded last year's new open flow by 29,824 M cubic feet. As compared with the past few years, operations in 1953 may be said to have been very satisfactory.

TABLE III—GAS WELLS AND THEIR PRODUCTION, 1953

County	Township	Wells as at Dec. 31, 1953			Wells drilled							Production	Rock pressure
					Dry			Producing					
		Producing	Idle	Abandoned	Exploratory	Development	Footage	Exploratory	Development	Footage	Open flow		
											M cu. ft.	M cu. ft.	lb. per sq. in.
ESSEX	Gosfield South	15	4									15,244	160
	Malden		5										395
	Mersea	2		1								3,650	289
	Tilbury West		3										445
KENT	Camden gore	15	2									11,295	588
	Chatham	21										86,495	419
	Chatham gore		3						1	1,928	450		758
	Dover	5	6	1								79,643	130
	Harwich		2		2	4	11,440	1		1,855	150		820
	Raleigh (Declute)	28	3									232,262	233
	Raleigh	17		1									248
	Romney	116	5	5		1	1,352		2	2,455	2,950	1,726,881	125
	Tilbury East	103		4					1	1,360	310		136
	Zone	49										99,165	
LAMBTON	Bosanquet				1		2,222						
	Brooke				6		12,400						
	Dawn	22	2		8	2	19,429					712	418
	Enniskillen		2		1	1	4,372		1	1,632	6,014		500
	Moore	12	20		3	4	16,767		6	14,795	82,000	4,247,472	760
	Plympton				1		2,575						
	Sarnia				4		11,006						
	Sombra	1	17		5	3	17,535		2	4,538	710	102,948	800
	Warwick		2		4		8,825				20,000		

HURON	Colborne				2		4,080						
	Goderich				2		4,174						
	Hullett				5		9,157						
	Morris				2		3,321						
	West Wawanosh				1		1,937						
MIDDLESEX	Adelaide				1		2,015						
	Caradoc				1		1,859						
	Ekfrid				1		1,825		1	1,602	165		
	Metcalfe				2		3,692						
	Mosa	12	1		1	1	3,403	1	1	3,439	950	585,371	526
ELGIN	Aldborough	22	5			1	1,645	1	1	2,930	1,200		496
	Dunwich	1	5		1	1	2,992						670
	Bayham	27	5										165
	Malahide	3	12									[1]16,929	320
	Yarmouth		5										320
	Bayham (Brownsville)	5										19,676	335
OXFORD	Dereham (Brownsville)	6			1		1,002						340
	South Norwich	8			1		1,156		1	1,136	52	34,032	360
	West Oxford				3		3,445						
NORFOLK	Charlotteville	35		1		6	7,505		11	13,896	675		278
	Houghton	7											320
	Middleton	46			2	5	8,610		5	6,203	822		231
	North Walsingham	61				4	5,575		16	21,336	1,989	[1] 517,872	332
	South Walsingham	24											282
	Townsend	57	2										204
	Windham	45	1	1		11	12,671		7	8,251	869		284
	Woodhouse	131	5	5					1	1,000	27		181
BRANT	Onondaga	3	1	3									53
	Tuscarora	19		3								18,810	103
	South Dumfries				1		2,647						

TABLE III—GAS WELLS AND THEIR PRODUCTION, 1953—*Continued*

County	Township	Wells as at Dec. 31, 1953			Wells drilled							Production	Rock pressure
					Dry			Producing					
		Producing	Idle	Abandoned	Exploratory	Development	Footage	Exploratory	Development	Footage	Open flow		
											M cu. ft.	M cu. ft.	lb. per sq. in.
WENTWORTH	Binbrook	21	1	7									45
	Glanford	7		1									35
HALDIMAND	Canborough	137		3					1	695	36		86
	Dunn	191	1	3		8	8,354		14	12,220	412		152
	Moulton	137		7		4	3,119		18	14,512	724		168
	North Cayuga	181	1	25									166
	Oneida	120		2		2	1,330		1	640	28		102
	Rainham	230	3	17					5	4,368	235		154
	Seneca	101	1	5					1	560	5	1,313,761	59
	Sherbrooke	23	1	1		1	846		1	885	12		133
	South Cayuga	123							2	1,493	45		150
	Walpole	475	5	28		4	3,691		5	4,448	206		159
LINCOLN	Caistor	108		3		2	922		9	4,347	170		66
	Gainsborough	5	1	1									60
WELLAND	Wainfleet	34	3	5		7	4,857		3	2,329	48		56
	Bertie	243	7	3		1	783		8	6,297	157		100
	Crowland	53				1	577		3	2,000	82		25
	Humberstone	140	20	9		4	3,085		16	12,560	956		60
	Pelham	2			1		615					596,771	103
	Stamford	5											45
	Thorold	30				3	1,591		1	501	40		108
	Willoughby	89		1		2	1,112		3	1,945	67		67
SURFACE WELLS	(Howard and Harwich)	55										6,500	
PRIVATE WELLS		419										120,000	
Total		3,848	161	146	63	83	219,515	3	148	158,156	122,546	9,835,469	

Acres under lease (estimated) 1,887,041
Rentals paid $658,219

[1]The small production of the seven wells in Houghton township is not measured separately, it is recorded with Bayham and Malahide townships and therefore included with them.

The county of Huron has again been given considerable attention in the way of exploratory drilling. Twelve wells were drilled of which only two had "shows" of gas and oil; all were dry commercially. This has not discouraged the operators, and the coming year will see further drilling in Huron county and some in Bruce county. The Sun Oil Company, Limited, now building a refinery at Sarnia, is expected to enter the drilling field in 1954. Indications are that operations will also extend to Essex county.

Mr. Brittain describes further drilling as follows:

KENT COUNTY

Harwich Township

A small gas pool was discovered by Imperial Oil, Limited, near the village of Guilds in the Salina-Guelph formation.

Romney Township

Two more good gas wells were completed 1½ miles offshore by the Consolidated West Petroleum Company, Limited, in Salina-Guelph formation.

LAMBTON COUNTY

Dawn Township

Reef structures were found in Dawn township that gave shows of gas, but they were not of commercial value.

Enniskillen Township

A reef was discovered that will be further explored in 1954.

Moore Township

Drilling was confined to the development of known fields. Core drilling with a rotary drill increased the knowledge of the character of the reef structures. In the Seckerton field two wells that produce both oil and gas were completed.

Warwick Township

A reef one mile northwest of Watford proved to be a good oil and gas pool. The area is small, but the volume is large. The gas will only be produced in a sufficient quantity to raise the oil.

MIDDLESEX COUNTY

Mosa Township

An exploratory well in the Big Bend area near Wardsville "came in" in the Salina. A development well near Wardsville was carried down to the Queenston formation without result.

ELGIN COUNTY

Aldborough Township

A new pool on the north end of the Aldborough-Dunwich township line was discovered in the Salina-Guelph formation. An offset in Ekfrid township was also a producer.

In the eastern division of the natural gas field, east of the city of London, the area to explore for new supplies is small. The producing formations, Clinton and Medina, thin out to the west and north of the present fields. The most promising areas are in the southern part of Norfolk county, particularly Middleton, Charlotteville, and North and South Walsingham townships, where there are many square miles unexplored. G. H. Smith, inspector of natural gas wells in this area, classifies two wells as exploratory; these are in north Middleton and were both dry. In Oxford township there were four exploratory wells, one being within a known field. No new supplies of gas were discovered in this area. Haldimand county is so fully drilled that it would be difficult to find an area for exploration. Drilling in this county has been continuous for fifty-three years and in Welland county for sixty-five years or more. It is worthy of note that the average open flow of new

wells in Haldimand county is 35.5 M cubic feet and in Welland county 40 M cubic feet. Strangely enough there is more room for drilling, both exploration and development, in Welland county than in Haldimand county, and drilling activity may be expected to continue in Welland county for many years.

The possibility of finding more gas fields in the Guelph formation in west Elgin, Oxford, and Middlesex should not be overlooked although the area that can be explored is now small.

TABLE IV—SUMMARY OF NATURAL GAS DISTRIBUTED AND CONSUMED, 1949–53

	1949	1950	1951	1952	1953
	M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.
DISTRIBUTION:					
To customers	9,025,107	10,460,830	11,206,441	11,682,773	12,602,838
Used by companies for all purposes	403,055	457,912	603,300	477,253	225,638
Used by private well owners	86,500	126,500	126,500	126,500	126,500
Leakage in transmission lines	456,048	515,353	527,877	207,733	518,836
Leakage in distribution plants	364,219	314,242	245,503	183,970	283,379
Leakage in rural lines	33,379	34,348	35,949	36,525	33,622
Used in gas-manufacturing plant (Hamilton)	.....	.....	.....	64,816	972
Natural gas to storage	1,748,065	1,499,560	1,114,271	1,748,624	2,164,619
Total	11,916,373	13,408,745	13,859,841	14,528,194	15,956,404
	M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.	M cu. ft.
Other than natural gas produced in Ontario included in totals (see Table II)	3,892,160	5,399,257	5,416,499	6,226,004	6,120,935
CONSUMPTION:					
Domestic and commercial:					
Number of consumers	140,074	143,338	147,424	151,747	156,181
Total consumption (M cu. ft.)	7,364,350	8,547,903	9,175,866	9,619,670	10,303,121
Average consumption (M cu. ft.)	52.6	59.6	62.2	63.4	65.9
Average retail rate per M cu. ft.	$1.10	$1.11	$1.18	$1.198	$1.196
Industrial (M cu. ft.)	1,563,863	1,811,257	1,929,567	1,994,953	2,207,988
EMPLOYMENT:					
Total number of employees	1,370	1,436	1,468	1,461	1,476
Total salaries and wages paid	$2,243,778	$3,106,801	$3,763,241	$3,968,682	$4,129,681

Distribution

Table IV gives a summary of gas distributed each year for a five-year period. The quantity distributed to consumers has been increased by 920,065 M cubic feet and is the highest on record. The number of customers is 156,181, an increase for the year of 4,434, and the consumption per customer has increased by 2.5 M cubic feet. These increases and the increase in wages paid are all indications of good times and a prosperous community. The imported natural gas sent to storage shows an increase of 415,999 M cubic feet and the total now in storage is 9,438,071 M cubic feet, which is equal to one year's production. This is most reassuring with the alarming shortages of the war years so clearly in mind. Industrial consumption has had a small increase of 213,035 M cubic feet but this is only in line with the normal growth of industry in the country.

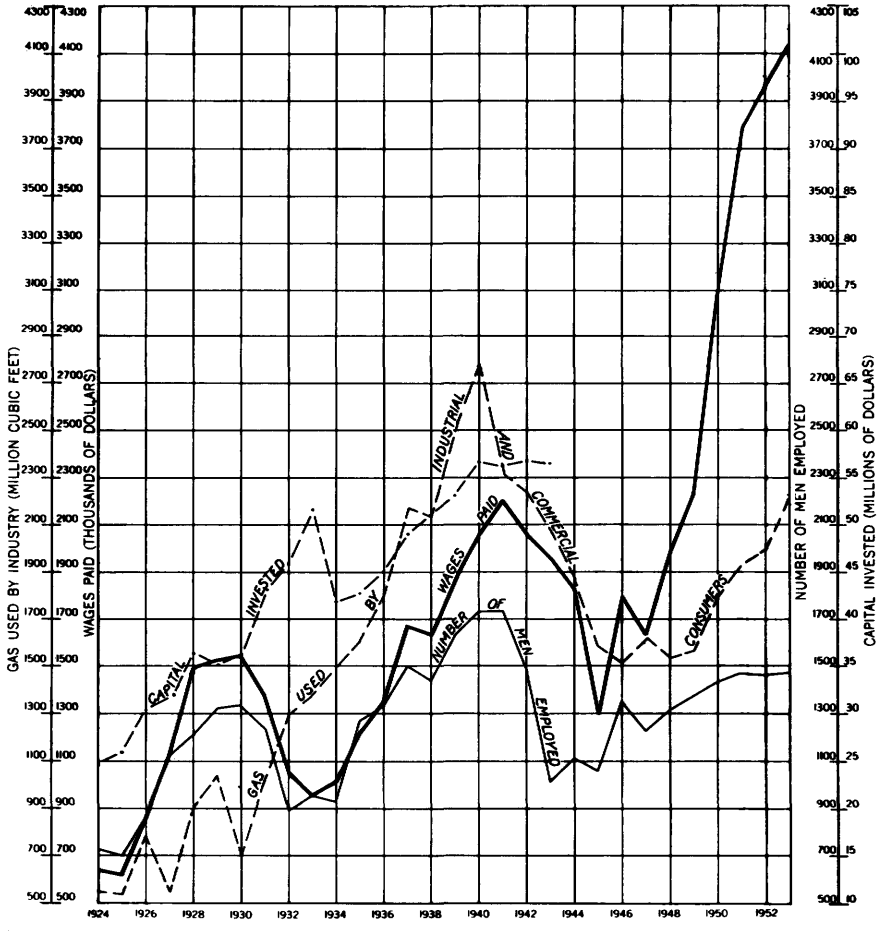
Table IV now includes Table V of last year. The items contained in these tables are so closely related that their combination makes for easier examination and comparison of statistics.

Rates

Table V gives the details of natural gas rates charged in western Ontario. These rates are set by the referee or by agreement between the gas company and the municipality with the approval of the referee.

Gas Consumption in Cities and Towns

Table VI shows the consumption of gas by consumers and industries in the towns and cities of western Ontario. The table is similar to those of other years and has been published since 1922. The past year shows increases in population, consumers, and consumption.



Data relating to natural gas in Ontario, 1924-53.

TABLE V—NATURAL GAS RATES, 1953

Classification	Company	Amount of gas used	Net rate
A	Dominion Natural Gas Co., Ltd.,	First 1,000 cu. ft. or less	$1.60
		Over 1,000 cu. ft.	1.09 per M cu. ft.
		Supplemental rates:[1]	
		Oct. 1, 1952—Sept. 30, 1953	0.21 per M cu. ft.
		Oct. 1, 1953—Sept. 30, 1954	0.23 per M cu. ft.
B	Central Pipe Line Co., Ltd.	Minimum bill	$2.00
		First 1,000 cu. ft.	2.00
		Second 1,000 cu. ft.	1.10 per M cu. ft.
		Next 2,000 cu. ft.	1.25 per M cu. ft.
		Next 3,000 cu. ft.	1.75 per M cu. ft.
		Over 7,000 cu. ft.	2.00 per M cu. ft.
C	Norotto Gas Co., Ltd.	Minimum bill	$1.75
		First 1,000 cu. ft.	1.75
		Over 1,000 cu. ft.	1.10 per M cu. ft.
D	Provincial Gas Co., Ltd.	First 200 cu. ft.	$0.40 per C cu. ft.
		Next 1,800 cu. ft.	1.10 per M cu. ft.
		Over 2,000 cu. ft.	1.00 per M cu. ft.
		Over 500,000 cu. ft.	0.90 per M cu. ft.
		Plus pro-rata share of import duty	
		Summer consumers (between May 1 and Oct. 31 in any year):	
		First 7,000 cu. ft.	$11.90
		Next 2,000 cu. ft.	1.70 per M cu. ft.
		Over 9,000 cu. ft.	1.32 per M cu. ft.
E	Pure Gas and Oil Co.	First 1,000 cu. ft.	$1.50
		Over 1,000 cu. ft.	1.06 per M cu. ft.
		Collection charge if not paid in 10 days	0.25
F	Union Gas Co. of Can., Ltd.	First 200 cu. ft.	$0.50 per C cu. ft.
		Next 1,800 cu. ft.	0.95 per M cu. ft.
		Next 8,000 cu. ft.	1.03½ per M cu. ft.
		Over 10,000 cu. ft.	0.98½ per M cu. ft.
		Industrial rate over 2,000 M cu. ft.	1.06½ per M cu. ft.
G	United Development	Minimum bill	$2.00
		First 1,000 cu. ft.	2.35
		Next 5,000 cu. ft.	1.50 per M cu. ft.
		Over 6,000 cu. ft.	1.35 per M cu. ft.
		Collection charge if not paid in 10 days	0.25
H	Grimsby Natural Gas Co., Ltd.	First 1,000 cu. ft.	$1.20
		Over 1,000 cu. ft.	1.05 per M cu. ft.
	Grimsby North Grimsby tp. South Grimsby tp. Caistor tp.	Minimum bill	1.25
	Gainsborough tp.	Minimum bill	1.50
		First 1,000 cu. ft.	1.50
		Over 1,000 cu. ft.	1.05 per M cu. ft.
J	Port Colborne-Welland Gas and Oil Co., Ltd.	Minimum bill	$1.05
		First 400 cu. ft.	1.05
		Over 400 cu. ft.	1.05 per M cu. ft.

[1]The supplemental rate is authorized by an order of the Natural Gas Referee dated November 29, 1951, and is to be added to the net rate. It is based on the actual costs incurred in manufacturing oil gas, liquid petroleum gas, or other gases purchased at a higher price than the Dominion Natural Gas company pays its independent producers.

Photographs courtesy Union Gas Co. of Canada, Ltd.





Drill cores from a storage well in the Dawn gas field.

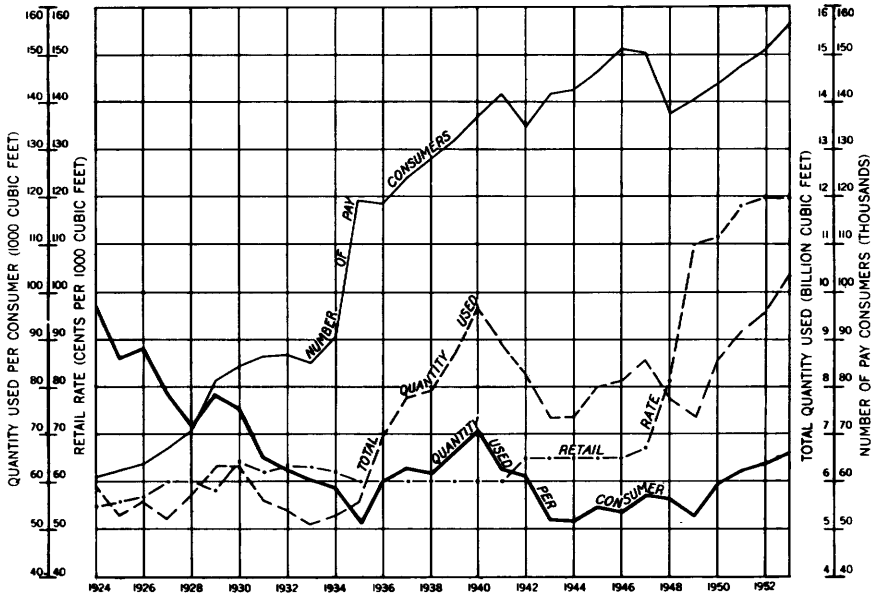
TABLE VI—GAS CONSUMPTION IN CITIES AND TOWNS, 1953

City or town	Population	Number of consumers		Quantity consumed			Net rate classification (see Table V) or rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu.ft.	M cu. ft.	
Alvinston	675	285	....	24,200	.....	725	F
Aylmer	3,724	833	1	35,231	145	.....	B
Beachville	661	42	....	2,758	.....	.....	$1.00 (M.B.,[1] $1.50)
Belle River	1,547	380	....	33,381	.....	264	F
Belmont	445	175	....	6,759	.....	.....	G
Blenheim	2,648	923	....	89,647	.....	1,322	F
Bothwell	738	241	....	23,332	.....	511	F
Brantford	36,526	6,187	....	234,489	.....	21,243	A
Brownsville	232	81	1	7,015	450	.....	E
Caledonia	1,785	642	3	35,323	450	1,000	J
Cayuga	771	238	....	16,102	.....	127	A
Chatham	22,274	7,402	....	678,409	.....	52,476	F
Chippawa	1,834	435	....	18,594	.....	.....	D
Comber	575	189	....	20,586	.....	1,473	F
Cottam	573	113	2	6,440	249	337	A
Courtright	559	187	....	17,483	.....	.....	F
Crystal Beach	3,977	917	....	78,230	.....	.....	D
Delhi	2,773	721	....	45,996	.....	339	A
Dresden	2,032	788	....	71,445	.....	9,121	E
Dunnville	4,796	1,438	1	97,188	455	969	A
Dutton	809	281	2	18,618	241	462	A
Essex	3,075	870	....	78,515	.....	6,887	F
Fenwick	542	155	....	6,005	.....	160	A
Fisherville	226	58	....	4,060	.....	.....	A
Fonthill	1,621	275	....	7,351	.....	.....	A
Fort Erie	8,071	2,342	1	204,527	172	7,163	D
Galt	21,513	2,638	....	101,742	.....	12,222	A
Glencoe	945	378	....	38,241	.....	.....	F
Grimsby	3,188	570	1	22,768	126	2,872	H
Hagersville	1,790	563	....	35,515	.....	72	A
Hespeler	3,851	685	....	27,928	.....	1,347	A
Highgate	376	135	2	9,215	324	.....	A
Ingersoll	6,607	1,443	....	65,124	.....	9,000	A
Jarvis	633	222	....	14,752	.....	.....	A
Kingsville	2,670	760	....	55,807	.....	1,073	A
Lambeth	1,307	197	....	13,724	.....	290	A
Leamington	7,732	2,132	....	143,262	.....	1,925	A
London	99,147	20,526	....	1,494,676	.....	273,199	F
Merlin	560	189	....	18,684	.....	396	F
Merritton	5,135	694	....	26,305	.....	10,715	A
Mount Brydges	695	202	....	16,846	.....	328	F
Niagara Falls	25,006	3,403	....	149,461	.....	50,250	D
Norwich	1,415	184	....	10,607	.....	.....	C
Oil Springs	494	118	....	9,613	.....	.....	F
Paris	5,396	1,064	....	39,650	.....	784	A
Petrolia	3,293	989	....	85,280	.....	8,689	F
Port Burwell	645	256	....	7,197	.....	.....	B
Port Colborne	13,113	3,031	1	129,581	121	2,028	A
Port Dover	2,487	784	....	50,140	.....	.....	A
Port Rowan	738	259	....	17,470	.....	.....	$0.77½
Preston	8,519	1,208	....	48,705	.....	16,198	A
Ridgetown	2,342	887	....	84,855	.....	2,692	F
Rodney	974	311	1	20,973	395	.....	A

[1] M.B.—minimum bill.

TABLE VI—GAS CONSUMPTION IN CITIES AND TOWNS, 1953—*Continued*

City or town	Population	Number of consumers		Quantity consumed			Net rate classification (see Table V) or rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu.ft.	M cu. ft.	
St. Catharines	39,399	6,740	....	255,273	.....	70,397	A
St. George	647	157	....	6,453	.....	.....	A
St. Thomas	18,966	3,195	....	139,546	.....	2,573	A
Sarnia	37,670	7,544	....	565,948	.....	239,285	F
Simcoe	7,348	2,216	....	167,449	.....	4,028	A
Sombra and Port Lambton	706	300	....	24,814	.....	674	F
Springfield	505	119	....	3,642	.....	.....	B
Thamesville	1,011	397	....	39,692	.....	2,004	F
Thorold	7,128	1,312	....	47,246	.....	3,248	A
Tilbury	3,081	888	....	81,759	.....	31,190	F
Tillsonburg	5,534	1,556	....	86,286	.....	906	A
Vienna	315	109	....	3,187	.....	.....	B
Wallaceburg	7,437	2,530	....	217,225	.....	287,002	F
Waterford	1,755	408	....	20,856	.....	.....	A
Welland	16,435	6,008	5	251,731	470	16,276	D
West Lorne	1,050	267	2	17,954	148	14	A
Wheatley	1,055	311	....	25,531	.....	.....	A
Windsor	125,966	29,236	....	2,198,531	.....	858,194	F
Woodstock	16,375	2,502	....	103,461	.....	2,712	A
Wyoming	784	222	....	16,057	.....	23	F
Total	617,227	136,043	23	8,872,446	3,746	2,017,185	.....



Data relating to the domestic use of natural gas in Ontario, 1924–53.

Gas Consumption in Townships

Table VII shows the consumption of gas by consumers and industries in the townships of western Ontario. A marked increase is apparent in all sections. The use of natural gas for tobacco curing is on the increase; 118,719 M cubic feet for this use is included with that used by industries. Gas used in drilling wells accounted for 10,368 M cubic feet of which 5,358 was furnished free of charge and is included under free gas.

TABLE VII—GAS CONSUMPTION IN TOWNSHIPS, 1953

County and township	Population	Number of consumers		Quantity consumed			Net rate classification (see Table IV) or rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu.ft.	M cu. ft.	
BRANT:							
Brantford	18,662	466	....	12,112	.....	.....	A
Burford	4,920	35	....	1,704	.....	11,965	A
Onondaga	1,202	54	2	2,581	36	.....	A
South Dumfries	3,141	11	....	652	.....	.....	A
Tuscarora	2,857	60	....	5,910	.....	.....	A
ELGIN:							
Aldborough	2,794	53	....	2,500	.....	13,702	A
Bayham	3,583	402	....	16,785	.....	2,252	B
Dunwich	2,202	118	....	7,584	.....	.....	A
Malahide	3,514	201	2	8,876	250	.....	B
Southwold	3,539	322	1	19,012	69	1,850	A
Yarmouth	7,139	109	....	39,716	.....	.....	A
ESSEX:							
Gosfield North	2,672	163	1	8,450	133	.....	A
Gosfield South	3,433	426	....	30,022	.....	4,862	A
Maidstone	4,382	508	4	44,431	1,348	2,705	F
Mersea	6,816	544	3	37,943	545	9,560	A
Rochester	2,427	228	7	19,640	1,874	253	F
Sandwich East	17,665	28	....	2,768	.....	.....	F
Sandwich South	3,242	209	....	16,500	.....	1,499	F
Tilbury North	1,958	57	2	4,428	519	458	F
Tilbury West	1,527	34	1	2,942	120	.....	F
HALDIMAND:							
Canborough	973	175	30	11,919	4,726	.....	A
Dunn	855	157	6	10,639	1,843	168	A
Moulton	1,859	235	7	14,460	1,796	198	A
North Cayuga	1,390	143	6	9,293	1,285	.....	A
Oneida	1,315	70	6	7,335	818	.....	A
Rainham	1,568	282	20	21,811	2,962	1,231	A
Seneca	1,819	192	14	10,380	2,009	82	A
Sherbrooke	380	58	1	3,174	312	.....	A
South Cayuga	587	81	13	4,274	2,131	.....	A
Walpole	3,211	459	39	32,528	5,292	343	A
KENT:							
Camden	2,323	59	....	4,728	.....	.....	F
Chatham	9,280	213	....	18,404	.....	3,201	F
Dover	5,629	549	1	57,860	150	2,155	F
Harwich	6,396	756	9	64,582	2,148	142	A and F
Howard	2,917	184	3	15,779	1,169	324	A and F
Orford	1,830	48	2	4,084	363	.....	A
Raleigh	5,696	1,037	22	92,888	5,370	1,396	A and F
Romney	1,538	129	34	11,288	7,398	627	A and F
Tilbury East	3,015	308	55	26,375	14,392	1,061	A and F
Zone	959	80	....	5,740	.....	3,205	F

TABLE VII—GAS CONSUMPTION IN TOWNSHIPS, 1953—*Continued*

County and Township	Population	Number of consumers		Quantity consumed			Net rate classification (see Table V) or rate per M cu. ft.
		Pay	Free	Pay	Free	Industrial	
				M cu. ft.	M cu.ft.	M cu. ft.	
LAMBTON:							
Brooke	2,006	140	....	10,727	.....	.....	F
Dawn	2,055	210	4	18,391	723	4,428	F
Enniskillen	2,541	238	....	15,522	.....	806	F
Euphemia	1,288	14	....	1,316	.....	.....	F
Moore	4,766	970	....	82,304	.....	369	F
Plympton	3,031	6	....	263	.....	.....	F
Sombra	3,320	165	....	11,533	.....	427	F
LINCOLN:							
Caistor	1,350	57	....	3,463	.....	.....	A and H
Gainsborough	2,205	100	8	5,588	1,333	.....	H
Grantham	20,573	136	....	5,313	.....	.....	A
Louth	4,466	13	....	503	.....	.....	A
North Grimsby	3,145	193	....	9,760	.....	.....	H
South Grimsby	1,815	259	....	15,871	.....	.....	H
MIDDLESEX:							
Caradoc	3,429	39	....	2,916	.....	13,018	F
Delaware	1,478	7	....	564	.....	2,995	F
Ekfrid	1,828	91	....	7,191	.....	355	F
Lobo	2,354	2	....	179	.....	8,694	F
London	20,814	639	....	44,551	.....	.....	F
Mosa	1,356	182	....	16,420	.....	6	F
North Dorchester	3,599	212	....	9,226	.....	7,699	A
Westminster	16,405	300	....	22,216	.....	1,299	A
NORFOLK:							
Charlotteville	4,715	300	5	15,023	1,034	15,794	A
Houghton	1,852	69	....	2,360	.....	.....	B
Middleton	3,170	294	3	18,833	1,055	23,384	A
North Walsingham	2,445	41	4	1,987	1,434	11,104	A
South Walsingham	2,041	110	4	4,073	274	677	$0.77½
Townsend	4,670	127	....	3,782	.....	8,193	A
Windham	4,654	122	1	6,044	643	7,675	A
Woodhouse	3,800	375	10	20,407	1,395	4,665	A
OXFORD:							
Dereham	3,717	33	....	1,104	.....	.....	E
East Oxford	2,116	18	....	849	.....	.....	A
North Oxford	1,234	4	....	156	.....	.....	A
South Norwich	2,604	183	....	14,480	.....	.....	C
West Oxford	2,796	67	2	3,900	152	77	A
WATERLOO:							
North Dumfries	3,142	19	....	700	.....	.....	A
Waterloo	9,443	14	....	838	.....	.....	A
WELLAND:							
Bertie	6,392	1,389	35	125,895	5,984	932	D
Crowland	13,540	206	16	10,013	2,137	.....	A and D
Humberstone	4,757	591	16	49,987	4,145	1,386	A and D
Pelham	4,250	122	2	4,123	294	.....	A
Stamford	22,868	1,830	7	84,400	1,603	7,868	D
Wainfleet	3,895	293	10	18,238	1,879	5,320	A
Willoughby	1,376	69	15	6,472	2,676	.....	E
WENTWORTH:							
Ancaster	7,432	143	....	15,172	.....	.....	A
Barton	3,967	179	....	7,385	.....	.....	A
Binbrook	1,498	124	9	7,606	1,463	.....	A
Glanford	2,706	200	2	10,934	701	393	A
Total	380,119	20,138	444	1,430,675	87,983	190,803	.....

Leakage in Distribution Plants

Table VIII, Leakage in Distribution Plants, is very similar to those of past years. The columns showing the pressures in distribution plants has been deleted, because all distribution plants now carry between 4 and 5 ounces. When this table was first published, pressures varied from 10 ounces to 4 ounces per square inch.

Former table VIII showing leakage in rural lines has been deleted as it does not present a true picture of all rural lines.

TABLE VIII—LEAKAGE IN DISTRIBUTION PLANTS, 1953

City or town	Company	Equivalent miles of 3-inch pipe in distribution plants	Leakage for year		Average number of consumers	Leakage per consumer
			Actual	Allowable		
			M cu. ft.	M cu. ft.		M cu. ft.
Alvinston	Union Gas	6.32	.....	1,262	285	.....
Ancaster	Dom. Natural Gas	1.40	121	280	108	1.12
Appin	Union Gas	1.06	26	212	66	0.39
Belle River	Union Gas	5.57	.....	1,114	380	.....
Beachville	Beachville Natural Gas	3.33	450	666	42	10.71
Blenheim	Union Gas	14.33	.....	2,866	923	.....
Bothwell	Union Gas	5.81	.....	1,162	241	.....
Brantford	Dom. Natural Gas	94.25	23,245	18,850	6,187	3.75
Brigden	Union Gas	4.06	253	912	217	1.16
Byron	Union Gas	3.15	200	630	137	1.46
Cainsville	Dom. Natural Gas	5.57	1,655	1,114	150	11.30
Caledonia	Pt. Colborne–Welland	8.00	2,452	1,600	645	3.80
Cayuga	Dom. Natural Gas	5.86	2,432	1,172	238	10.21
Chatham	Union Gas	112.63	.....	22,526	7,402	.....
Comber	Union Gas	3.57	129	714	189	0.68
Corunna	Union Gas	4.45	.....	890	260	.....
Courtright	Union Gas	4.66	.....	932	187	.....
Delhi	Dom. Natural Gas	7.08	1,461	1,416	721	2.02
Dorchester	Dom. Natural Gas	2.86	1,063	572	212	5.01
Dresden	Union Gas	14.15	1,566	2,830	788	1.98
Dunnville	Dom. Natural Gas	13.87	4,399	2,774	1,438	3.05
Dutton	Dom. Natural Gas	8.16	1,372	1,632	281	4.88
Essex	Union Gas	15.57	.....	3,114	870	.....
Fenwick	Dom. Natural Gas	1.51	883	302	155	5.76
Florence	Union Gas	1.88	.....	376	85	.....
Glencoe	Union Gas	8.55	.....	1,710	378	.....
Hagersville	Dom. Natural Gas	7.38	2,341	1,476	563	4.15
Hespeler	Dom. Natural Gas	8.97	.....	1,794	685	.....
Highgate	Dom. Natural Gas	2.00	1,252	400	135	9.20
Ingersoll	Dom. Natural Gas	20.82	5,537	4,164	1,443	3.83
Inwood	Union Gas	2.12	.....	424	99	.....
Jarvis	Dom. Natural Gas	4.05	920	810	222	4.14
Kingsville	Dom. Natural Gas	13.49	2,801	2,698	760	3.68
Lambeth	Dom. Natural Gas	3.84	1,389	768	197	7.05
Leamington	Town of Leamington	25.00	21,646	5,000	2,132	10.15
London	City Gas	394.56	89,917	78,912	20,526	4.38
Merlin	Union Gas	2.80	.....	560	189	.....
Merritton	Dom. Natural Gas	4.52	1,745	904	694	2.51
Mount Brydges	Union Gas	3.96	.....	792	202	.....
Newburg	Union Gas	1.50	260	300	77	3.37
North Pelham	Dom. Natural Gas	0.72	.....	144	122	.....
Norwich	Norotto Gas	18.50	7,600	3,700	184	41.30
Oil Springs	Union Gas	1.95	.....	390	118	.....
Paris	Dom. Natural Gas	14.92	3,460	2,984	1,064	3.25
Petrolia	Union Gas	18.09	5,987	3,618	989	6.05
Port Colborne	Dom. Natural Gas	30.40	1,542	6,080	3,031	0.50
Port Dover	Dom. Natural Gas	7.94	4,195	1,588	784	5.35
Port Lambton	Union Gas	2.38	.....	476	303	.....
Preston	Dom. Natural Gas	20.96	1,546	4,192	1,208	1.28
Ridgetown	Union Gas	18.59	1,319	3,718	887	1.48

TABLE VIII—LEAKAGE IN DISTRIBUTION PLANTS, 1953—*Continued*

City or town	Company	Equivalent miles of 3-inch pipe in distribution plants	Leakage for year		Average number of consumers	Leakage per consumer
			Actual	Allowable		
			M cu. ft.	M cu. ft.		M cu. ft.
Rodney	Dom. Natural Gas	5.39	2,365	1,078	311	7.60
St. Catharines	Dom. Natural Gas	68.80	29,732	13,760	6,740	4.41
St. George	Dom. Natural Gas	2.11	373	422	157	2.68
St. Thomas	Dom. Natural Gas	55.85	8,046	11,170	3,195	2.51
Sarnia	Union Gas	126.59	9,660	25,318	7,544	1.28
Sheddon and Fingal	Dom. Natural Gas	6.11	2,837	1,222	177	16.02
Simcoe	Dom. Natural Gas	29.69	11,216	5,938	2,216	5.06
Sombra	Union Gas	2.72	.....	544	300	.....
South London	Dom. Natural Gas	8.87	2,473	1,774	639	3.87
Thamesville	Union Gas	7.88	137	1,576	397	0.34
Thorold	Dom. Natural Gas	13.19	2,067	2,638	1,312	1.57
Tilbury	Union Gas	13.65	.....	2,730	888	.....
Tillsonburg	Dom. Natural Gas	23.49	2,082	4,698	1,556	1.33
Wallaceburg	Union Gas	36.64	977	7,328	2,530	0.39
Waterford	Dom. Natural Gas	5.88	847	1,176	408	2.07
West Lorne	Dom. Natural Gas	3.89	1,990	778	267	7.49
Wheatley	Dom. Natural Gas	3.46	1,637	692	311	5.26
Windsor	Union Gas	566.83	23,062	113,366	29,236	0.78
Woodburn	Dom. Natural Gas	2.03	950	406	57	16.66
Woodstock	Dom. Natural Gas	48.45	6,873	9,690	2,502	2.74
Wyoming	Union Gas	5.26	345	1,052	222	1.55
Total	.....	2,023.89	302,833	404,876	120,164	.....

	M cu. ft.
Actual leakage	302,833
Gain	19,454
Net loss	283,379

Courtesy Union Gas Co. of Canada, Ltd.



Rotary cores from a well in the Moore field.

Licences Issued in 1953

The Natural Gas Conservation Act, R. S. O. 1950, The Well Drillers Act, R. S. O. 1950, and the Regulations made under these Acts require that the several operations carried out shall be done under licence. Tables IX to XIII show lists of those to whom licences were issued during 1953. The licences required under the above acts and the cost of each are as follows:

To Lease and Prospect for Natural Gas	$ 5.00
To Drill or Bore for Natural Gas or Oil	5.00
To Produce Natural Gas	10.00
To Distribute Natural Gas	10.00
To Operate Natural Gas Pipelines	10.00

TABLE IX—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1953

Licence No.	Name	Address
6858	Albot Gas and Oil Syndicate	Toronto, Ont.
6788	Ashton, J.	Chatham, Ont.
6781	Austin, G.	Toronto, Ont.
6829	Avery, R.	Weston, Ont.
6845	Avery, W.	Toronto, Ont.
6890	Barnes, J.	Alliston, Ont.
6782	Bass, G.	Toronto, Ont.
6859	Bayfield Petroleum Co., Ltd.	Toronto, Ont.
6807	Blackwell, G.	Port Colborne, Ont.
6775	Beach, P.	St. Catharines, Ont.
6849	Beattie, J.	Glencoe, Ont.
6838	Beattie, J.	Glencoe, Ont.
6839	Beattie, R.	Glencoe, Ont.
6885	Bond, R.	Sault Ste. Marie, Ont.
6787	Boyce, G.	Chatham, Ont.
6842	Burke, J.	Brownsville, Ont.
6867	Burton, A.	Mimico, Ont.
6868	Burton, J.	Mimico, Ont.
6793	Caldwell, R.	London, Ont.
6806	Cameron, W.	Blenheim, Ont.
6892	Carrothers, I.	Kerwood, Ont.
6779	Chalton, W.	Ingersoll, Ont.
6876	Cheever, D.	Allegan, Mich.
6811	Comfort, A.	Chatham, Ont.
6785	Coste, E.	Toronto, Ont.
6803	Coatsworth, T.	Chatham, Ont.
6800	Cole, A.	Chatham, Ont.
6809	Coleman, L.	Blenheim, Ont.
6880	Croft, F.	Detroit 6, Mich.
6882	Cronenberg, M.	Toronto, Ont.
6810	Culver, G.	Dunnville, Ont.
6869	Dickinson, C.	Toronto, Ont.
6816	Denison, H.	Napanee, Ont.
6872	Earl, S.	Kerwood, Ont.
6776	Eaton, E.	Philadelphia 3, Penna.
6870	Fisher, W.	Toronto, Ont.
6834	Fleming, J.	Toronto, Ont.
6891	Forget, M.	Alliston, Ont.
6836	Fox, D.	Port Lambton, Ont.
6784	Flum, J.	Rodney, Ont.
6774	Fraser, W.	Toronto, Ont.
6825	Furry, L.	Dunnville, Ont.
6790	Gas and Oil Exploration Co.	Hamilton, Ont.
6828	Givens, W.	Philadelphia 3, Penna.
6884	Glenney, R.	Dunnville, Ont.

TABLE IX—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1953—*Continued*

Licence No.	Name	Address
6854	Godefroy, C.	Toronto, Ont.
6778	Green, C.	Wallaceburg, Ont.
6862	Haidon, R.	Chippawa, Ont.
6826	Hancock, C.	Philadelphia 3, Penna.
6881	Hansen, H.	Toronto, Ont.
6853	Huronia Leaseholders, Ltd.	Toronto, Ont.
6856	Hyatt, N.	Turnerville, Ont.
6794	Imperial Oil, Ltd.	Toronto, Ont.
6780	Jamieson, A.	Tillsonburg, Ont.
6889	Johnson, W.	Clare, Mich.
6888	Jones, W.	Mount Pleasant, Mich.
6864	Julian, S.	London, Ont.
6799	Kenney, A.	Chatham, Ont.
6837	Kerr, C.	Strathroy, Ont.
6823	Killins, H.	Niagara Falls, Ont.
6824	Killins, R.	Niagara Falls, Ont.
6791	MacDonald, H.	London, Ont.
6847	McGaffey, E.	Bothwell, Ont.
6796	McKenzie, D.	Sarnia, Ont.
6789	McKillop, W.	Hamilton, Ont.
6786	McLean, A.	Rodney, Ont.
6814	McMaster, R. and Sons	Caledonia, Ont.
6805	McMillan, G.	Blenheim, Ont.
6841	Mahaffy, A.	Toronto, Ont.
6850	Maracarden Oil, Ltd.	Toronto, Ont.
6808	Mercer, H.	Hagersville, Ont.
6877	Morris, G.	Buffalo, N.Y.
6857	Mountcliff Petroleum Co. of Canada, Ltd.	Montreal, Que.
6875	Murphy, R.	Camlachie, Ont.
6879	Myers, G.	Toledo 4, Ohio.
6874	Ousterbourt, C.	Rodney, Ont.
6813	Palenkas, J.	Highgate, Ont.
6860	Palenkas, P.	West Lorne, Ont.
6881	Paterson, I.	St. George, Ont.
6783	Paulin, B.	Toronto, Ont.
6812	Pearson, W.	Welland, Ont.
6833	Purdy, E.	Toronto, Ont.
6871	Randle, H.	Bothwell, Ont.
6804	Rayment, O.	Chatham, Ont.
6801	Reaume, H.	Chatham, Ont.
6797	Reicheld, F.	Jarvis, Ont.
6865	Roberts, J.	Windsor, Ont.
6848	Rose, G.	Chatham, Ont.
6818	Roth, E.	Hillsdale, Mich.
6817	Roth, E.	Hillsdale, Mich.
6851	Rowe, E.	Richmond Hill, Ont.
6852	Rowe, M.	Richmond Hill, Ont.
6798	Sadlier, L.	Chatham, Ont.
6878	Seynuck, T.	Acton, Ont.
6843	Sider, R.	Ridgeway, Ont.
6815	Smith, H.	Windsor, Ont.
6831	Smyth, A.	Calgary, Alta.
6886	Standish, G.	Sault Ste. Marie, Ont.
6835	Stephens, J.	Toronto, Ont.
6844	Stewart, E.	Jarvis, Ont.
6846	Stewart, G.	New York 6, N.Y.
6873	Sullivan, F.	Detroit 6, Mich.
6795	Sullivan, G.	Detroit 6, Mich.
6863	Sun Oil Co. Ltd.	Philadelphia 3, Penna.
6792	Sykes, H.	Chatham, Ont.
6893	Theokritoff, G.	London, Ont.

TABLE IX—OPERATORS LICENSED TO LEASE AND PROSPECT FOR NATURAL GAS, 1953—*Continued*

Licence No.	Name	Address
6821	Tyrill, E.	Fort Erie N., Ont.
6887	Wander, C.	Mount Pleasant, Mich.
6840	Walsh, F.	Buffalo, N.Y.
6822	Walsh, J.	Buffalo, N.Y.
6883	Weiss, A.	Toronto, Ont.
6819	Whittal, F.	Amherstburg, Ont.
6830	Whittington, C.	Chatham, Ont.
6802	Whyte, J.	Chatham, Ont.
6832	Willits, D.	Toronto, Ont.
6866	Winter, L.	Leamington, Ont.
6827	Yergey, J.	Philadelphia 3, Penna.
6820	Zuk, G.	Walkerton, Ont.

TABLE X—OPERATORS LICENSED TO DRILL OR BORE FOR NATURAL GAS OR OIL, 1953

Licence No.	Name	Address
50	Ashton, J. L.	Chatham, Ont.
51	Ashton, J. L.	Chatham, Ont.
102	Benner, E. J.	Port Dover, Ont.
100	Carter, C. M.	Wallaceburg, Ont.
112	Central Pipe Line Co., Ltd.	Chatham, Ont.
113	Central Pipe Line Co., Ltd.	Chatham, Ont.
82	Comfort, A.	Chatham, Ont.
90	Crowland Gas Syndicate	Welland, Ont.
93	Crowland Gas Syndicate	Welland, Ont.
107	Culver, M. and Son	Rainham Centre, Ont.
77	Culver, O.	Stevensville, Ont.
132	Demaray and Nichols	Kerwood, Ont.
133	Demaray and Nichols	Kerwood, Ont.
108	Dennis, G. A. and Sons	Selkirk, Ont.
49	Dominion Natural Gas Co., Ltd.	Buffalo, N.Y.
139	Donald, T. G.	Hagersville, Ont.
127	Earl, S.	Kerwood, Ont.
123	Ehde and Meier	Thamesville, Ont.
137	Emerson, H.	Dunnville, Ont.
138	Emerson, H.	Dunnville, Ont.
116	Emerson and Rose	Wainfleet, Ont.
117	Emerson and Rose	Wainfleet, Ont.
101	English and Mullin	Sombra, Ont.
144	Evans, H. and Sons	Tillsonburg, Ont.
145	Evans, H. and Sons	Tillsonburg, Ont.
59	Garringer, W.	Dunnville, Ont.
60	Garringer, W.	Dunnville, Ont.
150	Glenerd Ltd.	Dunnville, Ont.
147	Goodberry, C.	Verona, Ont.
89	Grand River Gas and Oil Syndicate	Canfield, Ont.
111	Harris, W.	Welland, Ont.
115	Heal, A.	Watford, Ont.
121	Held C. and Son	Fort Erie, Ont.
118	Hoover, A. E., estate	Selkirk, Ont.
119	Hoover, A. E., estate	Selkirk, Ont.
91	House, C.	Stevensville, Ont.
109	Hussey, W.	Petrolia, Ont.
53	Imperial Oil, Ltd.	Toronto, Ont.
71	Irving, D.	Simcoe, Ont.
92	Jackson, P.	Dunnville, Ont.

TABLE X—OPERATORS LICENSED TO DRILL OR BORE FOR NATURAL GAS OR OIL, 1953—*Continued*

Licence No.	Name	Address
88	Kin-Mar Gas Syndicate	Fort Erie, Ont.
146	Kiser Drilling Co.	Chatham, Ont.
57	Kiser, W. and Son	Chatham, Ont.
58	Kiser, W. and Son	Chatham, Ont.
149	Kiser, W. and Son	Chatham, Ont.
94	Knight and Neale	Dunnville, Ont.
79	Laramie, C.	Kingsville, Ont.
84	Lather, R.	Bothwell, Ont.
85	Lyons, S. and Son	Simcoe, Ont.
86	Lyons, S. and Son	Simcoe, Ont.
134	Lounsbury, I.	London, Ont.
78	Lymburner Bros. and Webber	Dunnville, Ont.
72	McCutcheon, T.	Dunnville, Ont.
131	McGaffey, E.	Bothwell, Ont.
55	MacGregor, W.	Kippen, Ont.
52	McKillop, W.	Hamilton, Ont.
143	McLaughlin, E.	Waterloo, Ont.
68	McMaster, R. and Sons	Caledonia, Ont.
69	McMaster, R. and Sons	Caledonia, Ont.
70	McMaster, R. and Sons	Caledonia, Ont.
128	McPherson, R.	Riverside, Ont.
129	McPherson, R.	Riverside, Ont.
130	McPherson, R.	Riverside, Ont.
190	McPherson, R.	Riverside, Ont.
104	R. Mandley and Son	Dunnville, Ont.
105	R. Mandley and Son	Dunnville, Ont.
106	R. Mandley and Son	Dunnville, Ont.
135	Meier and Shaw	Chatham, Ont.
148	Meier and Shaw	Chatham, Ont.
75	Nagel, E.	Stevensville, Ont.
66	Nauman, H.	Fisherville, Ont.
54	Nauman, J.	Fisherville, Ont.
87	Nauman, J.	Fisherville, Ont.
140	Palenkas, P.	West Lorne, Ont.
99	Palenkas, P.	West Lorne, Ont.
80	Patterson and Culver	Dunnville, Ont.
81	Patterson and Culver	Dunnville, Ont.
76	Port Colborne–Welland Gas and Oil Co., Ltd.	Port Colborne, Ont.
141	Rawlings, G.	Chatham, Ont.
142	Rawlings, G.	Chatham, Ont.
64	Reicheld, F.	Jarvis, Ont.
122	Ricker, E.	Canboro, Ont.
151	Roberts, Howard, Drilling Co.	Sombra, Ont.
83	Roth, H.	Dunnville, Ont.
56	Schramek, W.	Tilbury, Ont.
73	Schweyer, G.	Selkirk, Ont.
103	Shank, E.	Selkirk, Ont.
124	Sider, R.	Ridgeway, Ont.
114	Smelser and Son	Jarvis, Ont.
125	Stewart, E.	Jarvis, Ont.
219	Stewart, E.	Jarvis, Ont.
62	Stubble, H. and Son	Chatham, Ont.
63	Stubble, H. and Son	Chatham, Ont.
95	Stubble and Stubble	Merlin, Ont.
96	Stubble and Stubble	Merlin, Ont.
120	Union Rotary Drilling Corporation	Mount Pleasant, Mich.
67	Walter Gas Syndicate, Ltd.	Simcoe, Ont.
61	Warren, G.	Tillsonburg, Ont.
74	Wilson-Sullivan Development Co.	Sarnia, Ont.
97	Werner, D.	Fisherville, Ont.
98	Werner, D.	Fisherville, Ont.

TABLE XI—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1953

Licence No.	Name	Address
388	Bain, Lyons, and Werner	Fisherville, Ont.
302	Barnhart, Mrs. E.	Stevensville, Ont.
335	Bates and Bates	Humberstone, Ont.
344	Benner, A. and J.	Sherkston, Ont.
409	Benner and Tinney	Fisherville, Ont.
402	Bertie Township Gas and Oil Syndicate	Fisherville, Ont.
408	Big Seven Gas Syndicate	Fisherville, Ont.
346	Britco Oils, Ltd.	Toronto, Ont.
357	Boyers Creek Gas Syndicate	Chippawa, Ont.
413	Canfield Natural Gas Co., Ltd.	Dunnville, Ont.
330	Campbell, L.	Kingsville, Ont.
394	Caughell Bros.	Dunnville, Ont.
396	Central Pipe Line Co., Ltd.	Chatham, Ont.
363	Central Seneca Gas Syndicate	Cayuga, Ont.
425	Chambers, R.	Chippawa, Ont.
381	Coronation Gas Syndicate	Stevensville, Ont.
378	Crowland Gas Syndicate	Welland, Ont.
313	Consolidated West Petroleum, Ltd.	Toronto, Ont.
360	Dawson, R.	Merlin, Ont.
376	Deanna Lee Gas Syndicate	Fort Erie, Ont.
349	Dell-Burn Gas Co., Ltd.	Dunnville, Ont.
426	Dennis, G. and Sons	Selkirk, Ont.
417	Dickout, L.	Lowbanks, Ont.
356	Dickson and Mercer	Hagersville, Ont.
299	Dominion Natural Gas Co., Ltd.	Buffalo, N. Y.
333	Dover Gas Syndicate	Fort Erie N., Ont.
436	Earleejune Gas Co.	Port Maitland, Ont.
321	Edmund Gas Syndicate	Port Colborne, Ont.
401	Emerson, H.	Dunnville, Ont.
420	Erie Prospecting Syndicate	Ridgeway, Ont.
325	Falls View Gas Syndicate	Fort Erie, Ont.
310	Fisherville Gas Co.	Fisherville, Ont.
386	Fitzgerald, W.	South Cayuga, Ont.
309	Fletcher, E.	Glanford Station, Ont.
367	Fox, E.	Welland, Ont.
338	Franklin, S.	Dunnville, Ont.
341	George, A.	Fort Erie, Ont.
304	Grand Gas Co.	Dunnville, Ont.
377	Grand River Gas and Oil, Ltd.	Grimsby, Ont.
366	Haldimand Gas Syndicate	Cayuga, Ont.
389	Haldimand Natural Gas Syndicate	Stevensville, Ont.
398	Highbank Oil, Ltd.	Chatham, Ont.
399	High Grade Natural Gas Co., Ltd.	Chatham, Ont.
303	Hock, A.	Wainfleet, Ont.
317	Houk Syndicate	Dunnville, Ont.
379	House, C.	Stevensville, Ont.
301	Imperial Oil, Ltd.	Toronto, Ont.
383	Jackson, P.	Dunnville, Ont.
400	Jenkins, S.	Buffalo, N. Y.
353	Kerr, R.	York, Ont.
374	Kin-Mar Gas Syndicate	Fort Erie, Ont.
319	Kinsey and Kinsey	Dunnville, Ont.
336	Kramer and Bates	Port Colborne, Ont.
397	Lakeshore Gas Syndicate	Hamilton, Ont.
368	Lakeshore Gas and Oil Syndicate	Stevensville, Ont.
306	Lapp and Arendt	Stevensville, Ont.
348	Lincoln Natural Gas, Co., Ltd.	Dunnville, Ont.
358	Locators Oils, Ltd.	New Toronto, Ont.
352	Lymburner Bros. and Webber	Dunnville, Ont.
300	MacAnn-Wall Gas Syndicate	Fort Erie, Ont.
414	McIntyre and Hawkins	Welland, Ont.
354	McKechnie, S. estate	Dunnville, Ont.
337	Magee, C.	Port Colborne, Ont.
339	Maguire, J.	Clifford, Ont.

TABLE XI—OPERATORS LICENSED TO PRODUCE NATURAL GAS, 1953—*Continued*

Licence No.	Name	Address
324	Manock Gas Syndicate	Fort Erie, Ont.
369	Maple Leaf Gas Syndicate	Stevensville, Ont.
307	Medina Gas Syndicate	Welland, Ont.
465	Mehlenbacher, L.	Cayuga, Ont.
423	Meyers, P.	Fort Erie, Ont.
308	Minor and Luck	Barrie, Ont.
331	Mitchell, S.	Dunnville, Ont.
328	Mohawk Gas and Oil Syndicate, Ltd.	Hamilton, Ont.
404	Monarch Gas and Oil Syndicate	Fisherville, Ont.
372	Morningstar, R.	Ridgeway, Ont.
392	Mulgrave Gas Syndicate	Stevensville, Ont.
412	Neff, R.	Sherkston, Ont.
407	Niagara Gas Syndicate	Fisherville, Ont.
384	Niece, E.	Lowbanks, Ont.
322	Niece, W. and L.	Lowbanks, Ont.
416	North Cayuga Gas Syndicate	Hamilton, Ont.
314	North Shore Gas Co.	Selkirk, Ont.
418	Noyes, R.	Stevensville, Ont.
421	Patterson and Culver	Dunnville, Ont.
406	Peacock Point Gas and Oil Syndicate	Fisherville, Ont.
351	Petrol Oil and Gas Co., Ltd.	Toronto, Ont.
347	Port Colborne–Welland Gas and Oil Company	Port Colborne, Ont.
380	Prairie Gas and Oil Co., Ltd.	Toronto, Ont.
340	Provincial Gas Co., Ltd.	Fort Erie N., Ont.
342	Purcifer, C.	Stevensville, Ont.
323	Queenston Gas and Oil Co., Ltd.	Ridgeway, Ont.
332	Rae, R.	Niagara Falls, Ont.
305	Raydis Oil and Gas Co., Ltd.	Chatham, Ont.
315	Reicheld, F. W.	Jarvis, Ont.
371	Richmount Developments, Ltd.	Ridgeway, Ont.
311	Riverside Syndicate	Welland, Ont.
318	Rock Mills Gas and Oil Syndicate	London, Ont.
387	Roth, F.	Ridgeway, Ont.
385	Romney Oil and Gas Co., Ltd.	Toronto, Ont.
419	Royal Gas Syndicate	Stevensville, Ont.
391	Shank and Snively	Selkirk, Ont.
359	Sherk, B.	Stevensville, Ont.
393	Sherk and Carruthers	Sherkston, Ont.
343	Sherbrook Gas Syndicate	Dunnville, Ont.
345	Sherkston Gas Syndicate	Sherkston, Ont.
403	Shurr, I.	South Cayuga, Ont.
382	Sider, A. and J.	Stevensville, Ont.
427	Sider, N.	Sherkston, Ont.
415	Sider, R.	Ridgeway, Ont.
350	Smith and Ehde	Lowbanks, Ont.
405	Standard Gas and Oil Syndicate	Fisherville, Ont.
370	Star Gas Syndicate	Ridgeway, Ont.
312	Stevensville Natural Gas and Fuel Co.	Stevensville, Ont.
355	Sundy Gas Wells	Dunnville, Ont.
410	Sunnyside Gas Syndicate	Welland, Ont.
329	Tanke, E.	Buffalo, N. Y.
375	T. H. G. Gas Syndicate	Fort Erie, Ont.
395	Tri-County Gas and Oil Co., Ltd.	Tillsonburg, Ont.
424	Twin City Gas Syndicate	Fort Erie, Ont.
316	Union Gas Co. of Canada, Ltd.	Chatham, Ont.
422	Valencourt Gas Syndicate	Welland, Ont.
320	Valencourt, L.	Welland, Ont.
361	Warren Gas Syndicate	Cayuga, Ont.
362	Walpole Gas Syndicate No. 1	Cayuga, Ont.
364	Walpole Gas Syndicate No. 2	Cayuga, Ont.
327	Walter Gas Syndicate Ltd.	Simcoe, Ont.
373	Welland County Gas Syndicate	Stevensville, Ont.
390	Welland Gas Syndicate	Dunnville, Ont.
326	Zuba, A.	Stevensville, Ont.

Photographs courtesy Union Gas Co. of Canada, Ltd.





Drill cores from a storage well in the Dawn gas field.

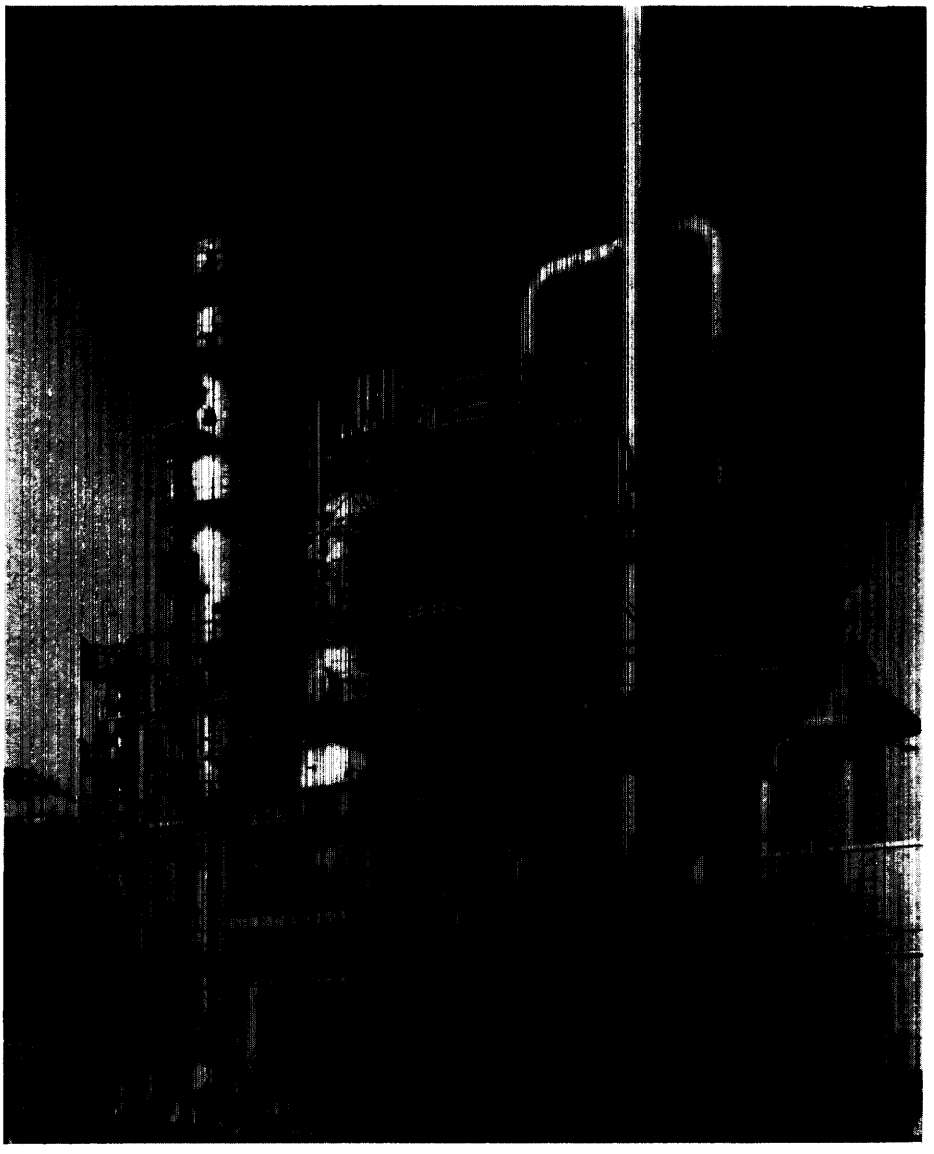
TABLE XII—OPERATORS LICENSED TO DISTRIBUTE NATURAL GAS, 1953

Licence No.	Name	Address
929	Beachville Gas Syndicate	Beachville, Ont.
896	Campbell, L.	Kingsville, Ont.
912	Canfield Natural Gas Co., Ltd.	Dunnville, Ont.
911	Central Pipe Line Co., Ltd.	Chatham, Ont.
894	City Gas Co. of London	London, Ont.
908	Crowland Gas Syndicate	Welland, Ont.
901	Dell-Burn Gas Co., Ltd.	Dunnville, Ont.
890	Dominion Natural Gas Co., Ltd.	Buffalo, N. Y.
891	Fisherville Gas Co.	Fisherville, Ont.
907	Grand River Gas and Oil Syndicate	Canfield, Ont.
897	Grimsby Natural Gas Co., Ltd.	Grimsby, Ont.
895	Houk Syndicate	Dunnville, Ont.
900	Lincoln Natural Gas Co., Ltd.	Dunnville, Ont.
906	Mehlenbacher Gas Syndicate	Cayuga, Ont.
903	Norotto Gas Co., Ltd.	Norwich, Ont.
902	Petrol Oil and Gas Co., Ltd.	Toronto, Ont.
899	Port Colborne–Welland Gas and Oil Co., Ltd.	Port Colborne, Ont.
898	Provincial Gas Co., Ltd.	Fort Erie N., Ont.
909	Public Utilities Commission	Leamington, Ont.
892	Reicheld, F.	Jarvis, Ont.
910	Sider, A. and J.	Stevensville, Ont.
893	Union Gas Co. of Canada, Ltd.	Chatham, Ont.
904	Walpole Gas Syndicate No. 1	Cayuga, Ont.
905	Walpole Gas Syndicate No. 2	Cayuga, Ont.

TABLE XIII—OPERATORS LICENSED TO OPERATE PIPELINES, 1953

Licence No.	Name	Address
169	Dominion Natural Gas Company, Limited	Buffalo, N. Y.
170	Union Gas Company of Canada, Limited	Chatham, Ont.

Courtesy Imperial Oil, Ltd.



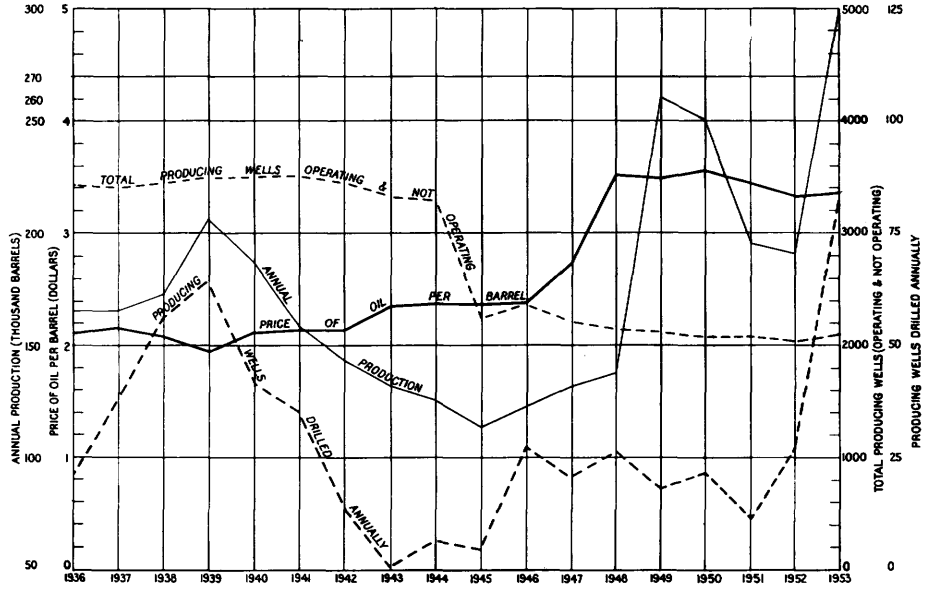
This 23,250-barrel-a-day, fluid catalytic-cracking unit at Imperial Oil's Sarnia refinery is among the most modern on the continent. The cracking process provides high-quality petroleum products, principally gasoline. The Sarnia refinery, the largest in Canada, has a daily capacity of 71,500 barrels.

Petroleum in 1953

By R. B. Harkness

General

The year 1953 has seen a great revival in petroleum production. It is necessary to go back to the year 1910 to find this year's production exceeded. The production for 1953 was 299,685 barrels, an increase of 107,871 barrels over the year 1952. The value was $1,005,535, and the average price per barrel, $3.36. The increase comes from the Aldborough field where the main development took place. A new, reef-type pool was discovered in Warwick township, a mile northwest of the village of Watford. All other oil fields show a decrease in production.



The development of the petroleum industry in Ontario, 1936–53.

There were 86 oil producers, of which 64 were individuals; 13, companies; 6, partnerships; and 3, estates. In addition to owners, 75 men were employed full time, and about 35 more were employed part time or as casual labour; they were paid $199,000 in wages. Forty-three administrative and office personnel received $136,500 in wages. The industry also provides considerable employment for specialists, tradesmen, and truck owners. Drilling contractors received an estimated $137,000. The total cost of oil-well equipment and supplies cannot be determined, but Inspector Brittain estimates it in excess of $250,000.

The refining industry has advanced in the past two years. The oil pipeline from Alberta to Superior, Wisconsin, and thence to Sarnia, making Alberta oil available to refiners in Ontario, has brought two refineries to the banks of the St. Clair River at Sarnia. The Canadian Oil Company, Limited, moved from Petrolia

and the Sun Oil Company, Limited, which had previously imported their product for retail, began their own refining. Refiners employed 3,345 persons and paid $14,866,354 in wages.

Two pipelines that carry refined products are now in operation from Sarnia to Hamilton and Toronto. One is owned by the Imperial Oil, Limited, and the other by Sun Oil and associates. These will reduce the cost of transportation and should eventually bring about a lower retail price.

Oil Drilling and Production, 1953

Table I shows the number of wells operating, wells drilled, and the production by fields.

Oil wells completed in southwestern Ontario in 1953 totalled 105. Two of these, also having a considerable gas potential, are mentioned among the gas wells completed, but are not duplicated in this table.

The number of oil wells drilled in 1953 is the highest since 1939 when the development of the Watford-Kerrwood field was at its peak. They are divided as follows: producers, 1 exploratory and 81 development; dry, 7 exploratory and 16 development.

The one successful exploratory well is in Warwick township. This appeared at first to be discovery of major importance, but further drilling in the area was disappointing. The production comes from a Guelph "reef." The well is 15 miles from the London transmission line, and since the gas-oil ratio is high, the production of oil will be limited to the optimum gas-oil ratio production of the oil. This discovery has been a great incentive to leasing.

The gravity meter continues to be the best means of furthering exploration for Salina-Guelph fields.

The outstanding feature of oil drilling in 1953 was the rapid development of the Rodney field. In late 1952 a southern extension of the field proved to be very productive, and development drilling was begun in that area. The 84 "shallow" completions in Aldborough township provided work for the smaller drilling rigs, and as many as 12 rigs were active there at one time. By mid-year the field's production rate considerably exceeded that of any other Ontario field, and at the year's end it exceeded that of all other fields combined. Drilling has now [July, 1954] reached the limits of the field, but there is the possibility of a pool to the south.

In Moore township, by the use of rotary equipment, Imperial Oil, Limited, was able to penetrate the "gas pays" in two Guelph reefs and obtain oil beneath the lower "gas pay" in limited quantities. Here too the gas-oil ratio is undesirably high, and in order to market the gas produced, high pressure separation equipment will be required.

W. D. Brittain inspector of oil wells for the Department of Mines reports as follows on the production from oil fields:

Aldborough Township

The Rodney field, the scene of major development in 1953, lies northwest of Rodney and has aroused much interest in shallow exploration in the township as a whole. The pool appears to be fairly well delineated and is an elongated dome running generally north and south. It is about 3 miles long and is from 3,000 to possibly 6,000 feet wide. Recoverable reserves of the field are estimated by the producers at 7,500,000 barrels.

Bothwell-Thamesville Field

There was a decline in production owing to the idleness of another property and the steady encroachment of sulphur water into parts of the field.

TABLE I—OIL FIELDS AND THEIR PRODUCTION, 1953

County or district	Township or oil field	Number of Wells in Ontario, December 31, 1953										Initial production	Production
		Active	Idle	Abandoned	Reopened	Wells drilled in 1953							
						Dry			Producing				
						Exploratory	Development	Footage	Exploratory	Development	Footage		
												barrels per day	barrels
ESSEX	Tilbury West tp.	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
KENT	Bothwell-Thamesville field	102	95	3	.....	.....	.....	.....	.....	.....	.....	.....	10,227
	Chatham tp.	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Dover field	5	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,302
	Harwich tp.	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Raleigh tp.	1	2	3	1	.....	.....	.....	.....	.....	.....	.....	60
	Romney tp.	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
LAMBTON	Brooke tp.	.....	6	.....	.....	.....	1	575	.....	.....	.....	.....	.....
	Euphemia tp.	7	16	.....	.....	.....	3	1,087	.....	2	602	15	1,246
	Moore tp.:												
	Dundee formation	1	37	.....	.....	.....	.....	.....	.....	.....	.....	.....	33
	Salina-Guelph formation	7	1	.....	.....	.....	.....	.....	.....	2	[1]4,891	25	2,446
	Enniskillen tp.:												
	Petrolia field	378	246	2	1	.....	.....	.....	.....	1	488	1	35,395
	Oil Springs field	629	96	3	.....	.....	.....	.....	.....	.....	.....	.....	27,067
	Plympton tp.	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Sarnia tp.	2	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	69
	Sombra tp.—Becher field	30	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	62,997
	Warwick tp.:												
	Dundee formation	3	23	1	.....	.....	.....	.....	.....	1	400	.....	1,157
	Guelph formation	1	1	.....	.....	.....	3	6,431	1	1	4,089	150	14,836
MANITOULIN	Assiginack tp.	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
MIDDLESEX	Adelaide tp.	.....	6	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Metcalfe tp.	2	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	283
	Mosa tp.	148	56	5	.....	1	.....	429	.....	5	1,920	12	14,290
ELGIN	Aldborough tp.	83	.....	1	.....	6	9	7,479	.....	69	29,001	900	126,400
	Dunwich tp.	23	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,877
BRANT	Onondaga tp.	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total		1,423	672	19	2	7	16	16,001	1	81	36,500	1,103	299,685

[1]These wells produce both oil and gas and have been classified as gas wells.

Dover Township

There was an abnormal decline in oil produced; because there is little market for the gas produced in summer months, most of these wells must be shut in.

Euphemia Township

A decline was caused by the rapid depletion of the small pool discovered in 1952.

Moore Township

The production was increased by the completion of two additional wells in this Salina-Guelph reef.

Petrolia and Oil Springs

Production from these old fields is quite constant under normal conditions. Much interest is being aroused by proposals to increase rates of production by the application of secondary-recovery techniques. A flooding program is being prepared for 1954.

Sombra Township

A decline follows the normal depletion of this Salina field, which was discovered in 1946.

Warwick Township

Production came from a single well in the Guelph formation. Four month's production shows it to be the largest oil well completed in Ontario since the early 1900's. The well has a high gas-oil ratio and, as a consequence, oil production must be restricted to conserve the gas. Drilling has indicated that the reef is small in area.

Mosa Township

Mosa township had a 10 percent decrease, mainly because the old wells at the south end of this old field have declined to a point where they are uneconomic to operate.

Oil Production by Fields, 1945–53

Table II, Oil Production by Fields, shows the comparative production from all fields for the past eight years.

In the past eight years the new discoveries have been the Sombra, Moore, Brooke, Warwick (Dundee), Metcalfe, Aldborough, and Warwick (Salina-Guelph) fields. This is a record not equalled in the history of the industry in Ontario. As already noted the Aldborough field produced over 42 percent of the total oil production.

The Mosa field has been fully developed. It was discovered in 1917 and reached its peak production of 108,988 barrels in 1918. Production declined very rapidly to 10,764 barrels in 1921, and the field produced from 6,000 to 8,000 barrels until 1933 when production, under new management, increased until it reached 19,209 barrels in 1942. Production remained within 1,000 barrels of this until 1947 when it began to decline; at present it is from 14,000 to 15,000 barrels per year. The management in this field has done much experimenting with flood clearing and re-drilling. Their efforts have proved to be more successful than those of any other operator in rejuvenating a fully drilled field. In the Bothwell field a partial flood revived production for five years, but this was followed by rapid decline. It now has only a quarter of its 1938 production. Operators have not as yet tried controlled flooding to increase production, but the Bothwell field has proved that this method can be successful.

Table III gives details of petroleum and refined products imported into Ontario in 1952 and 1953. The effect of the pipeline laid from Edmonton, Alberta, to Superior, Wisconsin, at the head of Lake Superior is again apparent. The reduction in imported crude oil was 5,341,000 barrels from the previous year. The decline in American crude oil imported has been continuous since 1950 when Alberta oil first became available to Ontario refineries; in 1953 the importation of American crude oil was 37 percent of that imported in 1950.

Of the refined products imported, aviation gasoline and lower quality lubricating oils, have shown a decided increase; blending gasoline, solvent naphtha, and kerosene, a slight increase; and all other products, a decrease. Imports of stove and furnace oil have declined over 50 percent, and heavy fuel oil, 25 percent.

TABLE II—OIL PRODUCTION BY FIELDS, 1946–53

Field	1946	1947	1948	1949	1950	1951	1952	1953
	barrels	barrels	barrels	barrels	barrels	barrels	barrels	barrels
ESSEX COUNTY:								
Tilbury West tp.	.....	.....	609	.....	.....	.....	.....	.....
KENTY COUNTY:								
Dover and Raleigh tps.	4,643	4,545	3,830	3,762	3,714	3,607	2,816	1,362
Bothwell and Thamesville	18,610	16,025	15,238	17,940	17,067	13,135	12,035	10,227
Harwich tp.	.....	.....	.....	.....	.....	.....	73	.....
LAMBTON AND MIDDLESEX COUNTIES:								
Sombra tp.	2,347	20,264	59,846	146,617	140,578	88,651	75,981	62,997
Moore tp.	259	132	544	301	931	1,683	1,744	2,479
Sarnia tp.	152	80	124	141	124	144	147	69
Petrolia and Enniskillen tp.	44,343	41,028	40,603	42,632	40,548	39,053	36,330	35,395
Oil Springs	27,995	25,683	26,165	25,692	25,310	26,576	26,957	27,067
Plympton	28	.....	8	.....	.....	.....	.....	.....
Dawn and Euphemia tps.	238	163	7,312	999	2,281	1,488	2,997	1,246
Brooke tp.	.....	.....	.....	.....	1,006	746	1,482	.....
Adelaide, Metcalfe, and Warwick tps.	5,400	2,390	2,479	2,010	1,670	1,264	1,345	16,276
Mosa tp.	17,351	19,165	18,341	18,580	15,494	14,935	15,925	14,290
ELGIN COUNTY:								
Dunwich tp.	1,621	1,740	1,821	1,929	1,006	1,793	1,923	1,877
Aldborough tp.	.....	.....	.....	.....	.....	4,050	12,043	126,400
BRANT COUNTY:								
Onondaga tp.	89	80	69	67	37	46	16	.....
Total production	123,082	131,295	176,989	260,760	250,656	197,171	191,814	299,685
Total value	$291,719	$349,895	$608,109	$905,143	$892,335	$677,905	$641,400	$1,005,535
Average price	$2.37	$2.67	$3.44	$3.47	$3.56	$3.43½	$3.35	$3.36

Among the petroleum products, liquefied petroleum gases show a great increase in importation as the use of this product for domestic fuel spreads. It must be transported and stored under pressure and is therefore an expensive product to market. It is in greater demand in winter than in summer and consequently has brought a premium price in winter and a discount in summer. This year the Sun Oil Company, Limited, drilled four storage wells at the site of their refinery on the St. Clair River, south of Sarnia. The wells penetrate the salt beds at 1,500 to 2,000 feet below surface. The salt is removed by solution in fresh water, and the cavity that remains is filled with liquid petroleum gas under the pressure necessary to keep it in its liquid form.

Finally the value of all imports has dropped from $93,982,117 in 1952 to $73,477,501 in 1953. This total will again be reduced in 1954 when the pipeline, lengthened from Superior, Wisconsin, to Sarnia early in the year has its full effect and makes Alberta crude oil available for refining the full twelve months of the year. The Sun Oil company's new refinery at Sarnia will be in operation and will undoubtedly reduce the quantity of refined products imported into Ontario.

TABLE III—PETROLEUM AND REFINED PRODUCTS IMPORTED IN 1952 AND 1953

Import	1952		1953	
	Imperial gallons	Value	Imperial gallons	Value
CRUDE PETROLEUM FOR REFINING:				
Petroleum, 0.8155 (A.P.I.) specific gravity or heavier, for refining	415,186,450	$31,455,118	298,254,000	$23,260,583
REFINED PETROLEUM:				
Oil for the concentration of ores	158,908	$ 155,527	125,205	$ 140,189
Aviation gasoline	10,763,721	2,095,796	12,828,851	2,735,191
Gasoline lighter than 0.6852 specific gravity (casing-head)	5,739,124	548,527	6,013,787	526,603
Gasoline lighter than 0.8236 specific gravity	36,790,919	5,603,662	33,428,688	5,564,680
Naphtha, including solvent naphtha	4,079,570	950,792	7,069,060	1,489,398
Kerosene and all illuminating oils	9,097,345	1,164,462	9,909,968	1,318,369
Lubricating oils costing less than 25 cents a gallon	7,661,981	1,452,985	11,689,106	2,248,217
Lubricating oils costing 25 cents or more per gallon	9,557,727	3,462,182	6,673,973	2,672,928
Engine distillate, 0.8107 specific gravity and heavier	14,717	1,405	.....	.....
Stove oil (No. 1 fuel oil)	21,793,374	2,689,412	9,087,246	1,149,929
Light fuel and furnace oil (No. 2 and No. 3)	161,492,817	18,108,313	79,364,642	8,812,452
Heavy fuel oil (Nos. 4, 5 and 6, bunkers A, B, and C)	74,206,346	6,500,014	53,369,240	4,374,120
Diesel and tractor fuel	2,798,037	325,926	2,637,717	333,114
Oils, all other	1,872,479	2,543,057	1,885,116	2,746,202
Total	346,027,085	$45,557,060	234,082,599	$34,111,392
PETROLEUM PRODUCTS:				
Petroleum and lubricating greases, n.o.p. lb.	11,210,005	$ 767,022	11,846,715	$ 963,490
Petroleum jellies, toilet and medicinal oils	.....	344,752	.....	347,751
Paraffin wax lb.	16,840,791	1,147,790	14,824,071	1,019,728
Paraffin wax candles lb.	97,325	30,666	137,525	37,793
Products of petroleum gals.	3,540,522	1,720,771	5,890,480	2,256,676
Liquefied petroleum gases lb.	172,161,534	2,656,473	236,088,997	3,210,265
Total	.....	$ 6,667,474	.....	$ 7,835,703
Total value	.....	$83,679,652	.....	$65,207,678
Total net value of petroleum and refined products imported[1]	$83,679,652		$65,207,678	
Duty paid, calculated on existing tariff schedule	3,340,827		2,799,268	
Sales tax at 8 percent	6,961,638		5,440,555	
Total value delivered in Ontario[2]	$93,982,117		$73,477,501	

[1]These statistics are furnished through the courtesy of the Canadian Department of Customs and Excise.

[2]Freight charges of between 15 and 20 million dollars are not included.

Petroleum Refining Operations

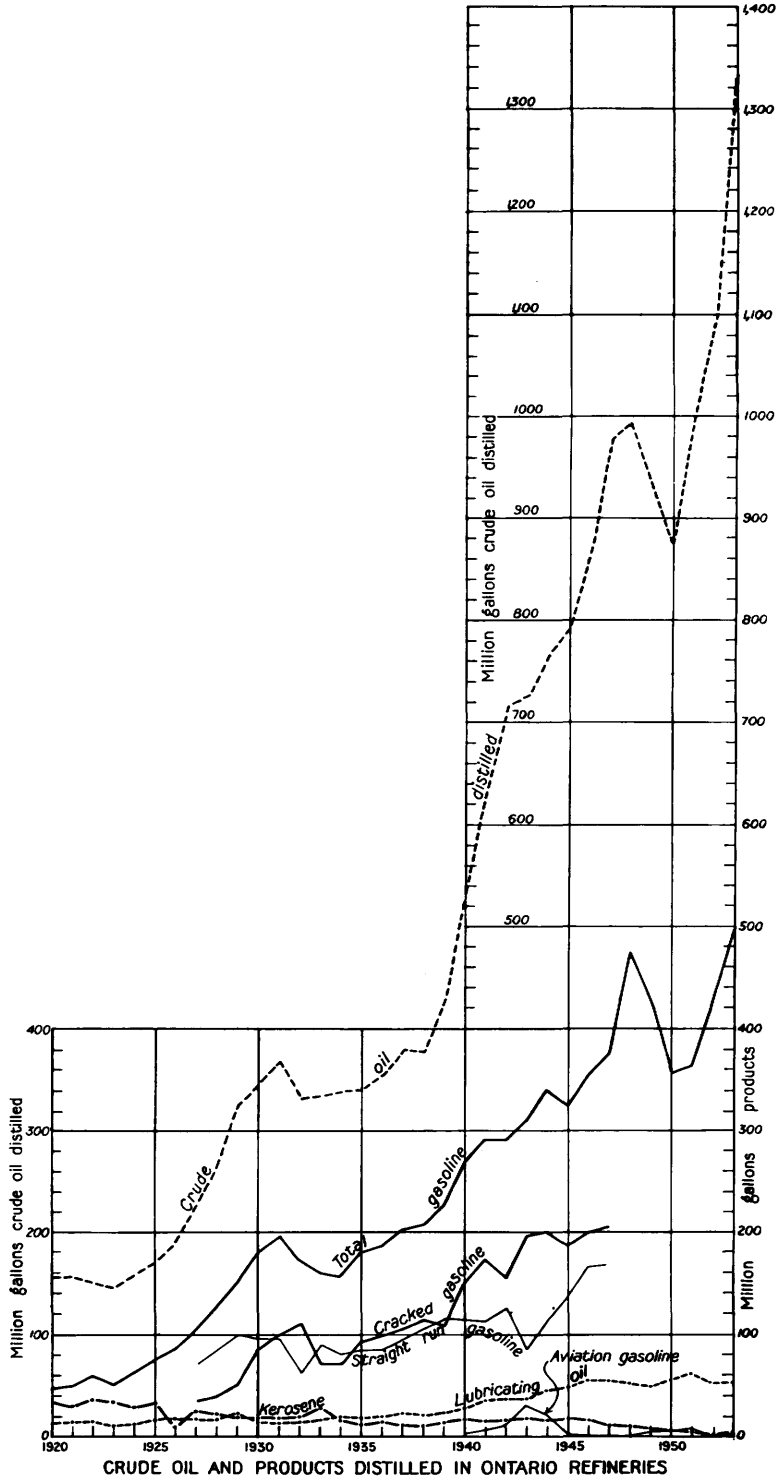
Table IV gives a comparison of six years of refining operations in Ontario. The crude oil distilled and the products produced with their value are shown. The Canadian crude oil distilled shows an increase from 64.7 percent to 70 percent of the total distilled in the last two years; the total distilled in 1952 was 1,084,746,416 imperial gallons, and in 1953 was 1,326,628,090 imperial gallons.

There is no outstanding change in the quantities of refined products distilled in the past few years. Aviation gasoline shows the outstanding increase. The quantity produced was 2,030,175 gallons, which was even greater than in any war year. Ontario refineries produced only 13.7 percent of the total aviation-grade gasoline used in 1954; the remainder was imported. Most high-grade motor gasolines are over 90-octane rating at present, which is little less than the aviation grade used during war years. Compression ratios of motors continue to increase from year to year, demanding a higher and higher octane rating, but these are all within the ability of an Ontario refiner to produce.

TABLE IV—PETROLEUM REFINING OPERATIONS, 1948–53[1]

Schedule		1948	1949	1950	1951	1952	1953
Crude oil distilled:							
From U.S.A.	Gallons[2]	982,150,834	934,432,803	867,454,648	664,039,963	456,436,390	306,474,335
	Value	$91,023,462	$88,996,864	$85,925,373	$52,169,743	$42,121,315	$28,044,040
From South America	Gallons	.....	.....	.....	.....	.....	89,926,165
	Value	.....	.....	.....	.....	.....	$8,724,777
From Canada	Gallons	6,462,189	8,982,963	8,795,095	375,232,386	628,310,026	930,277,590
	Value	$642,475	$909,390	$907,662	$38,615,085	$57,900,379	$86,343,106
Canada's percent of total	Gallons	0.67	0.97	0.99	40.0	64.7	70.0
Total crude distilled	Gallons	988,613,023	943,415,766	876,249,743	1,039,272,349	1,084,746,416	1,326,678,090
Total value of crude		$91,665,937	$89,906,254	$86,833,035	$90,784,828	$100,021,694	$123,111,923
PRODUCTS							
Gasoline:							
Aviation grade	Gallons	33,145	894,705	1,137,430	361,585	.....	2,030,175
	Value	$7,623	$223,676	$284,358	$90,396	.....	$442,578
Motor fuel	Gallons	431,437,146	421,873,690	356,561,369	360,077,409	425,344,156	497,988,582
	Value	$65,248,234	$65,648,080	$55,753,195	$55,411,573	$65,780,461	$78,086,780
Kerosene	Gallons	10,898,616	6,149,392	5,217,505	1,754,502	783,368	3,274,218
	Value	$1,833,093	$1,022,430	$781,054	$316,702	$134,818	$551,499
Lubricating oil	Gallons	56,803,098	53,392,468	54,994,356	63,091,376	54,770,991	52,700,837
	Value	$18,332,527	$18,099,940	$18,463,878	$22,967,340	$21,855,345	$20,330,985
Aviation turbine fuel	Gallons	.....	.....	.....	364,210	16,291	1,080,660
	Value	.....	.....	.....	$62,316	$2,589	$214,444
Tractor fuel	Gallons	11,585,361	1,840,070	2,510,090	1,741,215	346,885	.....
	Value	$1,813,825	$302,195	$390,877	$268,604	$54,704	.....
Diesel fuel[3]	Gallons	31,534,827	31,164,119	49,565,365	46,214,641	67,204,083	70,731,094
	Value	$2,589,930	$2,765,656	$5,924,104	$5,788,480	$8,581,653	$7,450,295
Solvent and special naphthas	Gallons	12,395,054	11,269,038	11,274,871	12,921,278	12,219,536	12,000,270
	Value	$2,156,839	$2,002,675	$1,792,141	$2,412,125	$2,299,521	$2,200,031
Stove oil, No. 1	Gallons	21,009,806	27,914,408	30,456,162	33,908,503	42,888,369	51,630,739
	Value	$2,954,651	$3,976,091	$4,157,667	$5,165,287	$6,662,428	$7,818,599
Furnace fuel oil, Nos. 2 and 3	Gallons	41,258,620	104,055,974	112,258,236	141,096,021	165,177,926	288,640,161
	Value	$5,332,132	$10,384,348	$13,917,860	$17,504,220	$21,215,135	$28,864,219
Other light fuel oils	Gallons	.....	.....	.....	.....	.....	37,461,371
	Value	.....	.....	.....	.....	.....	$4,008,367
Heavy fuel oil, Nos. 4, 5, and 6	Gallons	157,364,024	137,702,143	99,736,947	108,120,057	134,260,775	132,164,574
	Value	$14,351,953	$11,753,306	$9,055,333	$11,018,259	$13,636,908	$11,188,358
Lubricating grease	Pounds	25,787,815	30,242,908	33,533,156	33,989,684	31,640,217	34,327,017
	Value	$1,703,023	$2,015,261	$2,506,011	$2,609,499	$2,445,876	$2,755,340
Asphalt	Gallons	37,000,172	38,317,321	39,499,213	42,480,639	42,374,770	45,795,559
	Value	$4,912,866	$4,858,435	$5,309,241	$5,465,270	$5,583,741	$5,732,652
Petroleum coke	Tons	73,951	79,129	82,707	101,396	104,141	90,025
	Value	$981,154	$829,583	$867,966	$1,084,817	$1,334,093	$848,036
Still gas	M cu. ft.	1,406,523	1,430,668	1,174,364	1,156,605	140,092	200,313
	Value	$1,186,021	$728,210	$954,579	$860,844	$98,093	$80,607
Liquid petroleum gases	Gallons	73,045	809,375	1,239,182	6,427,780	10,502,665	15,499,500
	Value	$7,787	$70,416	$61,959	$449,945	$944,706	$1,840,875
Wax, crude and refined	Pounds	31,310,813	27,189,029	27,583,758	31,249,182	31,902,290	34,540,645
	Value	$1,731,119	$1,857,036	$4,643,597	$1,350,873	$1,316,909	$1,388,652
Polymer feed stock	Gallons	16,837,135	16,242,345	24,076,115	24,397,695	25,851,980	20,764,065
	Value	$2,311,701	$2,218,704	$3,251,760	$3,281,490	$3,081,048	$2,877,291
Miscellaneous	Value	$37,896	$11,115	$10,756	$11,386	$832,445	$471,699
Value of refined products sold		$127,492,375	$128,787,157	$128,126,336	$136,119,426	$155,860,473	$177,151,307
Value of refined products made for own use		$6,368,286	$5,682,057	$6,968,587	$7,891,452	$9,004,786	$8,756,403
Total value of refined products		$133,860,661	$134,469,214	$135,094,923	$144,010,878	$164,865,259	$185,907,710
Employees	Number	3,683	3,507	3,174	3,255	3,574	3,345
	Wages paid	$9,582,022	$9,788,882	$9,640,853	$11,336,027	$13,825,883	$14,866,354

[1]Information furnished by the Dominion Bureau of Statistics, Ottawa.
[2]Gallons refer to Imperial gallons.
[3]Classified as engine distillate prior to 1951.



CRUDE OIL AND PRODUCTS DISTILLED IN ONTARIO REFINERIES

Modern refineries are very adaptable in regard to the variety of products they can handle, and as the knowledge of petroleum chemistry improves, so does the number of different petroleum products produced. Kerosene for use in lamps has become practically non-existant. What is reported as kerosene is now used much

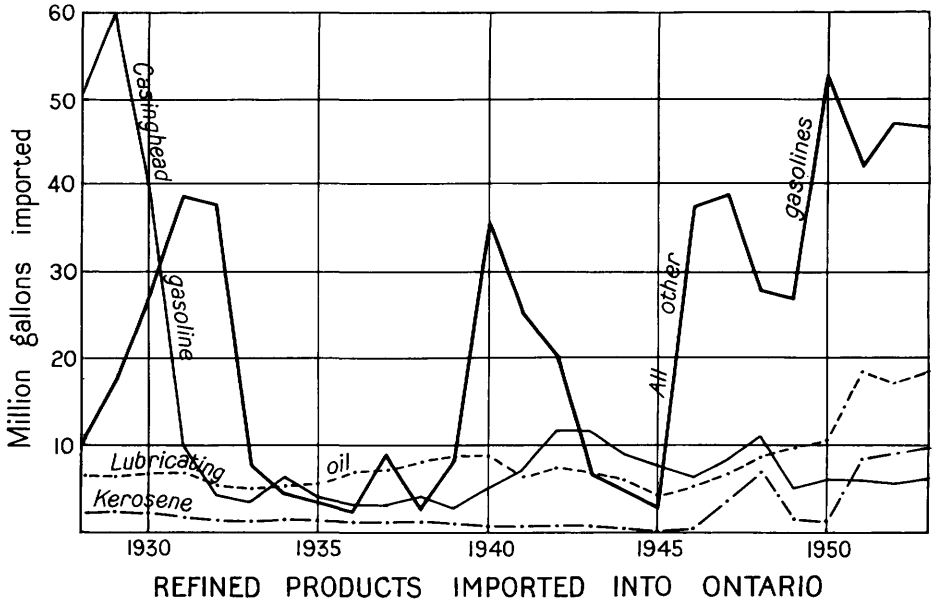
Courtesy Sun Oil Company, Ltd.



A night photograph of the catalytic-cracking unit at the Sarnia refinery of Sun Oil Company, Limited.

more for fuel than for light. Aviation turbine fuel approaches kerosene more nearly than any other product listed. It is, however, a specialty that is the subject of much research, and various blends are being experimented with that will make the jet engine safer from explosion or sudden failure. The increase of 1,063,369

gallons of aviation turbine fuel in 1953 may be far exceeded in 1954. So also in other products, the production of the refinery reflects the demand by the public. On this basis the public demand for domestic fuel oil is outstripping any other demand. Over a period of six years, stove oil has increased 150 percent and furnace oils 550 percent. On the other hand, heavy industrial fuel oils have shown a decrease of 27 percent in that period. However, the annual demand fluctuates by more than 30 percent. Liquid petroleum gases, mostly propane and butane, still show an increase and will continue to do so. The demand for this product can only be met by importing large quantities, and the extent of import is only limited by the freight rate and the supply of pressure tank cars. During the last war, liquid petroleum gases were sought from refineries as remote as Texas from where the freight rate was nearly equal to the value of the product.



Petroleum Refineries in Ontario

Table V gives the names, locations, capacity, and head office addresses of all refineries in Ontario. In 1953 there were four refineries, one more than in 1952. This is the River Lake Oils, Limited, at Fort William. Little is known of this refinery as their report is very incomplete. It can only be concluded that it was not particularily active during the year.

The Sun Oil Company, Limited, has completed a large, modern refinery on the banks of the St. Clair River on the southern outskirts of Sarnia; it had its initial runs at the end of the year. Imperial Oil, Limited, made major additions to its refinery at Sarnia.

The products pipeline of the Sun Oil company and Associates was in operation early in the year. It extends from Sarnia to Toronto with extensions to London and Hamilton. Imperial Oil, Limited had its products pipeline in operation in 1952.

TABLE V—PETROLEUM REFINERS IN ONTARIO, 1953

Company	Location of refinery	Capacity	Head office address
		barrels per day	
British American Oil Company, Limited	Clarkson, Ont.	17,000	800 Bay St., Toronto, Ont.
Canadian Oil Companies, Limited	Corunna, Ont.	20,000	204 Richmond St. West, Toronto, Ont.
Imperial Oil, Limited	Sarnia, Ont.	71,500	56 Church St., Toronto, Ont.
River Lake Oils, Limited	Fort William, Ont.	4,000	Fort William, Ont.
Sun Oil Company, Limited	Sarnia, Ont.	15,000	600 University Ave., Toronto, Ont.

Special Report on Aldborough Township

Introduction

Drilling for oil in Aldborough township, Elgin county, began immediately following the discovery of the Bothwell oil field across the Thames River in Mosa township, Middlesex county, in 1861. A map of 1865 shows a number of producing oil wells in lot 1, broken front concession. By 1866, drilling had extended along both sides of the Thames River as far east as the big bend (see map in back pocket). When the Bothwell field closed down in 1866, exploratory drilling in Aldborough township was discontinued.

The search for oil and gas in Aldborough township began again about 60 years ago. There is a report in the *Thamesville Herald* of May 24, 1894, to the effect that boring had begun in the village of Rodney; however, none of the local inhabitants can recall this drilling nor the location of any wells drilled at that time. In the following year the *Thamesville Herald* of April 30, 1897, reports that oil had been found at Rodney. The location of this well is shown on the map. The year 1910 saw more activity. The Oak Grove Oil Company drilled on the Kennedy farm, lot 5, concession II. The well was 500 feet deep; surface gas and a show of oil with a heavy flow of water near the bottom of the hole were found. A syndicate of Messrs. King, Evans, Roth, and Smith also drilled a well in the northwest corner of the northeast quarter of lot 7, concession VIII, to a depth of 1,680 feet.

Following the completion by the Southern Ontario Gas Company, Limited, (now the Dominion Gas Company, Limited) of a pipeline from the Tilbury field to Hamilton in 1914, this company drilled many wells along the route of the pipeline. One of the wells was reported to be in lot 21, concession XI, but its location cannot be found. In 1918 the Rockwood Oil Company drilled three wells on lots 6 and 7 of the broken front concession.

About that time F. J. Carman made a systematic survey of Aldborough and adjacent townships by drilling shallow holes to the top of the Dundee limestone or shallower markers. His logs have been of great assistance in making the contour map that accompanies this report. With the exception of a few shallow tests in concessions I and II, little was done following Carman's tests. By the end of World War II the Union Gas company's reserves were considerably depleted, and the company began an extensive search for new gas fields. The north and west sides of the township were covered by means of structure tests, and diamond-drill holes discovered three gas fields: (1) lots 24, Y, and Z, concessions I and II; (2) lots 18–21, concessions A and B; and (3) lots 12–15, concessions I and broken front, which extends into Mosa township across the Thames River. It was one of these test wells that led to the discovery of the Rodney oil field.

The Rodney Oil Field

The Rodney oil field consists of about 1,000 acres in the southern part of lots 5 and 6, concessions IV and V; lots 4, 5, and 6, concession VI; and lots 1 and 2 of the gore of Aldborough township. The producing horizon is at a depth of about 430 feet in the Dundee limestone of the Lower Devonian system, the walls are of moderate capacity, and the flow of gas is very small. Bottom water is not a problem, and very few wells have penetrated the water horizon. Although the field was discovered in 1949, it has been developed very slowly; only three wells were drilled in the first year. By the end of June, 1954, there were 90 wells in the field.

The oil produced is hauled by truck to Petrolia where it is delivered to the Imperial Oil, Limited's, receiving station and pumped to their refinery at Sarnia. The field had produced 255,242 barrels of oil by the end of June, 1954, and the production for the second half of 1954 may equal its total past production. The oil has a specific gravity of 35(A.P.I.) at 60°/60°F. No sulphur analysis has been made, but it probably equals that of other shallow Ontario fields.

The field was discovered in 1949 by James Beattie of Glencoe. Mr. Beattie had, in his younger days, worked for F. J. Carman who discovered both the west Bothwell and the Glencoe fields. Mr. Carman did a great deal of "structure drilling" in Kent, Lambton, Middlesex, and Elgin counties and outlined the structure of that area. He drilled eastward from the Bothwell field across the northern part of Aldborough township and outlined a broad anticline in Dunwich township. Mr. Beattie states that Mr. Carman was of the opinion that another oil field lay east of the Bothwell field, and with this in mind Mr. Beattie sought and collected information for over 30 years. When the Union Gas company drilled a diamond-drill, structure test hole on lot, 6, concession IV, and discovered oil at shallow depth, their main interest was in natural gas, not oil; since such shallow oil shows are not uncommon they took little interest in it. Mr. Beattie's examination of the cores led him to believe that he had found the area referred to by Mr. Carman. He secured the leases and began to explore the area. His first wells were in the northern limits of the area and not large. At this time an area to the east, in lots 12 and 13, concession V, was being explored with indifferent success, and it was not until Mr. Beattie enlarged his drilling to the south and brought in some large wells in a higher part of the structure that outsiders were attracted. A year passed before other operators entered the field and a large drilling campaign got underway.

Wells had been drilled in the southern part of Aldborough township as early as the 1880's; Mr. Carman's structure tests along the Thames River were drilled in 1918–20. In his memoir on the London area J. F. Caley[1] has outlined the fault to the west. With all this information available the general outline of the field became apparent after the first ten producing wells had been drilled. For this reason few dry holes were drilled.

Stratigraphy

The stratigraphy of the area has been very thoroughly described by Caley[2] in his memoir. He has renamed the Delaware and Onondaga formations and those to the base of the Detroit River, the Norfolk formation. He says;[3]

> . . . examination of cuttings from wells located in the southern part of the area has failed to reveal reliable criteria upon which the Detroit River rocks could be separated from the overlying Onondaga . . . all the pre-Hamilton rocks of the London area have been mapped as a single unit under the name Norfolk formation.

[1] J. F. Caley, *Palaeozoic Geology of the London Area, Ontario*, Geol. Surv. Can., Mem. 237, 1943.
[2] *Ibid*, p. 35.
[3] *Ibid*, pp. 36, 37.

In the section along the Detroit River there are more criteria for fixing horizons that separate formations. Caley discussed this on page 43, and his conclusions agree with the later work done in Michigan. There is a definite basis for dividing the Norfolk into two formations as has been done in Michigan and Ohio. This has been done in the accompanying table of formations.

Salina

Since Caley completed his memoir in 1942 the Salina section has been thoroughly studied. A comparison of many diamond-drill cores has clarified much that was hitherto obscure. C. S. Evans[1] in his report has divided the Salina formation into twelve members. These are shown in the accompanying table.

The table shows a complete section of the Salina as it occurs in the Lambton county gas fields. Of the twelve members, Nos. 1, 2, and 3 do not occur in the south half of Aldborough township and are very thin in the north half. The lower salt bed (No. 4 of A_2 in the table) does not occur at all in the township. No. 7, the big salt, is absent in the south half, but there are a few records of salt throughout the township: 85 feet of salt at 1,500 feet in lot A, concession XII; 140 feet of salt at 1,300–1,440 in lot 7, concession XIII; and 50 feet of salt at 1,440 in lot 19, concession XI. The greatest thickness of salt is 165 feet in lot 4, the gore. Members 4, 5, and 6 are thin in the south half of the township. According to Caley the maximum thickness of the Salina formation in Ontario is 1,438 feet of which 541 feet is salt. This was found in a well in Sarnia township. No. 7 and some of the higher members are either absent or are very thin in Aldborough township.

In A_2 are found the porous dolomites that contain gas in the fields along the Thames River. Of A_1 and A_2 Evans[2] says:

(1) Both A_1 and A_2 consist of a lighter colored upper part and a darker colored lower part regardless of whether both parts consist of a dense limestone (non-porous), tight dolomite (non-porous), or an upper porous dolomite and a lower non-porous dolomite.
(2) The first lighter strata of either A_2 or A_1 may be non-porous limestone or dolomite and contain one, two, or three lower porous dolomites separated by non-porous dense limestone or dolomite.
(3) Locally the top non-porous limestone or dolomite may be dark in color.

The samples of drill cuttings are not too difficult to follow in identifying these formations, the exception being the contact between the Salina and Guelph. The base of the Salina presents many variations from place to place. There is an erosional contact between these formations, and the sediments of the lower members of the Salina were derived from a reworking of the exposed Guelph. The Salina shallow seas made many advances and retreats, and at intervals, the sediments were exposed to erosion. It may therefore be expected that the sediments at this contact will show many variations from shaly dolomite mixed with anhydrite to brown dolomite that differs from the underlying Guelph only in crystallization. There is always a difference in texture, even if the colour does not change, from the fine dense dolomite of the Salina to the granular dolomite of the Guelph.

The division between the Salina and the overlying Bertie-Akron is placed at the first occurrence of gypsum or anhydrite if the shaly character of the Salina dolomites is not in evidence. The division between the Detroit River and Bertie-Akron formation is always marked by the change from the fine-grained dolomite of the Bertie-Akron to the overlying sand or sandy, cherty dolomite at the base of the Detroit River. The Dundee is similarly marked by passing from light, high-

[1]C. S. Evans, *Underground Hunting in the Silurian in Southwestern Ontario*, Geol. Assoc. Can., Vol. 3, 1950.
[2]C. S. Evans, *op. cit.* p. 59.

TABLE OF FORMATIONS[1]

System		Formation		Thickness	Lithology
				feet	
Devonian	Upper	Kettle Point		0–290	Thin-bedded, dark-grey to black shale with spherical shaly carbonate of lime concretions.
	Middle	Hamilton	Top Rock	110–330	Succession of beds of impure limestone and soft clay shale, or "soap." The drillers' terms identify the succession of these beds. At the bottom and in contact with the Dundee is a "black streak" of dark shale from 5 to 10 feet thick.
			Upper Soap		
			Middle Lime		
			Lower Soap		
		Dundee		120–150	Grey to brown-grey and buff, fine-grained limestone or dolomitic limestone with bituminous partings. Towards the base, chert and rounded quartz sand occur. This sand is the equivalent of the Oriskany sandstone of Haldimand county.
	Lower	Detroit River		100–300	Light-grey to white high-calcium limestone succeeded by buff to grey magnesian limestone with chert which increases towards the base. At the base from 10 to 75 percent of the dolomite may be sand with glauconite. This sand is the equivalent of the Sylvania sandstone where present.
Silurian		Bertie-Akron		90–130	Grey to brown, fine-grained dolomite. It locally carries bituminous streaks in the lower-middle part as well as oolitic limestone. In Lambton county there are occasional traces of gypsum near the base.
		Salina	Upper	300–700	12. Fine, brown to buff dolomite and shaly dolomite with beds of anhydrite. 11. Grey, shaly dolomite and dolomitic shale. 10. Fine, buff dolomite with beds of shale and anhydrite. In Lambton county the upper salt beds occur below this. 9. Grey, shaly dolomite with streaks of anhydrite. 8. Fine, buff and brown dolomite, and anhydrite. Some green shale. 7. Big upper salt bed. Where absent replaced by beds of anhydrite.

Silurian		Salina	Lower	50–150	A_2 6. Fine, buff to brown-grey dolomite. 5. Fine, dark-grey dolomite with dark shale at base. 4. Lower-salt bed. Replaced by beds of anhydrite in Aldborough township.
				0–150	A_1 3. Fine, buff to brown dolomite. 2. Fine to dense, brown-grey to dark-grey dolomite with dark-grey shale at base. 1. Beds of shale and anhydrite.
		Guelph		250–300	Brown to buff, granular to crystalline dolomite becoming light grey to white at the base.
		Lockport			
		Rochester		40–50	Dark-grey beds of hard and soft limy shale.
		Clinton		20	Dark-grey to brown crystalline dolomite.
		Medina		24	Fine, grey sandstone with much red and green shale.
				48	Green-grey shale with a trace of red shale, and impure dolomite.
				24	Green-grey shale with grey crystalline limestone.
				34	Grey, crystalline limestone with grey shale throughout.
Ordovician		Queenston		300–350	Red, argillaceous to sandy shale, mottled, green bands.
		Meaford-Dundas		350	Dark-grey shale with crystalline limestone beds.
		Billings		100–150	Dark, grey-brown to black shale.
		Trenton and older limestones		20	Crystalline, brown dolomite.
				30	Brown-grey, crystalline limestone.
				150	Brown-grey, crystalline limestone with much black bituminous shale.
				300	Brown-grey, dense limestone with some pyrite.
Ordovician or Cambrian		Basal beds		0–126+	Beds of limestone, grey-green and red shale, a little sandstone and dolomite.

[1]From Caley, adjusted to the section in Aldborough. The Lithology is of necessity very condensed.

calcium limestone of the Detroit River upward to the sandy and cherty dolomite of the Dundee.

The other contacts present no difficulty.

Structure

The township of Aldborough is a flat plain with an area of about 125 square miles and a maximum relief of 25 feet. It is covered by a mantle of till and lacustrine clay, 75–100 feet thick, along the Thames River, to 350 feet thick a few miles to the south. Nowhere is any rock in place to be seen, and structure can only be determined from the logs of wells. Unfortunately the logs of many of the old wells are of little value.

The area lies partly on the crest and partly on the south flank of a broad anticline that follows the course of the Thames River in a general east-west direction and separates the Michigan from the Appalachian basin. Two main faults, one running east-west and the other north-south, are indicative of the great disturbances that control the structure within the township.

In general, the structure as reflected on the surface of the Dundee limestone is a terrace cut off on the west by a fault running northwest almost along the township line. The upthrow side of the fault forms an anticlinal structure along which lies the Rodney oil field. In the eastern part of the township between this fault and another broad anticlinal structure in Dunwich township lies a low re-entrant. The fault is mentioned by Caley[1] and shown on the maps accompanying his memoir. Later information shows that the south end of the fault is at least a mile farther east than Caley had mapped it, and the displacement at the north end more than was anticipated. It terminates on the north in the larger east-west rupture that extends from Bothwell westward to Lake St. Clair. Its east end has not yet been outlined by drilling. The pattern is suggestive of a great shear zone, and the fold on the upthrow side is indicative of considerable pressure, at or prior to the time of faulting, followed by a post-fault tension. The axis of this anticline is tilted towards the west.

Along the crest of the anticline that forms the structure of the Rodney oil field the Dundee formation immediately underlies the surface deposits. An examination of the section (see map, back pocket) indicates that west-moving glaciers removed the Hamilton shales to a depth of 60 feet or more on the east slope of the anticline but only to a depth of 30 feet on the west slope.

In making the structure contour map of the area, concessions VII–IX, from lots A to 4, have been left blank. This section has undoubtedly been highly disturbed, but a determination of the position of the upthrow side of the fault cannot be made until the location of the main fault has been fixed; at present there is not sufficient drilling information from which to draw conclusions; the regional structure suggests a zone of shearing *en echelon*. In large areas with few or no wells the contours have been shown merely to indicate the regional dip.

It is quite possible that further drilling may show that the anticline may extend some miles south, since there is only a drop of 60 feet from the Albot Oil and Gas company's No. 3 well (the most southerly of three wells in the northeast quarter of lot 1, concession VII) to the Union Gas company's well in lot D, concession X, a distance of about three miles. With such a steep dip to the west terminating in a fault, the chances of an uninterrupted slope of 60 feet in three miles is small indeed; whereas with the indicated fold, there is a good chance of finding an extension of the oil field to the south.

[1]J. F. Caley, *op. cit.* p. 78

The broad anticline between the Michigan and Appalachian basins is more pronounced in the Salina and Guelph formations than it is in the Dundee. The three small gas fields (see page 43) lie along this anticline and occupy local structures that have small closures. C. S. Evans[1] states that the porous measures do not necessarily lie along the crest of the anticline but extend along the flank to the summit. Their porosity is continuous.

An examination of the structure contour map of the Dundee makes it evident that there are many faults subsidiary to the two main faults already mentioned. A depression of 125 feet runs east-west through lots 7–14, concession V; another, 80 feet deep, is in the vicinity of lot 17, concession I, eastern division; and another, 50–60 feet deep, apparently runs in a general north-south direction along the Aldborough-Dunwich township line. In the re-entrant in the southerly part of the township a well was recently drilled on lot 16, concession XIII, that shows a rise of 30 feet in three miles instead of an equal drop, which would have been the case had the dip been continuous. This is an interesting feature and may lead the way to a new structure in the Dundee and, provided it does not cover an equal thickness of salt, a parallel structure in the Salina-Guelph.

Reservoir Rocks

The oil in the Rodney field is found in the Dundee limestone about 130 feet below surface, which is the same depth as in the Dunwich and Bothwell fields, but 65 feet deeper than in the Oil Springs and Petrolia fields. The depth below land surface to the oil horizon is from 400 to 430 feet. The closure in the oil field averages about 40 feet. The highest point in the structure is 468 feet above sea level in lot 1 of the gore. Another high point is at the north end of lot 5, concession VI, where the line is at an elevation of 455 feet; there is a dip of 10 feet to the north from which it rises to 459 feet at the north end of lot 5, concession V. On the west side of the anticline, production appears to be restricted to the 440 contour, whereas on the east the 410 contour is the approximate limit, with the exception of one well in the northeast quarter of lot 6, concession V, which has an elevation of 386 feet. No dry holes have been drilled within the field, and the edge of the field has not been exactly outlined.

The Dundee underlies all the counties of Lambton, Kent, Essex, Elgin, Middlesex, all Oxford except the northeastern part, Perth, Huron, and parts of adjacent counties. Oil pools have been found in the Dundee in Essex, Kent, Lambton, and Middlesex. In Elgin county a pool along the shore of Lake Erie in Dunwich township has been producing for many years. Non-commercial shows of oil and gas eight miles east of the Rodney field were discovered 30 years ago. The formation ranges in thickness from 70 to 240 feet over this area, and as a consequence, the depths within the formation to the oil horizon show considerable differences. It can be said that there is a porous horizon about 50–150 feet within the Dundee where oil, gas, or water will be found.

Cable-drill cuttings do not give much information regarding the character of the reservoir rock in the field. Some cores have been taken, but no description of the rock, its porosity or permeability, has been given out. The cores were taken with cable tools, and it is known that only two-thirds to three-quarters of the cores were recovered. Had the initial production been higher this might have been an indication that some highly fossilized beds are marked by a preponderance of their casts in the dolomite, but such does not appear to be the case. The cores have the appearance of a dark-grey dolomite. It is difficult to speculate on what might be the nature of the missing parts of the cores, but it can be safely said that

[1]C. S. Evans, personal communication.

they are softer. Whether they are soft shale or limestones, so porous that they are fragile, can only be a matter of speculation.

Porosity appears to be fairly even and continuous. Initial production of wells seems to be related to the thickness of the producing "sand" and is roughly one barrel per foot of "sand." The thickness of the "pay" varies from 5 feet on the flank to 30 feet on the crest of the structure.

Oil Field Practice

All wells in this field have been drilled with cable tools. Drive pipe is landed on the limestone at an average of 230 feet and good shut-off secured. The well is completed into the oil "pay" in an open hole. Wells are then tubed to the bottom with 2-inch tubing. With so little gas pressure, no anchoring is necessary. Screen and pump is set up to 10 feet off bottom.

Electric power is available in the field, and wells are pumped with individual electric motors. Most wells are pumped continuously, but there are a few with automatic shut-down periods. This makes for economy in operation. Pumps deliver the oil to a central tank, and tank wagons haul the oil to Imperial Oil, Limited's, receiving station at Petrolia. From here the oil is delivered to the Sarnia refinery by pipeline.

Because of the shallow depth and normal deliveries, no great trouble with sucker-rod breakage from fatigue has developed. Individual electric motors give a much smoother and surer performance than the old jerker-line system.

After a year's operation it was found that the wells collect paraffin and waste, which cut down production. Pumps and tubing are pulled, and the wells washed with a heat-producing solution. This usually brings production back to normal.

Oil and Water Levels

There is no great problem of protecting the field against intrusion of water. The operators are all well experienced in the shallow fields, and any wells that have been drilled through the oil horizon into bottom water have been plugged back. There are two mineral water horizons. One, a shallow sulphur water, at 100–200 feet below surface, is not found in every well and not at any predictable horizon. Mr. Brittain gives the specific gravity of this water as from 1.005 to 1.015. The second water horizon is with or below the oil. It is more saline; Mr. Brittain estimates it to have a specific gravity of 1.040. Only one well has had a heavy flow of bottom water; it was observed in an offset well some 700 feet distant. When it was plugged back, the pump easily controlled the water.

The field is too new to be much troubled with water since the gas pressure, although low, keeps the water from bypassing the oil. The Albot Oil and Gas company's No. 1 well was closed down for one month; when bailed it made only 20 gallons of water. The well is on the east flank of the field, 25 feet below the crest of the structure.

For reasons given above the static level of bottom water is not easily determined. An examination of logs gives a variety of levels, and the most reliable estimate that can be made is from 200 to 250 feet below surface.

Oil Level

There is little gas in the field, but it is enough to hinder any attempt to determine the fluid level of the oil. A few wells flow, but in the others the gas turns the oil column into a froth. The most reliable measurement comes from the Albot Oil and Gas company's No. 1 well in the northeast quarter of lot 1, the gore. Here the fluid level stood at 140 feet below surface after the well had been closed down for a month.

Production

Up to the end of June, 1954, production from the field was as follows:

Year	Barrels	Number of wells
1949 (6 months)	675	1
1950	1,071	1
1951	4,050	8
1952	12,043	13
1953	126,400	83
1954 (6 months)	111,003	.....
Total	255,242	.....

There are no records of production of individual wells that would be helpful in determining the flush production. Initial production is determined by bailing wells for a few hours when they come in. There is not enough gas with the oil to flow the oil through the casing, although it is reported that four wells are now, or shortly will be, flowing the oil through the tubing. It is not possible to measure the open flow of the gas from these wells because of the column of fluid, but estimates of gas in a few selected wells show it is up to 10 M cubic feet. The rock pressure has not been determined. It is safe to say that the gas produced per barrel of oil is from 400 to 800 cubic feet.

An attempt has been made to determine a decline curve for an average well, but the results were contradictory. Few dependable records are available since wells are pumped to a central receiving tank. The records examined by the writer showed practically no decline. The oldest wells (4 years old) were small, and the production from these is tanked with that of 25 later and larger wells, defeating any attempt to calculate their individual production. A. Comfort, who operates four wells on the highest point in the field where most gas would be expected, and the wells had high initial production, says that his wells declined 40 percent in production in the first ten months. In areas where there is less gas than in Mr. Comfort's wells the decline is small. The average daily production of the 25 wells mentioned is eight barrels, and the average for the field is half that. Estimates of the recoverable production from the field by primary methods are from 3,500,000 to 7,500,000 barrels.

Spacing

Originally, by mutual arrangement, wells were kept 250 feet from boundaries of blocks of leases. For royalty purposes this distance has been generally maintained along farm boundaries. Within blocks of leases and farms, a 500-foot space has been generally maintained, one operator only having adopted 400-foot and another 600-foot spacing. Oil well spacing is now regulated by the Ontario Fuel Board.

Surface Gas

Surface gas occurs in many places in Aldborough township and is used very extensively by property owners for the same purposes as natural gas produced from greater depth.

The author has made an extensive study of surface gas deposits in Ontario. In his report[1] he shows that surface gas occurs where gravel beds overlie bituminous shales. In the major part of Kent and Lambton counties, the Kettle Point bituminous shales are found immediately underlying the surface deposits; and where gravel beds are covered with 50–100 feet of clay, they form a reservoir in which the surface gas can accumulate. The Kettle Point formation extends to the

[1] R. B. Harkness, *Natural Gas in 1930*, Ont. Dept. Mines, Vol. XL, pt. 5, pp. 51–53.

west boundary of Aldborough township where it is cut off by the fault running north along the township line. Surface gas is found in Orford township and in Aldborough township, concession III, as far east as lot 5; in concession II as far east as lot 7; and in concession VII eastward to lot 2.

A news item in the *Chatham Planet* of April 23, 1894, says that when a well was being drilled on the Charles Degraw farm, lot 1, concession VII, gas was struck that "could be heard roaring for miles." When the Albot company's No. 1 well was being drilled on the northeast corner of the same lot in 1953, gas was struck in the surface deposits that flowed for a few days at the rate of several million cubic feet per day, until it blew down. No doubt this surface gas came from the bituminous shales a few miles to the west and migrated through the gravel beds as far as its pressure would carry it.

In Aldborough township a small area in concessions II and III has been producing gas for 50 years. The general practice, when the gas pressure is reduced to a few ounces per square inch, is to install a vacuum pump. These pumps keep the wells producing for many years. When a new well is drilled into this stratum, a considerable flow of air can be seen entering the well. A new well must be immediately shut in, and all wells have check valves in the delivery line to keep air from entering the well. It would seem that the day will come when enough air has entered the underground reservoir to form an explosive mixture, and there will be an answer to the question as to whether, on ignition, an underground explosion will occur or whether flame propagation is arrested when it reaches the rock reservoir.

Secondary Recovery

A study of the Rodney field has led others besides the author to believe that there is an excellent opportunity to experiment with what is known as secondary recovery. In most oil fields pumping is continued until it becomes unprofitable; this is known as primary recovery. Where the porosity is uniform, the permeability satisfactory, and the old wells plugged off or in good condition, secondary recovery is conducted by pumping gas or air under pressure into the formation and allowing it to escape through selected wells. The gas or air carries oil with it and recovers additional oil. Another method is to inject water instead of gas or air. In this case a well of water washes the oil towards the selected wells where it is pumped out.

In the Rodney field there is so little gas that, even if the oil content is as high as in fields where the initial production runs into hundreds of barrels, it will take much longer to recover the same quantity of oil. The date of unprofitable primary production is, therefore, much nearer in the Rodney field than it would be if there were a greater flow of gas. It seems logical that the time to try a method of secondary production has arrived.

Conclusion

The present producing field has been fairly well outlined and perhaps three-quarters of the area has been drilled. There is, however, an area previously mentioned where an anticline similar to the Rodney field might be found.

Investigations should be made at once to determine the best method to be used for secondary recovery of oil from this field. A study of abandoned fields has shown that only a third of the oil is recovered by pumping and that at least an equal quantity can be recovered by repressuring or flooding. Now is the time to undertake this because, as time goes on, faulty workmanship or accidents may create difficulties that will be very costly to overcome in the way of secondary recovery.

Logs of Wells for 1953

The drillers' logs for the 403 gas and oil wells completed during 1953 are published in the following pages.

The locations of gas and oil wells are given by distances from the nearest boundary of the lot, its centre line (C.L.), or some well-known landmark.

Elevations are all taken at ground level from mean sea level. Additions are made for the distance from ground level to the floor of the drilling rig.

All information regarding water, oil, and gas horizons is given in the logs, but at the request of the companies concerned, open flow of gas wells is not shown.

In compliance with regulations made under the Well Drillers Act, R.S.O., 1950, Chapter 423, samples of rock cuttings have been taken from representative wells. These cuttings have been forwarded to the Canadian Department of Mines and Technical Surveys at Ottawa for detailed examination. Copies of the detailed logs are available through the office of the Ontario Fuel Board in Toronto.

The following logs of wells are arranged alphabetically by counties, townships, operators, and owners, respectively.

Brant County

TRI-ZONE OIL DEVELOPMENT—No. 1

R. Anderson No. 1, lot 3, con. XV, South Dumfries tp.

Location: 225 ft. N. of road, 190 ft. W.
Driller: R. McMaster and Sons.
Completed: June 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	127
Niagara	410
Rochester shale	506
Clinton	525
Red Medina	540
Blue shale and Manitoulin	600
White Medina	609
Big Red shale	865
Red and grey shale	880
Red shale and lime	1,190
Big grey shale	1,910
Utica and probably Collingwood	1,985
Trenton	2,600
Arkose	2,625
Granite	2,647

Show of gas at 605 ft.
Fresh water at 160, 400, 540, and 580 ft.

Elgin County

F. ACKERMAN—No. 1

F. Ackerman No. 1, lot 4, con. VIII, Aldborough tp.

Location: 230 ft. S., 240 ft. E. of C.L.
Elevation: 693+1 ft.
Driller: Demaray and Nichols.
Completed: Nov. 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	304
Brown lime	468
Sand	478

Show of gas at 310 ft.
Small show of oil at 410–25 ft.
Fresh water at 265 ft.; sulphur and salt water at 478 ft.

ALBOT GAS AND OIL CO., LTD.—No. 1

H. and I. McCallum No. 1, lot 1, con. VII, Aldborough tp.

Location: 220 ft. N., 250 ft. E.
Elevation: 690 ft.
Driller: Demaray and Nichols.
Completed: May 27, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	242
Light-brown and grey lime	342
Light-brown lime with chert	381
Light-brown lime with blue lime	418
Dark-brown lime	428

Oil at 105, 357, and 418–28 ft.
Fresh water at 240 ft.

ALBOT GAS AND OIL CO., LTD.—No. 2

H. and I. McCallum No. 2, lot 1, con. VII, Aldborough tp.

Location: 720 ft. S., 250 ft. W.
Elevation: 689+1 ft.
Driller: Demaray and Nichols.
Completed: June 27, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	246
Brown lime	343
Chert and lime	393
Brown lime	415
Sand	431

Oil at 418–30 ft.
Show of gas at 346 ft.
Fresh water at 110 ft.; sulphur water at 346, 390, and 430 ft.

Elgin County—Continued

ALBOT GAS AND OIL CO., LTD.—No. 3

H. and I. McCallum No. 3, lot 1, con. VII, Aldborough tp.

Location: 1,220 ft. S., 250 ft. W.
Elevation: 691+1 ft.
Driller: Demaray and Nichols.
Completed: Aug. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	258
Brown lime	345
Chert and lime	360
Brown lime	416
Sandstone	431

Show of oil at 420–30 ft.
Fresh water at 125 ft.; sulphur water at 279 ft.; salt water at 431 ft.

ALDBOROUGH OIL AND GAS CO.—No. 1

F. Wright No. 1, lot 5, con. VI, Aldborough tp.

Location: 225 ft. S., 455 ft. E. of C. L.
Elevation: 693+1 ft.
Driller: H. Evans and Sons.
Completed: Sept. 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	245
Buff and grey lime	400
Oil sand	414

Oil at 400–14 ft.
Fresh water at 225 ft.

ASHLEY-STORK—No. 1

F. Quinton No. 1, lot 7, con. IV, Aldborough tp.

Location: 250 ft. N., 250 ft. W.
Elevation: 690+1 ft.
Driller: I. Lounsbury.
Completed: June 20, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	338
Brown lime	385
Blue lime	418
Light lime	435
Soft muddy lime	446
Grey lime	450
Brown lime	466

Show of gas at 365 and 466 ft.
Show of oil at 385 and 466 ft.
Fresh water at 175 ft.; sulphur water at 433 and 448 ft.; salt water at 466 ft.

BRADFORD OIL AND GAS CO.—No. 1

S. Sabjon No. 1, lot 5, con. V, Aldborough tp.

Location: 225 ft. N., 255 ft. W.
Elevation: 692 ft.
Driller: H. L. Evans and Sons.
Completed: Sept. 30, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	263
Lime	395
Oil sand	410

Oil at 395–410 ft.
Fresh water at 230 ft.

BRADFORD OIL AND GAS CO.—No. 2

S. Sabjon No. 2, lot 5, con. V, Aldborough tp.

Location: 825 ft. N., 255 ft. W.
Elevation: 694+1 ft.
Driller: H. L. Evans and Sons.
Completed: Oct. 25, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	254
Lime	387
Oil sand	405

Oil at 387–405 ft.
Fresh water at 210 and 250 ft.

BRADFORD OIL AND GAS CO.—No. 3

S. Sabjon No. 3, lot 5, con. V, Aldborough tp.

Location: 1,450 ft. N., 250 ft. W.
Elevation: 693+1 ft.
Driller: H. Evans and Sons.
Completed: Nov. 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	253
Lime	382
Oil sand	398
Lime	399

Oil at 382–98 ft.
Fresh water at 215 and 250 ft.

BRADFORD OIL AND GAS CO.—No. 4

S. Sabjon No. 4, lot 5, con. V, Aldborough tp.

Location: 2,050 ft. N., 250 ft. W.
Elevation: 682+1 ft.
Driller: H. Evans and Sons.
Completed: Dec. 3, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	235
Lime	362
Oil sand	382

Oil at 362–82 ft.
Fresh water at 200 and 235 ft.

BRADFORD OIL AND GAS CO.—No. 5

S. Sabjon No. 5, lot 5, con. V, Aldborough tp.

Location: 1,625 ft. N., 475 ft. W.
Elevation: 696+1 ft.
Driller: H. Evans and Sons.
Completed: Dec. 30, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	245
Lime	373
Oil sand	392

Oil at 375–92 ft.
Fresh water at 210 and 250 ft.

Elgin County—Continued

A. COMFORT—No. 6

G. Tunks No. 2, lot 4, con. VI, Aldborough tp.

Location: 850 ft. N. of C. L., 250 ft. W.
Elevation: 694+1 ft.
Driller: A. Comfort.
Completed: Jan. 31, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	251
Lime	408
Sand	428

Oil at 350 and 408–28 ft.
Fresh water at 240 and 260 ft.

COMFORT-ACME GAS AND OIL CO., LTD.—No. 5

C. Jamieson No. 1, lot 15, con. VI, Aldborough tp.

Location: 250 ft. N., 250 ft. W.
Elevation: 704+1 ft.
Driller: Demaray and Nichols.
Completed: Sept. 30, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	240
Soap, lime streaks	374
Grey lime	378
Brown lime	379

Fresh water at 240 and 283 ft.

COMFORT-ACME GAS AND OIL CO.,—No. 3

G. Tunks No. 3, lot 4, con. VI, Aldborough tp.

Location: 700 ft. N., 250 ft. W.
Elevation: 696 ft.
Driller: Demaray and Nichols.
Completed: Apr. 10, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	249
Light-brown lime	322
Light-brown lime with chert	370
Brown lime	392
Dark-brown lime or sandstone	414
Hard-brown lime	422

Oil at 404–6 and 408–10 ft.
Fresh water at 233 ft.

COMFORT-ACME GAS AND OIL CO.—No. 4

G. Tunks No. 4, lot 4, con. VI, Aldborough tp.

Location: 250 ft. S., 250 ft. W.
Elevation: 692 ft.
Driller: Demaray and Nichols.
Completed: Apr. 28, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	235
Light-brown lime	316
Light-brown lime with chert	363
Brown lime	392
Dark-brown lime or sandstone	402
Very hard lime	405
Brown lime	420

Oil at 293–97, 382–87, and 396–98 ft.
Fresh water at 204 ft.

COMFORT-PRAIRIE GAS AND OIL CO.—No. 1

G. Tunks No. 5, lot 3, con. VI, Aldborough tp.

Location: 250 ft. S., 250 ft. W.
Elevation: 688+1 ft.
Driller: A. Comfort.
Completed: July 16, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	257
Soap and shale	280
Grey lime	300
Brown lime	350
Sharp lime	393
Lime	454
Sand	474

Show of oil at 325, 393, and 454 ft.
Fresh water at 235 ft.; sulphur water at 300 and 393 ft.; sulphur and salt water at 462 ft.

COMFORT-PRAIRIE GAS AND OIL CO., LTD.—No. 2

G. Tunks No. 6, lot 3, con. VI, Aldborough tp.

Location: 220 ft. S., 490 ft. E.
Elevation: 696+1 ft.
Driller: A. Comfort.
Completed: Sept. 10, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	255
Soap and shale	318
Brown lime	455
Sand and lime	465

Fresh water at 240 ft.; sulphur water at 340 ft.; sulphur and salt water at 465 ft.

CROWN OIL AND GAS CO.—No. 2

A. McCallum No. 2, lot 6, con. V, Aldborough tp.

Location: 1,600 ft. S., 260 ft. E. of C. L.
Elevation: 692+1 ft.
Driller: H. Evans and Sons.
Completed: Jan. 30, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	307
Buff and brown lime	405
Oil sand	420

Oil at 405–20 ft.
Fresh water at 197 ft.

CROWN OIL AND GAS CO.—No. 3

A. McCallum No. 3, lot 6, con. V, Aldborough tp.

Location: 2,200 ft. S., 250 ft. E.
Elevation: 693 ft.
Driller: H. Evans and Sons.
Completed: Mar. 3, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	265
Lime	405
Oil sand	422

Oil at 352 and 405–22 ft.
Fresh water at 200 and 270 ft.

Elgin County—Continued

CROWN OIL AND GAS CO.—No. 4

A. McCallum No. 4, lot 6, con. V, Aldborough tp.

Location: 2,800 ft. S., 260 ft. E. of C. L.
Elevation: 696 ft.
Driller: H. Evans and Sons.
Completed: Apr. 25, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	262
Lime	410
Oil sand	426

Oil at 410–26 ft.
Fresh water at 265 ft.; salt water at 365 ft.; black and salt water at 385 ft.

CROWN OIL AND GAS CO.—No. 5

A. McCallum No. 5, lot 6, con. V, Aldborough tp.

Location: 3,328 ft. S., 255 ft. E. of C. L.
Elevation: 693+1 ft.
Driller: H. Evans and Sons.
Completed: June 5, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	272
Lime	410
Dolomite and oil sand	426

Oil at 410–26 ft.
Fresh water at 225 ft.; sulphur water at 400 ft.

CROWN OIL AND GAS CO.—No. 6

A. McCallum No. 6, lot 6, con. V, Aldborough tp.

Location: 830 ft. N., 255 ft. E. of C. L.
Elevation: 691½+1 ft.
Driller: H. Evans and Sons.
Completed: July 4, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	268
Lime	405
Dolomite	419

Oil at 406–19 ft.
Fresh water at 215 and 310 ft.; sulphur water at 401 ft.

CROWN OIL AND GAS CO.—No. 7

A. McCallum No. 7, lot 5, con. V, Aldborough tp.

Location: 250 ft. S., 550 ft. E. of C. L.
Elevation: 691+1 ft.
Driller: H. Evans and Sons.
Completed: Aug. 31, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	259
Grey and brown lime	410
Oil sand	415
Water sand	420
Oil sand	422
Water sand	428

Show of oil at 410–15 and 420–22 ft.
Fresh water at 200 and 260 ft.; sulphur water at 310 and 424 ft.

CROWN OIL AND GAS CO.—No. 8

A. McCallum No. 8, lot 6, con. V, Aldborough tp.

Location: 227 ft. N., 255 ft. E. of C. L.
Elevation: 692 ft.
Driller: H. Evans and Sons.
Completed: Aug. 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	272
Lime	400
Dolomite	419

Oil at 400–19 ft.
Fresh water at 205 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 18

J. Clark No. 1, lot D, gore, Aldborough tp.

Location: 735 ft. N., 235 ft. W.
Elevation: 695+1 ft.
Driller: I. Smelser.
Completed: Nov. 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	235
Soap	253
Brown lime	424
Dolomite	438
Sandstone	444

Show of oil at 424–33 ft.
Fresh water at 185 ft.; salt water at 438 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 1

G. McColl No. 1, lot 4, con. VI, Aldborough tp.

Location: 1,182 ft. N., 260 ft. W.
Elevation: 696 ft.
Driller: R. Mandley.
Completed: Mar. 20, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	252
Brown lime	351
Blue flint	363
Grey and brown lime	420
Oil sand	426½
Water sand	428½

Oil at 408–10 and 420–26 ft.
Fresh water at 268 ft.; sulphur water at 428 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 2

G. McColl No. 2, lot 4, con. VI, Aldborough tp.

Location: 990 ft. N., 1,210 ft. E.
Elevation: 697 ft.
Driller: I. Smelser.
Completed: Apr. 7, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	242
Grey lime	244
Brown lime	417
Oil sand	427

Oil at 401–3 and 417–27 ft.
Show of gas and oil at 413–17 ft.
Show of gas at 417–18 ft.
Fresh water at 244 ft.

Elgin County—Continued

DOMINION NATURAL GAS CO., LTD.—No. P. 3

G. McColl No. 3, lot 4, con. VI, Aldborough tp.

Location: 955 ft. N., 710 ft. E.
Elevation: 696 ft.
Driller: R. Mandley.
Completed: Apr. 27, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	243
Shale	269
Brown lime	334
Grey lime	421
Oil sand	426½

Oil at 421–26½ ft.
Fresh water at 223 ft.; sulphur water at 299 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 14

G. McColl No. 4, lot 4, con. VI, Aldborough tp.

Location: 945 ft. N., 275 ft. E.
Elevation: 696 ft.
Driller: I. Smelser.
Completed: Aug. 27, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	247
Brown lime	426½
Dolomite	430½

Oil at 426½–30½ ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 15

J. McColl No. 1, lot D, con. VII, Aldborough tp.

Location: 250 ft. S., 250 ft. W.
Elevation: 690+1 ft.
Driller: I. Smelser.
Completed: Oct. 8, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	253
Brown lime	419
Dolomite	432
Brown lime	650
Chert	793
Sylvania	840

Oil at 421–26 ft.
Salt water at 433 ft.; sulphur water at 258, 503, 612, and 793 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 4

F. Purcell No. 1, lot 5, con. VI, Aldborough tp.

Location: 783 ft. N. of C. L., 250 ft. E.
Elevation: 693 ft.
Driller: I. Smelser.
Completed: May 5, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	252
Grey lime	283
Brown lime	404
Oil sand	420

Oil at 405–20 ft.
Fresh water at 250 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 5

F. Purcell No. 2, lot 5, con. VI, Aldborough tp.

Location: 788 ft. S., 250 ft. E.
Elevation: 693 ft.
Driller: I. Smelser.
Completed: June 2, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	244
Grey lime	271
Light-brown lime	400
Oil sand	419

Oil at 400–19 ft.
Fresh water at 232 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 6

F. Purcell No. 3, lot 5, con. VI, Aldborough tp.

Location: 250 ft. S., 250 ft. E.
Elevation: 694+1 ft.
Driller: R. Mandley and Son.
Completed: June 18, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	242
Brown lime	362
Grey lime	392
Dolomite	408
Grey lime	420

Oil at 392–408 ft.
Fresh water at 230 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 7

F. Purcell No. 4, lot 5, con. VI, Aldborough tp.

Location: 250 N. of C. L., 250 ft. E.
Elevation: 694 ft.
Driller: I. Smelser.
Completed: June 19, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	255
Grey lime	288
Brown lime	410
Oil sand	427

Oil at 413–27 ft.
Fresh water at 260 ft.; sulphur water at 347 ft.; salt water at 352 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 8

F. Purcell No. 5, lot 5, con. VI, Aldborough tp.

Location: 220 ft. S., 250 ft. W. of C. L.
Elevation: 692+1 ft.
Driller: R. Mandley and Son.
Completed: July 9, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	242
Brown lime	362
Grey lime	392
Dolomite	412

Oil at 393–412 ft.
Fresh water at 208 ft.

Elgin County—Continued

DOMINION NATURAL GAS CO., LTD.—No. P. 9

F. Purcell No. 6, lot 5, con. VI, Aldborough tp.

Location: 250 ft. N. of C. L., 250 ft. W. of C. L.
Elevation: 693 ft.
Driller: I. Smelser.
Completed: July 7, 1953.
Result: producing oil well

Formation	Depth ft.
Surface	253
Grey lime	283
Brown lime	415
Dolomite and oil sand	428

Oil at 415–28 ft.
Fresh water at 249 ft.; sulphur water at 347 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 10

F. Purcell No. 7, lot 5, con. VI, Aldborough tp.

Location: 1,306 ft. S., 750 ft. E.
Elevation: 692+1 ft.
Driller: I. Smelser.
Completed: July 24, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	250
Grey lime	265
Brown lime	408
Dolomite	423

Oil at 408–23 ft.
Fresh water at 248 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 11

F. Purcell No. 8, lot 5, con. VI, Aldborough tp.

Location: 763 ft. S., 750 ft. E.
Elevation: 694+1 ft.
Driller: I. Smelser.
Completed: Aug. 20, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	245
Grey lime	269
Brown lime	402
Dolomite	421

Oil at 402–20 ft.
Fresh water at 240 ft.; sulphur water at 359–67 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 12

J. Rubi No. 1, lot 6, con. VI, Aldborough tp.

Location: 250 ft. S., 250 ft. E.
Elevation: 694+1 ft.
Driller: R. Mandley and Son.
Completed: July 29, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	269
Brown and grey lime	330
Flint and lime	395
Grey lime	410
Oil sand	425½

Oil at 410–24 ft.
Fresh water at 230 ft.; salt water at 424 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 13

J. Rubi No. 2, lot 6, con. VI, Aldborough tp.

Location: 250 ft. S., 800 ft. E.
Elevation: 696+1 ft.
Driller: R. Mandley and Son.
Completed: Sept. 2, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	278
Brown lime	316
Flint and lime	417
Oil sand	428

Oil at 417–28 ft.
Fresh water at 220 ft.; sulphur water at 278 ft.; salt water at 428 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 16

J. Rubi No. 3, lot 6, con. VI, Aldborough tp.

Location: 250 ft. S., 750 ft. W.
Elevation: 695+1 ft.
Driller: R. Mandley and Son.
Completed: Sept. 29, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	280
Brown lime	350
Flint	390
Lime	420
Dolomite	424

Oil at 420–24 ft.
Fresh water at 220 ft.; sulphur water at 280 ft.

DOMINION NATURAL GAS CO., LTD.—No. P. 17

J. Rubi No. 4, lot 6, con. VI, Aldborough tp.

Location: 750 ft. S., 250 ft. E.
Elevation: 697+1 ft.
Driller: R. Mandley and Son.
Completed: Oct. 25, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	254
Brown lime	314
Flint and lime	398
Grey lime	414
Oil sand	425

Oil at 414–25 ft.
Fresh water at 220 ft.; sulphur water at 254 and 330 ft

DOMINION NATURAL GAS CO., LTD.—No. P. 19

J. Rubi No. 5, lot 6, con. VI, Aldborough tp.

Location: 1,250 ft. S., 250 ft. E.
Elevation: 697+1 ft.
Driller: R. Mandley and Son.
Completed: Nov. 6, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	252
Brown lime	300
Flint and lime	330
Grey lime	419
Oil sand	425

Oil at 419–25 ft.
Fresh water at 220 ft.

Elgin County—Continued

DOMINION NATURAL GAS CO., LTD.—No. P. 21

J. Rubi No. 6, lot 6, con. VI, Aldborough tp.

Location: 750 ft. S., 750 ft. E.
Elevation: 698+1 ft.
Driller: R. Mandley and Son.
Completed: Nov. 27, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	274
Lime	314
Flint	404
Grey lime	420
Dolomite	425

Oil at 420–25 ft.
Fresh water at 220 ft.; sulphur water at 330 ft.

J. W. FRASER—No. 2

J. Schleihauf No. 1, lot 3, con. XI, Aldborough tp.

Location: 350 ft. N., 350 ft. E.
Elevation: 663+1 ft.
Driller: Palenkas Bros.
Completed: June 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	285
Soap and shale	330
Grey lime	405
Light-brown lime	415
Sharp flint	435
Grey lime	475
Sandstone	495
Grey lime	505
Sandstone	555
Grey lime	670
Light-brown lime	700

Fresh water at 195 ft.; sulphur water at 535 ft.

LATHER AND EARL

R. Currie No. 1, lot 7, gore, Aldborough tp.

Location: 374 ft. S., 338 ft. E.
Driller: S. Earl.
Completed: Mar. 7, 1953.
Result: dry hole; discontinued because of depth of drift.

Formation	Depth ft.
Surface	340

Fresh water at 287 ft.

PALENKAS BROS.—No. 1

J. Mahon No. 2, lot 9, con. V, Aldborough tp.

Location: 900 ft. N., 250 ft. E.
Elevation: 696+1 ft.
Driller: Palenkas Bros.
Completed: Sept. 14, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	288
Brown lime	390
Flint and lime	410
Brown lime	435
Sandy lime	462
Dark-brown oil sand	463
Very light brown sand	467½

Gas at 322 ft.
Oil at 462–63 ft.
Fresh water at 190–288 ft.; salt and sulphur water at 322 and 439 ft.

RICHFIELD OIL AND GAS CO.—No. 12

A. and W. Gillies No. 3, lot 6, con. V, Aldborough tp.

Location: 1,382 ft. S., 255 ft. W. of C. L.
Elevation: 694+1 ft.
Driller: Palenkas Bros.
Completed: Mar. 18, 1953
Result: producing oil well.

Formation	Depth ft.
Surface	280
Soft, brown lime	327
Hard, light-brown lime	342
Soft, light-brown lime	346
Hard, brown lime	355
Hard, light-brown lime	375
Oil sand	406
Hard, grey lime	408

Oil at 380–406 ft.
Fresh water at 190 ft.

RICHFIELD OIL AND GAS CO.—No. 13

A. and W. Gillies No. 4, lot 6, con. V, Aldborough tp.

Location: 1,940 ft. S., 255 ft. W.
Elevation: 693 ft.
Driller: Palenkas Bros.
Completed: Apr. 13, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	260
Soft, brown lime	327
Hard, grey lime	341
Sandstone	390
Producing sandstone	409

Oil at 390–409 ft.
Fresh water at 190 ft.; salt water at 348 ft.

RICHFIELD OIL AND GAS CO.—No. 14

A. and W. Gillies No. 5, lot 6, con. V, Aldborough tp.

Location: 2,530 ft. S., 255 ft. W. of C. L.
Driller: Palenkas Bros.
Completed: May 5, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	260
Soft, dark-brown lime	280
Hard, light-brown lime	375
Hard, dark-brown lime	391
Producing oil sand	407

Oil at 391–407 ft.
Fresh water at 260 ft.

RICHFIELD OIL AND GAS CO.—No. 18

A. and W. Gillies No. 6, lot 6, con. V, Aldborough tp.

Location: 260 ft. N., 250 ft. E.
Elevation: 691+1 ft.
Driller: Palenkas Bros.
Completed: Sept. 3, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	263
Brown lime	330
Flint and lime	360
Brown lime	380
Sandy lime	402
Oil sand	416

Oil at 402–16 ft.
Fresh water at 250–63 ft.

Elgin County—Continued

RICHFIELD OIL AND GAS CO.—No. 20

A. and W. Gillies No. 7, lot 6, con. V, Aldborough tp.

Location: 850 ft. N., 252 ft. E.
Elevation: 694 +1 ft.
Driller: Palenkas Bros.
Completed: Oct. 29, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	259
Brown lime	325
Blue flint and brown lime	355
Brown lime with white streaks	380
Brown, sandy lime, with white streaks	392
Brown, sandy lime	396
Producing oil sand	413

Show of gas at 263 ft.
Gas and oil at 396–413 ft.
Fresh water at 215–59 ft.

RICHFIELD OIL AND GAS CO.—No. 21

A. and W. Gillies No. 8, lot 6, con. V, Aldborough tp.

Location: 1,450 ft. N., 255 ft. E.
Elevation: 694 +1 ft.
Driller: Palenkas Bros.
Completed: Nov. 28, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	256
Brown lime	320
Blue flint and lime	350
Brown lime with white streaks	390
Brown lime and sand	392
Producing oil sand	407
Brown lime	407½

Show of gas at 270 ft.
Gas and oil at 290 and 393–407 ft.
Fresh water 225–56 ft.

RICHFIELD OIL AND GAS CO.—No. 22

A. and W. Gillies No. 9, lot 6, con. V, Aldborough tp.

Location: 1,990 ft. N., 255 ft. E.
Elevation: 697 +1 ft.
Driller: Palenkas Bros.
Completed: Dec. 29, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	255
Brown lime	310
Blue flint and lime	330
Brown lime and gypsum	386
Brown lime and sand	390
Oil sand	405
Brown lime	406

Oil at 390–405 ft.
Fresh water at 220 ft.

RICHFIELD OIL AND GAS CO.—No. 15

J. and M. McMillan No. 4, lot 5, con. V, Aldborough tp.

Location: 220 ft. N., 740 ft. E.
Elevation: 692 ft.
Driller: Palenkas Bros.
Completed: June 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	243
Brown lime	315
Sharp sand and lime	335
Brown lime	382
Producing sand	403

Fresh water 225–43 ft.

RICHFIELD OIL AND GAS CO.—No. 16

J. McMillan No. 5, lot 5, con. V, Aldborough tp.

Location: 1,565 ft. S., 250 ft. W.
Elevation: 693½ +1 ft.
Driller: Palenkas Bros.
Completed: July 9, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	242
Brown lime	300
Flint	315
Brown lime	360
Brown sand and lime	369
Producing sand	389

Show of gas at 255, 285 and 320 ft.
Oil at 369–89 ft.
Fresh water at 200–42 ft.
Salt water at 275 ft.

RICHFIELD OIL AND GAS CO.—No. 17

J. McMillan No. 6, lot 5, con. V, Aldborough tp.

Location: 1,065 ft. S., 800 ft. W.
Elevation: 689 +1 ft.
Driller: Palenkas Bros.
Completed: Aug. 6, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	231
Brown lime	355
Brown, sandy lime	362
Producing sand	378
Brown lime	383

Oil at 362–78 ft.
Fresh water at 190–231 ft.; sulphur water at 345 ft.

RICHFIELD OIL AND GAS CO.—No. 19

J. McMillan No. 7, lot 5, con. V, Aldborough tp.

Location: 800 ft. N., 740 ft. E.
Driller: Palenkas Bros.
Completed: Oct. 10, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	247
Brown lime	300
Blue flint and lime	330
Light-brown lime with white streaks	345
Sandy, brown lime with white streaks	375
Producing oil sand	396
Brown lime	397

Oil at 376 ft.
Fresh water at 190–245 ft.; black sulphur water at 370 ft.

E. L. ROTH—No. 33

F. Downie No. 3, lot 5, con. VI, Aldborough tp.

Location: 315 ft. S. of C. L., 25 ft. E.
Elevation: 695 ft.
Driller: R. Lather.
Completed: Feb. 16, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	253
Grey lime	273
Brown lime	320
Sharp lime	350
Sharp sand	357
Sandy lime	419
Oil sand	428

Oil at 320 and 419–28 ft.

Elgin County—Continued

E. L. ROTH—No. 34

F. Downie No. 4, lot 4, con. VI, Aldborough tp.

Location: 475 ft. N., 310 ft. W.
Elevation: 696+1 ft.
Driller: Demaray and Nichols.
Completed: Feb. 6, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	247
Brown lime	348
Sharp sand	390
Brown lime	418
Oil sand	429

Oil at 362 and 418–29 ft.
Fresh water at 223 ft.

E. L. ROTH—No. 35

F. Downie No. 5, lot 4, con. VI, Aldborough tp.

Location: 270 ft. N., 1,059 ft. E.
Elevation: 698 ft.
Driller: Demaray and Nichols.
Completed: Feb. 21, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	240
Buff lime	335
Cherty, sharp lime	394
Brown lime	401
Brown lime and sand	425

Oil at 410 and 417–25 ft.
Fresh water at 225 ft.

E. L. ROTH—No. 38

F. Downie No. 6, lot 2, gore, Aldborough tp.

Location: 175 ft. S., 925 ft. W.
Elevation: 695 ft.
Driller: S. Earl.
Completed: Apr. 14, 1952.
Result: producing oil well.

Formation	Depth ft.
Surface	238
Grey lime	280
Buff lime	345
Brown lime	355
Grey lime	395
Brown lime	405
Dark-brown lime	420
Sharp sand	422

Oil at 355 and 405–20 ft.
Fresh water at 210 ft.

E. L. ROTH—No. 40

F. Downie No. 7, lot 2, gore, Aldborough tp.

Location: 940 ft. S., 410 ft. W.
Elevation: 698 ft.
Driller: Demaray and Nichols.
Completed: May 5, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	267
Brown lime	350
Brown lime with chert	394
Brown lime	424
Oil sand	439

Oil at 424–39 ft.
Fresh water at 210 ft.

E. L. ROTH—No. 41

F. Downie No. 8, lot 2, gore, Aldborough tp.

Location: 35 ft. S., 650 ft. E.
Elevation: 694 ft.
Driller: S. Earl.
Completed: May 12, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	236
Grey lime	400
Brown lime	420
Grey lime	422

Oil at 310 and 407–20 ft.
Fresh water at 212 ft.

E. L. ROTH—No. 42

F. Downie No. 9, lot 4, con. VI, Aldborough tp.

Location: 450 ft. N., 770 ft. E.
Elevation: 696+1 ft.
Driller: Demaray and Nichols.
Completed: May 25, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	238
Brown lime	334
Sharp lime	386
Brown lime	412
Oil sand	425

Oil at 412–25 ft.
Fresh water at 235 ft.

E. L. ROTH—No. 43

F. Downie No. 10, lot 2, gore, Aldborough tp.

Location: 320 ft. S., 325 ft. E.
Elevation: 692+1 ft.
Driller: S. Earl.
Completed: June 8, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	230
Grey lime	390
Brown lime	405
Oil sand	423
Brown lime	432

Oil at 405–23 ft.
Fresh water at 212 ft.

E. L. ROTH—No. 44

F. Downie No. 11, lot 4, con. VI, Aldborough tp

Location: 475 ft. N., 330 ft. E.
Elevation: 696 ft.
Driller: Demaray and Nichols.
Completed: June 8, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	240
Brown lime	335
Sharp sand or chert	390
Brown lime	415
Oil sand	430

Oil at 415–30 ft.
Fresh water at 210 ft.

Elgin County—Continued

E. L. Roth—No. 45

F. Downie No. 12, lot 4, con. VI, Aldborough tp.

Location: 180 ft. N., 440 ft. E.
Elevation: 696 ft.
Driller: Demaray and Nichols.
Completed: June 23, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	236
Brown lime	332
Sharp sand or chert	385
Brown lime	409
Oil sand	428

Oil at 409–28 ft.
Fresh water at 230 ft.

E. L. Roth—No. 46

F. Downie No. 13, lot 2, gore, Aldborough tp.

Location: 705 ft. S., 405 ft. E.
Elevation: 692½+1 ft.
Driller: S. Earl.
Completed: June 30, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	235
Grey lime	350
Brown lime	360
Grey lime	405
Brown lime	420
Grey lime	425

Oil at 405–20 ft.
Fresh water at 175 ft.

E. L. Roth—No. 47

F. Downie No. 14, lot 5, con. VI, Aldborough tp.

Location: 405 ft. S. of C. L., 450 ft. E.
Elevation: 695+1 ft.
Driller: Demaray and Nichols.
Completed: July 14, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	255
Brown lime	340
Sharp sand	380
Brown lime	412
Oil sand	429

Oil at 412–29 ft.
Fresh water at 225 ft.; salt water at 347 ft.

E. L. Roth—No. 48

F. Downie No. 15, lot 1, gore, Aldborough tp.

Location: 655 ft. S., 45 ft. W.
Elevation: 693+1 ft.
Driller: S. Earl.
Completed: July 21, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	231
Grey lime	390
Brown lime	413
Grey lime	421
Brown lime	434

Oil at 347 and 401–13 ft.
Fresh water at 190 ft.

E. L. Roth—No. 49

F. Downie No. 16, lot 5, con. VI, Aldborough tp.

Location: 595 ft. S. of C. L., 250 ft. W. of C. L.
Elevation: 693+1 ft.
Driller: Demaray and Nichols.
Completed: Aug. 5, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	256
Brown lime	344
Sharp sand	375
Brown lime	415
Oil sand	430

Oil at 415–30 ft.
Fresh water at 230 ft.; sulphur water at 351 ft.

E. L. Roth—No. 50

F. Downie No. 17, lot 1, gore, Aldborough tp

Location: 405 ft. S., 330 ft. W.
Elevation: 692+1 ft.
Driller: S. Earl.
Completed: Aug. 17, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	225
Grey lime	391
Brown lime	412
Grey lime	417
Brown lime	428

Oil at 395–412 ft.
Fresh water at 200 ft.

E. L. Roth—No. 51

F. Downie No. 18, lot 1, gore, Aldborough tp.

Location: 915 ft. S., 360 ft. W.
Elevation: 692+1 ft.
Driller: Demaray and Nichols.
Completed: Aug. 24, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	233
Brown lime	330
Sharp sand or chert	374
Brown lime	398
Oil sand	427

Oil at 398–427 ft.
Fresh water at 170 ft.

E. L. Roth—No. 52

F. Downie No. 19, lot 1, gore, Aldborough tp.

Location: 948 ft. S., 977 ft. E.
Elevation: 693 ft.
Driller: Demaray and Nichols.
Completed: Sept. 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	231
Brown lime	327
Sharp sand or chert	364
Brown lime	395
Oil sand	420

Oil at 395–420 ft.
Fresh water at 160 ft.

Elgin County—Continued

E. L. ROTH—No. 53

F. Downie No. 20, lot 1, gore, Aldborough tp.

Location: 960 ft. S., 1,284 ft. E.
Elevation: 696+1 ft.
Driller: Demaray and Nichols.
Completed: Oct. 6, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	234
Brown lime	327
Sharp sand	364
Brown lime	395
Oil sand	420

Oil at 395–420 ft.
Fresh water at 170 ft.

E. L. ROTH—No. 54

F. Downie No. 21, lot 1, gore, Aldborough tp.

Location: 801 ft. S., 732 ft. E.
Elevation: 692+1 ft.
Driller: Demaray and Nichols.
Completed: Oct. 29, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	228
Brown lime	330
Sharp sand	371
Brown lime	395
Oil sand	420

Oil at 395–420 ft.
Fresh water at 160 ft.

E. L. ROTH—No. 55

F. Downie No. 22, lot 1, gore, Aldborough tp.

Location: 648 ft. S., 1,037 ft. E.
Elevation: 697+1 ft.
Driller: Demaray and Nichols.
Completed: Nov. 16, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	229
Brown lime	328
Sharp lime	365
Brown lime	394
Oil sand	420
Brown lime	430

Oil at 394–420 ft.
Fresh water at 190 ft.; brackish water at 250 ft.

E. L. ROTH—No. 57

F. Downie No. 23, lot 1, gore, Aldborough tp.

Location: 1,300 ft. S., 700 ft. W.
Elevation: 692+1 ft.
Driller: Demaray and Nichols.
Completed: Dec. 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	230
Brown lime	336
Sharp lime	368
Brown lime	394
Oil sand	418

Oil at 394–418 ft.
Fresh water at 155 ft.

E. L. ROTH—No. 36

F. Fleming estate No. 1, lot 4, con. VI, Aldborough tp.

Location: 296 ft. S. of C. L., 375 ft. W.
Elevation: 696 ft.
Driller: Demaray and Nichols.
Completed: Mar. 13, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	252
Buff lime	350
Chert and lime	360
Sharp, brown lime	425
Oil sand	432
Grey, sandy lime	435

Oil at 425–32 ft.
Sulphur water at 361 ft.; brackish water at 432 ft.

E. L. ROTH—No. 39

F. Fleming estate No. 2, lot 4, con. VI, Aldborough tp.

Location: 260 ft. S. of C. L., 645 ft. W.
Elevation: 645 ft.
Driller: Demaray and Nichols.
Completed: Apr. 21, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	255
Soap	262
Dark-grey lime	267
Brown lime	370
Lime and chert	400
Brown lime	443
Sandy, sharp lime	463
Brown lime	550

Show of gas at 515 ft.
Show of gas and oil at 440 ft.
Fresh water at 217 ft.; sulphur water at 446 ft.

E. L. ROTH—No. 32

C. Scott No. 1, lot 2, con. VI, Aldborough tp.

Location: 1,075 ft. N., 115 ft. W.
Elevation: 717 ft.
Driller: Demaray and Nichols.
Completed: Jan. 20, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	260
Middle lime	280
Lower soap	305
Grey and buff lime	486

Show of oil at 438 ft.
Fresh water at 230 ft.; sulphur water at 320, 340, 348, and 380 ft.

M. ROWE—No. 1

D. Leverington No. 1, lot 22, con. VII, Aldborough tp.

Location: 250 ft. S., 140 ft. W.
Elevation: 708+1 ft.
Driller: Demaray and Nichols.
Completed: Sept. 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	273
Soap and lime streaks	347
Brown lime	443
Lime and chert	483
Sand and lime	506
Water sand	511
Brown lime	518

Sulphur water at 510 ft.

Elgin County—Continued

UNION GAS CO. OF CANADA, LTD.—MOSALD NO. 52

J. Blain No. 4, lot 13, con. I, Aldborough tp.

Location: 1,585 ft. S., 272 ft. W.
Elevation: 683 ft.
Driller: Ehde and Meier.
Completed: Jan. 2, 1953.
Rock pressure: 507 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	209
Hamilton	340
Brown lime	490
Water sand	500
Brown lime	610
Sharp lime	890
Brown lime	940
Brown and blue lime and gypsum	960
Brown lime	970
Brown and blue lime and gypsum	1,000
Brown lime	1,010
Brown and blue lime and gypsum	1,110
Brown lime	1,170
Brown and blue lime and gypsum	1,200
Brown lime	1,250
Brown and blue lime and gypsum	1,360
Brown lime	1,414
Grey lime	1,450
Brown and grey lime and gypsum	1,462
Brown lime	1,498
Grey and brown lime	1,500

Gas at 1,462–74 ft.

UNION GAS CO OF CANADA, LTD.—MOSALD NO. 53

B. McPherson No. 1, lot Z, con. A, Aldborough tp.

Location: 1,580 ft. S., 100 ft. W.
Elevation: 688 ft.
Driller: Meier and Shaw.
Completed: Aug. 6, 1953.
Rock pressure: 746 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	175
Hamilton	365
Brown lime	680
Sharp lime	780
Brown lime	800
Brown and blue lime	890
Brown and blue lime and gypsum	980
Blue and brown lime	1,230
Salt and lime	1,300
Brown lime	1,354
Grey and brown lime	1,400
Brown lime and gypsum	1,406
Brown lime	1,425
Brown lime and gypsum	1,430

Gas at 1,410–22 ft.
Fresh water at 155 ft.; sulphur water at 510 ft.

WESTERN ASHLEY MINERALS, LTD.—NO. 14

A. Downey No. 1, lot 15, con. I, Aldborough tp.

Location: 360 ft. S., 500 ft. E.
Driller: G. Rawlings.
Completed: Feb. 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	171
Hamilton	357
Brown lime	512
Sharp, grey lime	536
Brown lime	665
Sharp lime	915
Brown lime	955
Brown lime and gypsum	1,014
Brown and blue lime	1,040
Blue lime and gypsum	1,110
Brown and grey lime	1,186
Lime and gypsum	1,198
Brown lime	1,251
Brown and grey lime and gypsum	1,273
Grey and brown lime	1,468
Brown lime and gypsum	1,475
Brown lime	1,550
Grey lime and gypsum	1,565
Brown lime	1,645

Fresh water at 100 ft.; sulphur water at 510 and 530 ft.; salt water at 1,640 ft.

WESTERN ASHLEY MINERALS, LTD.–PRAIRIE GAS AND OIL CO., LTD.–ANCHOR PETROLEUMS, LTD.

J. Bilton No. 1, lot 10, con. II, Aldborough tp.

Driller: A. Comfort.
Completed: June 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	227
Soap	315
Lime and shale	340
Soap	355
Buff lime	425
Brown lime	472
Sand	480

Show of oil at 425 ft.
Fresh water at 140 ft.; sulphur water at 472 ft.

UNION GAS CO. OF CANADA, LTD.—MOSALD NO. 55

J. Dymock No. 1, lot 1, con. B, broken front, Dunwich tp.

Location: 1,254 ft. N. of road, 410 ft. E.
Elevation: 688+2 ft.
Driller: Meier and Shaw.
Completed: Oct. 27, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	185
Hamilton	310
Brown lime	580
Sharp lime	770
Brown lime	860
Lime and gypsum	880
Blue and brown lime	970
Lime and gypsum	1,090
Blue and brown lime and shale	1,185
Salt and lime	1,315
Brown lime	1,333
Grey and brown lime	1,410
Lime and gypsum	1,420
Brown lime	1,453
Grey lime	1,478
Brown lime	1,482
Grey lime	1,514
Brown lime	1,532

Gas at 1,420–25 ft.
Show of oil at 1,425–29 ft.
Sulphur water at 440 ft.; salt water at 1,528 ft.

Elgin County—Continued

DOMINION NATURAL GAS CO., LTD.

H. Graham No. 1, lot 14, con. VI, Dunwich tp.

Location: 50 ft. N. of C. L., 50 ft. W.
Elevation: 753+2 ft.
Driller: Glenerd Drilling Co.
Completed: Dec. 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	345
Hamilton	377
Brown lime	690
Flint and sharp lime	867
Brown lime	970
Lime, shale and gypsum	1,050
Brown lime	1,130
Grey shale and gypsum	1,140
Brown lime	1,211
Shale and gypsum	1,285
Brown lime	1,332
Grey lime	1,363
Brown lime	1,408
Lime and gypsum	1,414
Brown lime	1,500

Black sulphur water at 418 and 825 ft.; salt water at 521–27 and 1,435 ft.

Haldimand County

H. L. EMERSON

N. Dolan No. 1, lot 7, con. II, Canborough tp.

Location: 250 ft. N. of tracks, 1,951 ft. W.
Driller: D. Werner.
Completed: Feb. 24, 1953.
Rock pressure: 200 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	97
Lime and shale	196
Niagara	417
Shale	477
Clinton	503
Red Medina	540
Grey shale	595
White Medina	610
Red shale	695

Gas at 479, 503, 531, and 600 ft.
Fresh water at 95 ft.; sulphur water at 110 ft.

A. DAUBARIS—No. 5

A. Daubaris No. 5, lot 22, con. IV, south of Dover Rd., Dunn tp

Location: 175 ft. S., 350 ft. E.
Driller: A. Daubaris.
Completed: Mar. 14, 1953.
Rock pressure: 200 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	42
Flint	65
Lime and shale	437
Niagara	665
Grey shale	725
Clinton	760
Red Medina	800
Shale	855
White Medina	870
Red shale	900

Gas at 869 ft.
Fresh water at 69 ft.; black water at 110 ft.

DELL-BURN GAS CO., LTD.

P. Bradford No. 3, lot 8, Sheehan tract, Dunn tp.

Location: 350 ft. N., 3,700 ft. E.
Driller: Knight and Neale.
Completed: Oct. 24, 1953.
Rock pressure: 310 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	99
Lime and shale	370
Niagara	600
Shale	654
Clinton	690
Red Medina	730
Grey shale	783
White Medina	799
Red shale	840

Gas at 657 and 788 ft.
Fresh water at 34 and 99 ft.; sulphur water at 100 and 200 ft.

DELL-BURN GAS CO., LTD.

E. Clark No. 3, lot 6, con. I, north of Dover Rd., Dunn tp.

Location: 1,350 ft. S., 675 ft. W.
Driller: Besley and Root.
Completed: May 5, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	54
Shale rock	69
Lime and shale	367
Niagara	596
Shale	658
Clinton	690
Red Medina	728
Shale	782
White Medina	799
Red shale	805

Gas at 665 ft.
Fresh water at 90 ft.; sulphur water at 120 ft.

DELL-BURN GAS CO., LTD.

S. Powell No. 2, lot 10, Sheehan tract, Dunn tp.

Location: 100 ft. N., 1,400 ft. E.
Driller: Besley and Root.
Completed: Jan. 6, 1953.
Rock pressure: 350 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	92
Brown lime	132
Lime and shale	390
Niagara	595
Blue shale	638
Clinton	670
Red Medina	710
Grey shale	767
White Medina	782
Red shale	824

Gas at 680–90 and 773–78 ft.
Sulphur water at 90 and 120 ft.; black water at 470 ft.

Haldimand County—Continued

DELL-BURN GAS CO., LTD.

S. Powell No. 3, lot 9, Lachine tract, Dunn tp.

Location: 100 ft. S. of Grand River, 1,300 ft. E. of road.
Driller: Knight and Neale.
Completed: Sept. 17, 1953.
Rock pressure: 350 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	97
Lime and shale	360
Niagara	596
Shale	650
Clinton	678
Red Medina	718
Grey shale	771
White Medina	788
Red shale	838

Gas at 653 and 755–82 ft.
Fresh water at 18 and 97 ft.; sulphur water at 101 and 190 ft.

DELL-BURN GAS CO., LTD.

S. Powell No. 4, lot 9, Sheehan tract, Dunn tp.

Location: 100 ft. N., 3,450 ft. E.
Driller: Knight and Neale.
Completed: Dec. 9, 1953.
Rock pressure: 325 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	94
Lime and shale	364
Niagara	593
Shale	648
Clinton	687
Red Medina	725
Grey shale	775
White Medina	793
Red shale	824

Gas at 661 and 784 ft.
Fresh water at 93 and 99 ft.; sulphur water at 141 and 270 ft.

DELL-BURN GAS CO., LTD.

G. Ramsey No. 6, lot 9, con. II, south of Dover Rd., Dunn tp.

Location: 1,350 ft. N., 600 ft. W.
Driller: Knight and Neale.
Completed: July 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	38
Flint	104
Lime and shale	424
Niagara	646
Shale	706
Clinton	738
Red Medina	778
Grey shale	830
White Medina	848
Red shale	850

Sulphur water at 38, 62, 106, and 426 ft.

DICK BROS.

Dick Bros. No. 1, lot 8, con. II, north of Dover Rd., Dunn tp.

Location: 470 ft. S. of railway, 350 ft. E.
Driller: H. Roth.
Completed: Jan. 23, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	51
Lime and shale	300
Niagara	510
Shale	580
Clinton	612
Red Medina	654
Shale	712
White Medina	724
Red shale	726

Show of gas at 586 ft.
Fresh water at 50 ft.; sulphur water at 135 ft.; black water at 395 ft.

DOMINION NATURAL GAS CO., LTD.

M. and G. Battye No. 3, lot 12, con. I, south of Dover Rd., Dunn tp.

Location: 1,400 ft. S., 1,350 ft. W.
Driller: T. McCutcheon.
Completed: Apr. 1, 1953.
Rock pressure: 150 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	21
Shell rock and flint	91
Lime and shale	390
Niagara	615
Shale	677
Clinton	710
Red Medina	750
Grey shale	797
White Medina	815
Red shale	917

Gas at 700–6 and 810–17 ft.
Fresh water at 40 ft.; sulphur water at 140 and 165 ft.; black sulphur water at 203 and black water at 515 ft.

DOMINION NATURAL GAS CO., LTD.

Can. Dept Veterans Affairs (G. King) No. 4, lot 17, con. IV, south of Dover Rd., Dunn tp.

Location: 530 ft. S., 325 ft. E.
Driller: Lymburner and Webber.
Completed: Dec. 29, 1953.
Rock pressure: 250 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	32
Flint	68
Lime and shale	452
Niagara	670
Shale	721
Clinton	748
Red Medina	792
Shale	851
White Medina	863
Red shale	967

Gas at 752 and 860 ft.
Sulphur water at 68 and 100 ft.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

A. Hicks No. 1, lot 2, Sheehan tract, Dunn tp.

Location: 350 ft. S., 1,950 ft. E.
Driller: W. Garringer.
Completed: Aug. 1, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	31
Flint	55
Lime and shale	420
Niagara lime	645
Shale	705
Clinton	735
Red Medina	775
Blue shale	830
White Medina	848
Red shale	849

Gas at 705–11 and 725–31 ft.
Black water at 50, 190, and 225 ft.

DOMINION NATURAL GAS CO., LTD.

K. Kapitan No. 4, lot 18, con. IV, south of Dover Rd., Dunn tp.

Location: 750 ft. S., 800 ft. W.
Driller: E. Shank.
Completed: Jan. 15, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	34
Flint	76
Lime and shale	443
Niagara	666
Shale	723
Clinton	755
Red Medina	803
Grey shale	853
White Medina	866
Red shale	868

Show of gas at 862–65 ft.
Fresh water at 55 ft.; sulphur water at 146 and 244 ft.

DOMINION NATURAL GAS CO., LTD.

H. King No. 2, lot 16, con. IV, south of Dover Rd., Dunn tp.

Location: 50 ft. S., 725 ft. W.
Driller: E. Shank.
Completed: Apr. 23, 1953.
Rock pressure: 330 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	35
Flint	78
Lime and shale	442
Niagara	663
Shale	724
Clinton	757
Red Medina	800
Grey shale	853
White Medina	863
Red shale	865

Gas at 734–51 ft.
Black water at 63 and 238 ft.

DOMINION NATURAL GAS CO., LTD.

W. King No. 4, lot 15, con. III, south of Dover Rd., Dunn tp.

Location: 650 ft. N., 1,320 ft. W.
Driller: E. Shank.
Completed: May 26, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	32
Flint	68
Lime and shale	444
Niagara	662
Shale	720
Clinton	753
Red Medina	795
Grey shale	850
White Medina	862
Red shale	864

Sulphur water at 49 and 147 ft.

DOMINION NATURAL GAS CO., LTD.

J. and A. Mazi No. 1, lot 10, Earl tract, Dunn tp.

Location: 50 ft. N., 50 ft. W.
Driller: W. Garringer.
Completed: Jan. 7, 1953.
Rock pressure: 215 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	36
Lime and shale	425
Niagara	650
Shale	705
Clinton	735
Red Medina	775
Blue shale	830
White Medina	845
Red shale	945

Gas at 838–40 ft.
Fresh water at 47 ft.; sulphur water at 80 and 185 ft.

DOMINION NATURAL GAS CO., LTD.

J. and A. Mazi No. 1, lot 11, Earl tract, Dunn tp.

Location 1,150 ft. N., 350 ft. W.
Driller: W. Garringer.
Completed: Mar. 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	35
Lime and shale	420
Niagara lime	645
Shale	699
Clinton	729
Red Medina	769
Blue shale	824
White Medina	836
Red shale	838

Gas at 711 ft.
Fresh water at 38 ft.; sulphur water at 190 ft.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

L. Murphy No. 1, lot 11, con. IV, south of Dover Rd., Dunn tp.

Location: 750 ft. S., 400 ft. E.
Driller: E. Shank.
Completed: July 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	16
Flint	56
Lime and shale	447
Niagara	663
Shale	723
Clinton	752
Red Medina	802
Grey shale	853
White Medina	865
Red shale	867

Gas at 748–52 ft.
Fresh water at 30 ft.; sulphur water at 134, 208, and 406 ft.

DOMINION NATURAL GAS CO., LTD.

F. Newman No. 1, lot 18, con. III, south of Dover Rd., Dunn tp.

Location: 1,100 ft. N., 400 ft. E.
Driller: E. Shank.
Completed: Feb. 25, 1953.
Rock pressure: 325 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	23
Flint	63
Lime and shale	438
Niagara	655
Shale	716
Clinton	749
Red Medina	796
Grey shale	849
White Medina	859
Red shale	862

Gas at 743–49 ft.
Fresh water at 45 ft.; sulphur water at 124 ft.

P. L. JACKSON

W. Hanna No. 1, lot 7, Earl tract, Dunn tp.

Location: 400 ft. N. of dead-end road, 75 ft. E.
Driller: P. Jackson.
Completed: Jan. 29, 1953.
Rock pressure: 140 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	19
Lime	31
Flint	49
Lime and gypsum	391
Niagara lime	615
Shale	683
Clinton	708
Red Medina	744
Grey shale	785
White Medina	793

Gas at 744–93 ft.
Fresh water at 89 ft.; black water at 264 ft.

P. L. JACKSON

G. Stadelmair No. 1, lot 7, Earl tract, Dunn tp.

Location: 1,017 ft. N. of road, 530 ft. W.
Driller: P. Jackson.
Completed: Apr. 20, 1953.
Rock pressure: 150 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	17
Flint	51
Lime and gypsum	400
Brown lime	432
Niagara	658
Shale	723
Clinton	756
Red Medina	796
Grey shale	853
White Medina	864
Red shale	907

Gas at 760–860 ft.
Black water at 69 and 141 ft.

P. L. JACKSON

G. Stadelmair No. 2, lot 9, Haldimand tract, Dunn tp.

Location: 380 ft. N., 320 ft. E.
Driller: P. Jackson.
Completed: Sept. 14, 1953.
Rock pressure: 150 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	23
Flint	62
Brown lime	111
Lime and gypsum	175
Lime	430
Niagara	676
Shale	727
Clinton	763
Red Medina	803
Grey shale	859
White Medina	874
Queenston	927

Gas at 763–874 ft.
Sulphur water at 71 ft.; black water at 138 ft.

S. MITCHELL—No. 4

S. Mitchell No. 4, lot 11, con. I, north of Dover Rd., Dunn tp.

Location: 300 ft. S., 355 ft. W.
Driller: Patterson and Culver.
Completed: Mar. 31, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Lime and shale	355
Niagara	575
Shale	627
Clinton	659
Red Medina	697
Shale	746
White Medina	769
Red shale	770

Gas at 658–60 ft.
Fresh water at 62 ft.; sulphur water at 160 ft.

Haldimand County—Continued

CLARK AND PHILLIPS

G. Phillips No. 1, lot 13, town of Dunnville.

Location: 650 ft. N., 185 ft. E.
Driller: Patterson and Culver.
Completed: July 17, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	82
Lime and shale	310
Niagara	538
Shale	595
Clinton	625
Red Medina	660
Shale	720
White Medina	745
Red shale	780

Gas at 597 and 641 ft.
Fresh water at 95 ft.; sulphur water at 120 and 430 ft.

LUNDY STEEL LTD.

Lundy Steel Ltd. No. 1, town of Dunnville, lot 3, range I. from Grand River.

Location: 300 ft. N. of railway, 450 ft. E.
Driller: Patterson and Culver.
Completed: Aug. 29, 1953.
Rock pressure: 110 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	79
Lime and shale	318
Niagara	538
Shale	600
Clinton	630
Red Medina	670
Shale	723
White Medina	743
Red shale	793

Gas at 733 ft.
Fresh water at 90 ft.; sulphur water at 125 ft.

PATTERSON AND CULVER

M. Billyard No. 2, lot 8, plan 140, town of Dunnville.

Location: 800 ft. S. of lot 1, con. I, from Canborough; 300 ft. W. of projection of George St.
Driller: Patterson and Culver.
Completed: June 20, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	83
Lime and shale	291
Niagara	510
Shale	571
Clinton	604
Red Medina	644
Shale	704
White Medina	714
Red shale	750

Gas at 758, 634, and 712 ft.
Fresh water at 85 ft.; sulphur water at 350 ft.

PATTERSON AND CULVER

W. Potts No. 1, lot 6, plan 1407, town of Dunnville.

Location: 100 ft. S., 350 ft. W.
Driller: Patterson and Culver.
Completed: Nov. 16, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	88
Lime and shale	285
Niagara	507
Shale	565
Clinton	597
Red Medina	635
Shale	688
White Medina	705
Red shale	748

Gas at 577, 612–17, and 700 ft.
Fresh water at 95 ft.; sulphur water at 457 ft.

DOMINION NATURAL GAS CO., LTD.

J. Bucsis No. 2, lot 7, con. III, fronting Lake Erie, Moulton tp.

Location: 1,300 ft. N., 450 ft. W.
Driller: Emerson and Rose.
Completed: Feb. 18, 1953.
Rock pressure: 210 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	137
Shale	385
Niagara	563
Shale	622
Clinton	654
Red Medina	700
Grey shale	743
White Medina	754
Red shale	854

Gas at 667 and 745–53 ft.
Fresh water at 133 and 136 ft.; black water at 240 ft.

DOMINION NATURAL GAS CO., LTD.

D. and M. Clark, No. 2, lot 12, con. III, fronting Lake Erie, Moulton tp.

Location: 1,200 ft. S., 300 ft. E.
Driller: Lymburner and Webber.
Completed: Aug. 24, 1953.
Rock pressure: 220 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	125
Lime and shale	355
Niagara	564
Shale	620
Clinton	656
Red Medina	703
Shale	751
White Medina	761
Red shale	861

Gas at 755–59 ft.
Fresh water at 124 ft.; sulphur water at 180 ft.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

E. Clark No. 2, lot 1, con. III, cross concession, Moulton tp.

Driller: H. Emerson.
Completed: Jan. 3, 1953.
Rock pressure: 236 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	125
Lime and shale	340
Niagara	560
Shale	607
Clinton	648
Red Medina	687
Shale	732
White Medina	744
Red shale	844

Gas at 632 and 737–40 ft.
Sulphur water at 125 and 137 ft.

DOMINION NATURAL GAS CO., LTD.

J. and F. Clark No. 1, lot 11, con. III, fronting Lake Erie, Moulton tp.

Location: 1,000 ft. S., 350 ft. W.
Driller: Lymburner and Webber.
Completed: Oct. 15, 1953.
Rock pressure: 170 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	113
Lime and shale	343
Niagara	565
Shale	613
Clinton	648
Red Medina	693
Shale	740
White Medina	752
Red shale	807

Gas at 617 and 742–52 ft.
Fresh water at 110 ft.; sulphur water at 200 ft.

DOMINION NATURAL GAS CO., LTD.

Can. Dept. Veterans Affairs No. 3, lot 1, con. IV, cross concession, Moulton tp.

Location: 50 ft. S. of C. L., 700 ft. W.
Driller: H. Emerson.
Completed: Mar. 2, 1953.
Rock pressure: 200 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	117
Lime and shale	335
Niagara	550
Shale	610
Clinton	642
Red Medina	682
Shale	735
White Medina	747
Red shale	847

Gas at 615 and 739–43 ft.
Sulphur water at 117 and 137 ft.

DOMINION NATURAL GAS CO., LTD.

S. Elkow No. 1, lot 16, con. III, fronting Lake Erie, Moulton tp.

Location: 250 ft. S., 350 ft. E.
Driller: H. Emerson.
Completed: Apr. 25, 1953.
Rock pressure: 275 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	122
Lime, shale and gypsum	355
Niagara	575
Shale	636
Clinton	658
Red Medina	711
Shale	761
White Medina	771
Red shale	871

Gas at 639 and 761–66 ft.
Sulphur water at 122 and 148 ft.

DOMINION NATURAL GAS CO., LTD.

G. Ireland No. 2, lot 14, con. III, fronting Lake Erie, Moulton tp.

Location: 950 ft. S., 1,450 ft. E.
Driller: H. Emerson.
Completed: Aug. 19, 1953.
Rock pressure: 220 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	116
Lime, shale and gypsum	345
Niagara	575
Shale	634
Clinton	669
Red Medina	710
Shale	759
White Medina	770
Red Shale	870

Gas at 637 and 760–67 ft.
Sulphur water at 116 and 138 ft.

DOMINION NATURAL GAS CO., LTD.

M. MacMillan No. 1, lot 17, con. II, fronting Lake Erie, Moulton tp.

Location: 300 ft. S., 350 ft. E. of C. L.
Driller: Lymburner and Webber.
Completed: Mar. 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	120
Lime and shale	365
Niagara	585
Shale	637
Clinton	668
Red Medina	714
Shale	769
White Medina	781
Red shale	784

Fresh water at 112 ft.; sulphur water at 150 ft.

Haldimand County—Continued

DOMINION NATURAL GAS CO., LTD.

M. MacMillan No. 2, lot 16, con. II, fronting Lake Erie, Moulton tp.

Location: 2,400 ft. S., 350 ft. W.
Driller: Lymburner and Webber.
Completed: June 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	133
Lime and shale	370
Niagara	593
Shale	649
Clinton	679
Red Medina	727
Shale	777
White Medina	789
Red shale	792

Fresh water at 122 ft.; sulphur water at 210 ft.

DOMINION NATURAL GAS CO., LTD.

L. Pew No. 2, lot 3, con. I, fronting Lake Erie, Moulton tp.

Location: 350 ft. N., 50 ft. E.
Driller: Emerson and Rose.
Completed: June 13, 1953.
Rock pressure: 149 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	151
Shale	405
Niagara	617
Shale	698
Clinton	730
Red Medina	771
Grey shale	815
White Medina	824
Red shale	826

Gas at 744–49 ft.
Sulphur water at 98 and 162 ft.

DOMINION NATURAL GAS CO., LTD.

H. Rittenhouse No. 1, lot 16, con. III, fronting Lake Erie, Moulton tp.

Location: 50 ft. S. of C. L., 100 ft. E.
Driller: H. Emerson.
Completed: June 11, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	128
Lime, shale and gypsum	353
Niagara	575
Shale	638
Clinton	663
Red Medina	713
Shale	763
White Medina	775
Red shale	776

Fresh water at 125 ft.; sulphur water at 140 ft.

DOMINION NATURAL GAS CO., LTD.

H. Rittenhouse No. 2, lot 15, con. III, fronting Lake Erie, Moulton tp.

Location: 800 ft. S., 425 ft. E. of C. L.
Driller: H. Emerson.
Completed: Oct. 3, 1953.
Rock pressure: 290 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	120
Lime, shale, and gypsum	355
Niagara	575
Shale	631
Clinton	667
Red Medina	712
Shale	760
White Medina	771
Red shale	876

Gas at 63 and 760–63 ft.
Sulphur water at 120 and 140 ft.

DOMINION NATURAL GAS CO., LTD.

A. Rittenhouse No. 3, lot 13, con. III, fronting Lake Erie, Moulton tp.

Location: 1,450 ft. S., 50 ft. E.
Driller: H. Emerson.
Completed: Nov. 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	115
Lime, shale, and gypsum	345
Niagara	577
Shale	628
Clinton	662
Red Medina	705
Shale	756
White Medina	766
Red shale	767

Sulphur water at 115 and 130 ft.

GRAND VIEW LODGE

Grand View Lodge No. 3, lot 3, Indian reserve, Moulton tp.

Location: 700 ft. S. of railway; 575 ft. W. of West St.
Driller: Patterson and Culver.
Completed: Feb. 3, 1953.
Rock pressure: 205 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	62
Lime and shale	305
Niagara	530
Shale	586
Clinton	618
Red Medina	655
Shale	712
White Medina	730
Red shale	780

Gas at 640 and 724 ft.
Fresh water at 64 ft.; sulphur water at 140 ft.

Haldimand County—Continued

LINCOLN NATURAL GAS CO., LTD.

T. Miller No. 4, lot 21, con. II, Moulton tp.

Location: 350 ft. N. of creek, 1,000 ft. E. of Diltz Rd.
Driller: Patterson and Culver.
Completed: Mar. 20, 1953.
Rock pressure: 125 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	71
Lime and shale	150
Niagara	380
Shale	425
Clinton	455
Red Medina	490
Shale	540
White Medina	555
Red Shale	590

Gas at 426, 475, and 550 ft.
Fresh water at 70 and 75 ft.; sulphur water at 125 ft.

PATTERSON AND CULVER

M. Valley No. 1, lot 1, con. I, Moulton tp.

Location: 75 ft. N., 1,600 ft. E.
Driller: Patterson and Culver.
Completed: Oct. 12, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	86
Lime and shale	283
Niagara	505
Shale	564
Clinton	596
Red Medina	636
Shale	690
White Medina	705
Red shale	755

Gas at 570 and 700 ft.
Fresh water at 95 ft.; sulphur water at 120 ft.

SMITH AND EHDE

J. and S. Sullivan estate No. 1, lot 3, con. IV, cross concession, Moulton tp.

Location: 350 ft. S., 350 ft. E.
Driller: E. Ricker.
Completed: Mar. 8, 1953.
Rock pressure: 190 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	135
Lime and shale	335
Niagara	542
Guelph lime	567
Shale	604
Clinton	638
Red Medina	680
Grey shale	742
White Medina	750
Red shale	831

Gas at 609, 614, 629, 652, 658, and 747 ft.
Fresh water at 105, 138, and 166 ft.; sulphur water at 261 ft.; black water at 405 ft.

SMITH AND EHDE

J. and S. Sullivan estate No. 2, lot 3, con. IV, cross concession, Moulton tp.

Location: 360 ft. N., 1,325 ft. E.
Driller: E. Ricker.
Completed: Sept. 25, 1953.
Rock pressure: 200 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	124
Lime and shale	335
Niagara	555
Guelph lime	575
Shale	613
Clinton	645
Red Medina	687
Grey shale	740
White Medina	754
Red shale	829

Gas at 617 and 742 ft.
Fresh water at 132 ft.; sulphur water at 255 ft.; black water at 401 ft.

PETROL OIL AND GAS CO., LTD.—No. 152

J. Longboat and associates No. 4, lot 5, con. IV, Oneida tp.

Location: 1,600 ft. S., 25 ft. E.
Driller: Patterson and Culver.
Completed: Oct. 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	50
Lime and shale	250
Niagara	480
Shale	532
Clinton	570
Red Medina	585
Shale	640
White Medina	658
Red shale	660

Show of gas at 535 ft.
Fresh water at 53 ft.; sulphur water at 120 ft.

PETROL OIL AND GAS CO., LTD.—No. 153

J. Longboat and associates, lot 5, con. IV, Oneida tp.

Location: 700 ft. N., 200 ft. W.
Driller: Patterson and Culver.
Completed: Nov. 6, 1953.
Rock pressure: 290 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	40
Broken rock	44
Lime and shale	232
Niagara	460
Shale	515
Clinton	553
Red Medina	568
Shale	623
White Medina	638
Red shale	640

Gas at 516 and 545 ft.
Fresh water at 60 ft.; sulphur water at 110 ft.

Haldimand County—Continued

PETROL OIL AND GAS CO., LTD.—No. 154

E. Powless No. 1, lot 4, con. IV, Oneida tp.

Location: 840 ft. S., 600 ft. W.
Driller: Patterson and Culver.
Completed: Dec. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	35
Broken rock	45
Lime and shale	255
Niagara	490
Shale	540
Clinton	578
Red Medina	598
Shale	648
White Medina	668
Red shale	670

Show of gas at 543 ft.
Sulphur water at 135 ft.

HALDIMAND GAS SYNDICATE

R. Overholt No. 1, lot 12, con. IV, Rainham tp.

Location: 1,600 ft. N., 60 ft. W.
Driller: A. E. Hoover estate.
Completed: Oct. 30, 1953.
Rock pressure: 230 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	12
Flint	88
Lime and shale	455
Niagara	692
Shale	739
Clinton	764
Red Medina	804
Grey shale	869
White Medina	881
Red shale	884

Gas at 742 ft.
Fresh water at 42 ft.

HALDIMAND GAS SYNDICATE

C. Schweyer No. 2, lot 14, con. IV, Rainham tp.

Location: 1,800 ft. S., 800 ft. E.
Driller: A. E. Hoover estate.
Completed: Sept. 26, 1953.
Rock pressure: 260 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	12
Flint	95
Lime and shale	458
Niagara	675
Shale	738
Clinton	763
Red Medina	811
Grey shale	867
White Medina	878
Red shale	882

Gas at 793 ft.
Fresh water at 27 and 39 ft.; sulphur water at 190 ft.

L. B. MEHLENBACHER GAS SYNDICATE

E. Bacher No. 1, lot 5, con. VII, Rainham tp.

Location: 50 ft. S., 900 ft. W.
Driller: E. Culver.
Completed: May 23, 1953.
Rock pressure: 300 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	11
Flint	81
Lime and shale	435
Niagara	680
Shale	736
Clinton	764
Red Medina	804
Grey shale	856
White Medina	871
Red shale	872

Gas at 753 ft.
Fresh water at 38 ft.; sulphur water at 230 ft.

L. B. MEHLENBACHER GAS SYNDICATE

H. Ebert No. 2, lot 5, con. VII, Rainham tp.

Location: 1,000 ft. N., 900 ft. W.
Driller: M. Culver and Son.
Completed: July 20, 1953.
Rock pressure: 320 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	18
Flint	83
Lime and shale	433
Niagara	668
Shale	728
Clinton	753
Red Medina	793
Grey shale	848
White Medina	863
Red shale	864

Gas at 740 and 763 ft.
Fresh water at 32 ft.

L. B. MEHLENBACHER GAS SYNDICATE

E. Schweyer No. 1, lot 6, con. VII, Rainham tp.

Location: 40 ft. N. of C. L., 700 ft. W.
Driller: M. Culver and Son.
Completed: Mar. 16, 1953.
Rock pressure: 300 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	10
Flint	80
Lime and shale	445
Niagara	680
Shale	738
Clinton	763
Red Medina	801
Grey shale	851
White Medina	863
Red shale	866

Gas at 758 and 768 ft.
Fresh water at 38 ft.; sulphur water at 280 ft.

Haldimand County—Continued

ANSON TOMLINSON

A. Tomlinson No. 3, lot 10, con. IV, Seneca tp.

Location: 350 ft. N., 660 ft. W.
Driller: Patterson and Culver.
Completed: May 28, 1953.
Rock pressure: 50 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	60
Broken rock	68
Lime and shale	120
Niagara	340
Shale	383
Clinton	413
Red Medina	445
Shale	500
White Medina	525
Red shale	560

Gas at 388 and 520 ft.
Fresh water at 70 ft.; sulphur water at 130 ft.

DOMINION NATURAL GAS CO., LTD.

E. Henry No. 1, lot 18, con. II, Sherbrooke tp.

Location: 300 ft. S., 350 ft. E.
Driller: Emerson and Rose.
Completed: Apr. 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	32
Shale	395
Niagara	623
Shale	707
Clinton	738
Red Medina	793
Grey shale	830
White Medina	846

Fresh water at 34 ft.; sulphur water at 120 ft.; black water at 290 ft.

ELMOND NIECE

E. Niece No. 5, lot 12, con. II, Sherbrooke tp.

Location: 615 ft. S., 425 ft. W.
Driller: Patterson and Culver.
Completed: Aug. 10, 1953.
Rock pressure: 170 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	60
Lime and shale	442
Niagara	662
Shale	725
Clinton	758
Red Medina	805
Shale	855
White Medina	870
Red shale	885

Gas at 732, 822, and 865 ft.
Fresh water at 60 ft.; sulphur water at 205 ft.

HALDIMAND GAS SYNDICATE

W. Asher No. 4, lot 9, con. IV, South Cayuga tp.

Location: 900 ft. N., 400 ft. E.
Driller: M. Culver and Son.
Completed: Dec. 22, 1953.
Rock pressure: 270 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	57
Lime and shale	338
Niagara	538
Guelph lime	568
Shale	625
Clinton	655
Red Medina	695
Grey shale	747
White Medina	757
Red shale	761

Gas at 650, 660, and 680 ft.
Fresh water at 60 ft.; sulphur water at 195 ft.

HALDIMAND GAS SYNDICATE

G. Pridmore No. 3, lot 10, con. IV, South Cayuga tp.

Location: 400 ft., N., 400 ft. W.
Driller: M. Culver and Son
Completed: Oct. 31, 1953.
Rock pressure: 270 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	57
Lime and shale	305
Niagara	505
Guelph lime	535
Shale	593
Clinton	623
Red Medina	663
Grey shale	721
White Medina	731
Red shale	732

Gas at 628 and 635 ft.
Fresh water at 57 ft.; sulphur water at 105 ft.

GORDON A. DENNIS AND SONS.

C. De Boer No. 3, lot 16, con. VI, Walpole tp.

Location: 60 ft. N., 100 ft. E.
Driller: G. A. Dennis and Sons.
Completed: Sept. 18, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	6½
Flint	103
Brown lime and shale	456
Niagara	712
Shale	789
Clinton	815
Red Medina	857
Grey shale	920
White Medina	925
Red shale	933

Black sulphur water at 72 ft.

Haldimand County—Continued

GORDON A. DENNIS AND SONS

C. Gee No. 1, lot 15, con. VI, Walpole tp.

Location: 45 ft. N., 375 ft. E. of C. L.
Driller: G. A. Dennis and Sons.
Completed: Aug. 13, 1953.
Rock pressure: 305 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	8
Flint	101
Brown lime and shale	470
Niagara lime	731
Shale	813
Clinton	840
Red Medina	886
Grey shale	894

Gas at 840, 845, abd 849 ft.
Fresh water at 24 and 33 ft.; black sulphur water at 92 ft.

G. GREEN

G. Green No. 1, lot 15, con. XIII, Walpole tp.

Location: 510 ft. NW. of Mud St., 170 ft. NE. of New St.
Driller: T. Donald.
Completed: June, 1953.
Rock pressure: 400 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	11
Flint	71
Lime and shale	425
Niagara	684
Blue shale	711
Clinton	756
Red Medina	786
Grey shale	838
White Medina	850
Red shale	852

Gas at 731 ft.
Fresh water at 75 ft.; black water at 270 ft.

L. B. MEHLENBACHER GAS SYNDICATE

T. Munroe No. 2, lot 11, con. XIII, Walpole tp.

Location: 350 ft. S., 100 ft. W
Driller: T. Donald.
Completed: Oct. 7, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	19
Flint	80
Lime and shale	425
Niagara	682
Shale	717
Clinton	752
Red Medina	782
Grey shale	830
White Medina	842
Red shale	844

Show of gas at 722 ft.
Fresh water at 90 ft.; black water at 280 ft.

F. W. REICHELD

H. Bundy No. 1, lot 4, con. V, Walpole tp.

Location: 1,450 ft. S., 150 ft. W.
Driller: F. Reicheld.
Completed. July 11, 1953
Rock pressure: 410 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	42
Flint	140
Lime and shale	525
Niagara	785
Shale	835
Clinton	875
Red Medina	905
Shale	955
White Medina	965
Red shale	970

Gas at 840 and 863 ft.
Sulphur water at 68 ft.; black water at 115 ft.

F. W. REICHELD

H. Bundy No. 2, lot 4, con. V, Walpole tp.

Location: 50 ft. N., 450 ft. E.
Driller: F. Reicheld.
Completed: Nov. 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Flint	160
Lime and shale	525
Niagara	800
Shale	850
Clinton	878
Red Medina	918

Fresh water at 65 and 130 ft.

F. W. REICHELD

F. Reicheld No. 2, lot 8, con. V, Walpole tp.

Location: 1,930 ft. S., 30 ft. E.
Driller: F. Reicheld.
Completed: Mar. 16, 1953.
Rock pressure: 400 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	25
Flint	120
Lime and shale	495
Niagara	760
Shale	810
Clinton	840
Red Medina	880
Shale	895

Gas at 825 and 840 ft.
Fresh water at 35 ft.; sulphur water at 55 ft.; black water at 90 ft.

Haldimand County—Continued

STANDARD GAS AND OIL SYNDICATE

O. Erwin No. 3, lot 15, con. I, Walpole tp.

Location: 1,350 ft. S. of C. L., 420 ft. W.
Driller: G. Schweyer.
Completed: Jan. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	52
Flint	152
Lime and shale	525
Niagara	745
Lime	791
Shale	850
Clinton	878
Red Medina	918
Blue shale	983
White Medina	991
Red shale	996

Fresh water at 50 ft.; black water at 59 and 70 ft.; salt water at 520 ft.

WALPOLE GAS SYNDICATE

G. Risdil No. 2, lot 5, con. XIII, Walpole tp.

Location: 1,200 ft. S., 900 ft. E.
Driller: T. Donald.
Completed: Dec. 31, 1953.
Rock pressure: 230 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	4
Flint	64
Lime and shale	445
Niagara	707
Shale	742
Clinton	777
Red Medina	817
Grey shale	837

Gas at 761 ft.
Fresh water at 80 ft.; black water at 210 ft

Huron County

IMPERIAL OIL, LTD.—No. 378

H. Hill No. 1, lot 9, con. II, eastern division, Colborne tp.

Location: 700 ft. N., 500 ft. E.
Elevation: 947+2 ft.
Driller: R. McPherson.
Completed: May 12, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	155
Brown lime	350
Grey lime	395
Brown lime	449
Grey lime and gypsum	510
Brown lime	530
Sharp sand and brown lime	783
Grey and brown lime	930
Blue and brown shale	1,172
Blue shale and salt	1,182
Blue shale	1,268
Blue shale and salt	1,335
Salt	1,564
Brown lime	1,614
Blue shale	1,710
Blue shale and salt	1,730
Salt	1,770
Brown lime and gypsum	1,795
Brown lime	1,876
Grey lime	1,885
Brown lime	1,900
Grey lime	1,980
Red and blue shale	2,000
Blue shale	2,050

Fresh water at 200 ft.

IMPERIAL OIL, LTD.—No. 412

R. McCabe No. 1, lot 6, con. IV, western division, Colborne tp.

Location: 1,500 ft. S., 600 ft. E.
Elevation: 828+2 ft.
Driller: R. McPherson.
Completed: Oct. 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	125
Brown and grey lime	522
Sharp sand	752
Grey lime	913
Brown and blue lime and blue shale	1,074
Shale and salt	1,084
Blue shale and brown and blue lime	1,180
Lime and salt	1,220
Red and blue shale	1,240
Blue shale	1,298
Brown lime and salt	1,358
Salt	1,575
Brown lime	1,632
Blue and grey shale and brown and grey lime	1,795
Dark brown lime	1,827
Black shaly lime	1,887
Gypsum	1,895
Grey and brown lime	1,922
Grey lime	2,020
Black shale	2,030

Fresh water at 150 ft.

IMPERIAL OIL, LTD.—No. 397

I. McCullagh No. 1, lot 38, con. IX, Goderich tp.

Location: 100 ft. N., 800 ft. W.
Elevation: 921 ft.
Driller: R. McPherson.
Completed: Aug. 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	215
Brown and grey lime	675
Sharp lime, grey and brown lime	950
Grey and brown lime	1,132
Grey and shaly brown lime	1,180
Blue and brown shale and brown lime	1,365
Blue and brown lime	1,450
Blue shale	1,500
Brown lime	1,646
Brown lime and gypsum	1,651
Brown lime	1,695
Blue and grey lime	2,105
Red shale	2.110

Fresh water at 240 ft.

Huron County—Continued

IMPERIAL OIL, LTD.—No. 368

H. Murch No. 1, lot 37, con. X, Goderich tp.

Location: 50 ft. N., 700 ft. E.
Elevation: 906 ft.
Driller: R. McPherson.
Completed: Mar. 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	213
Brown lime	650
Sharp lime	875
Blue shale	905
Brown lime	1,015
Grey lime	1,055
Brown lime	1,098
Blue and grey shale	1,143
Brown lime	1,157
Blue shale	1,297
Grey lime	1,302
Blue shale	1,353
Brown lime	1,371
Blue shale	1,400
Brown lime	1,450
Blue shale	1,550
Brown lime	1,585
Salt	1,615
Brown lime	1,663
Grey and brown lime	1,785
Brown lime and gypsum	1,800
Brown lime	1,825
Blue and brown lime	1,874
Dark-brown lime	1,897
Brown and grey lime	1,919
Brown lime	1,949
Lime and gypsum	1,959
Brown lime	1,983
Grey lime	2,006
Brown lime	2,058
Red and green shale	2,064

Fresh water at 97 and 240–54 ft.

IMPERIAL OIL, LTD.—No. 380

D. Farquhar No. 1, lot 27, con. V, Hullett tp.

Location: 1,600 ft. N., 100 ft. E.
Elevation: 959 ft.
Driller: R. McPherson.
Completed: May 23, 1953.
Result: abandoned well.

Formation	Depth ft.
Surface	111
Brown lime	527
Sharp, brown and grey lime	745
Brown and grey lime	880
Blue shale and brown lime	1,210
Brown lime and salt	1,274
Lime shells	1,284
Salt	1,439
Brown lime	1,543
Grey lime	1,573
Lime shells and salt	1,583
Salt	1,609
Brown lime and gypsum	1,628
Brown lime	1,656
Grey lime	1,740
Grey lime and gypsum	1,753
Brown lime	1,858
Red shale	1,861

Gas at 1,756–58 and 1,764–70 ft.
Fresh water at 122, 180, and 855 ft.

IMPERIAL OIL, LTD.—No. 409

W. Blacker No. 1, lot 28, con. V, Hullett tp.

Location: 300 ft. S., 970 ft. W.
Elevation: 945+2 ft.
Driller: R. McPherson.
Completed: Oct. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	99
Brown and grey lime	544
Sharp, grey and brown lime	731
Brown lime	855
Blue shale and brown lime	1,200
Salt	1,220
Brown lime	1,260
Salt	1,430
Brown and grey lime	1,550
Salt	1,592
Brown lime	1,723
Brown lime and gypsum	1,744
Brown lime	1,844
Grey shale	1,845

Gas at 1,744 ft.
Fresh water at 99 and 182 ft.

IMPERIAL OIL, LTD.—No. 396

D. Farquhar No. 2, lot 26, con. V, Hullett tp.

Location: 500 ft. S., 375 ft. E.
Elevation: 971 ft.
Driller: R. McPherson.
Completed: Aug. 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	98
Brown and grey lime	547
Sharp, brown and grey lime	740
Brown lime	886
Brown and blue lime and gypsum	907
Brown and blue lime	1,195
Lime and salt	1,438
Brown lime	1,454
Brown lime and gypsum	1,462
Grey shale	1,565
Lime and salt	1,590
Brown lime and gypsum	1,600
Brown lime	1,715
Brown lime and gypsum	1,737
Brown lime	1,769
Grey lime	1,805
Brown and grey lime	1,839
Grey lime and red shale	1,850

Gas at 1,751 ft.
Fresh water at 137 and 266–70 ft.

Huron County—Continued

IMPERIAL OIL, LTD.—No. 400

A. Gloor No. 1, lot 15, con. I, Hullett tp.

Location: 1,500 ft. S., 100 ft. E.
Elevation: 935 ft.
Driller: R. McPherson.
Completed: Sept. 7, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	84
Brown lime	536
Brown lime and sharp lime	693
Brown lime	825
Blue and brown lime	1,202
Blue shale and salt	1,313
Lime and salt	1,367
Salt	1,400
Brown lime	1,466
Grey lime	1,529
Lime and salt	1,550
Brown lime	1,567
Grey lime	1,677
Brown lime	1,793
Red shale	1,798

Fresh water at 84 and 255 ft.

IMPERIAL OIL, LTD.—No. 389

R. and E. Procter No. 1, lot 7, con. V, Morris tp.

Location: 2,000 ft. S., 200 ft. W.
Elevation: 1,107+2 ft.
Driller: R. McPherson.
Completed: June 20, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	55
Brown lime	290
Grey lime	343
Brown lime	395
Sharp lime	560
Grey and brown lime	696
Blue shale and brown lime	890
Brown lime	955
Blue and red shale	975
Salt	1,040
Blue shale	1,160
Brown lime	1,268
Grey lime	1,281
Brown lime	1,295
Water sand	1,300
Brown lime	1,335
Blue lime	1,370
Black shale	1,403
Grey lime	1,423
Brown lime	1,452
Grey and brown lime	1,535
Blue shale	1,541

Fresh water at 55 ft.; sulphur water at 1,300 ft.; salt water at 1,430 ft.

IMPERIAL OIL, LTD.—No. 369

E. Jamieson No. 1, lot 28, con. X, Hullett tp.

Location: 1,500 ft. S., 700 ft. E.
Elevation: 966 ft.
Driller: R. McPherson.
Completed: Mar. 26, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	76
Brown lime	432
Grey lime	449
Brown lime	470
Sharp lime	707
Brown lime	841
Blue shale and gypsum	883
Blue and brown lime	1,020
Brown lime	1,068
Blue shale	1,144
Blue shale and brown lime	1,166
Lime and salt	1,379
Brown lime	1,505
Lime and salt	1,538
Salt and gypsum	1,542
Brown lime	1,552
Grey lime	1,639
Brown lime	1,664
Grey lime	1,678
Brown lime	1,710
Grey lime	1,801
Red shale	1,803

Fresh water at 20, 100, 160, 368, 386, 752, 760, 768, 808, and 819 ft.

IMPERIAL OIL, LTD.—No. 390

K. and E. Webster No. 1, lot 1, con. IX, Morris tp.

Location: 900 ft. S., 300 ft. E.
Elevation: 1,129+2 ft.
Driller: R. McPherson.
Completed: July 11, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	133
Brown, and grey lime	545
Sharp lime	705
Brown lime	842
Blue shale	915
Blue and brown lime	1,187
Salt	1,370
Brown lime	1,430
Grey and brown lime	1,526
Grey lime	1,554
Brown lime	1,586
Dark-brown lime	1,646
Grey lime	1,654
Brown lime	1,700
Grey lime	1,725
Brown lime	1,778
Red shale	1,780

Fresh water at 98 and 148 ft.

Huron County—Continued

IMPERIAL OIL, LTD.—No. 385

B. Ruddock No. 1, lot 17, con. II, West Wawanosh tp.

Location: 1,500 ft. S., 390 ft. W.
Elevation: 872+2 ft.
Driller: R. McPherson.
Completed: June 20, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	108
Brown lime	505
Sharp, brown and grey lime	737
Brown lime	850
Brown and blue lime and blue and grey shale	1,120
Lime and salt	1,150
Red and blue shale	1,237
Lime and salt	1,475
Brown lime	1,540
Blue shale	1,586
Brown and blue lime	1,609
Lime and salt	1,665
Brown lime	1,706
Grey lime	1,760
Black lime	1,800
Brown lime	1,842
Grey and brown lime	1,864
Brown lime	1,883
Brown and grey lime	1,904
Brown lime	1,931
Brown and red shale	1,937

Fresh water at 224 ft.

IMPERIAL OIL, LTD.

M. and V. Bokar No. 2, lot 16, con. II, Lake Erie survey, Harwich tp.

Location: 600 ft. S., 800 ft. W.
Driller: English and Mullin.
Completed: July 29, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	131
Black shale	193
Hamilton	413
Brown lime	730
Sharp lime	1,038
Brown lime	1,185
Blue and brown shale	1,260
Brown and blue lime	1,533
Brown lime and gypsum	1,539
Brown lime	1,591
Brown and grey lime	1,615
Brown lime and gypsum	1,630
Brown lime	1,779
Grey lime	1,789

Fresh water at 85 ft.; sulphu water at 659 ft.; salt water at 1,779 ft.

Kent County

UNION GAS CO. OF CANADA, LTD.

F. Wynd No. 1, lot 18, con. III, Chatham gore, Chatham tp.

Location: 900 ft. S., 75 ft. E.
Driller: W. Kiser and Son.
Completed: July 31, 1953.
Rock pressure: 771 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	67
Brown shale	390
Hamilton	628
Brown lime	775
Brown lime and gypsum	785
Brown lime	1,010
Sharp lime	1,150
Brown lime	1,270
Blue and grey lime and gypsum	1,380
Brown, blue, and grey lime	1,622
Brown lime	1,684
Grey, brown, and blue lime	1,764
Brown lime	1,865
Brown and grey lime	1,889
Brown lime	1,928

Gas at 1,764–85 and 1,800–8 ft.
Sulphur water at 740 ft.; salt water at 1,628 and 1,665 ft.

IMPERIAL OIL, LTD.

F. Nedeau No. 1, lot 16, con. IV, River Thames survey, Harwich tp.

Location: 1,800 ft. S, 900 ft. E.
Driller: English and Mullin.
Completed: Apr. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	65
Black shale	170
Hamilton	390
Brown lime	500
Grey lime	539
Brown lime	575
Grey lime	622
Sharp, brown lime	914
Brown lime	1,017
Shale and lime	1,041
Brown and blue lime and gypsum	1,082
Blue shale and gypsum	1,183
Brown lime	1,333
Blue shale	1,354
Brown and blue lime	1,407
Brown lime and salt	1,550
Brown lime and gypsum	1,565
Brown lime	1,666
Lime and gypsum	1,672
Brown lime	1,734
Blue and brown lime	1,742
Blue lime and gypsum	1,750
Brown and blue lime	1,765
Brown lime	1,903
Brown and grey lime	1,930
Brown lime	1,945
Grey lime	1,975
Blue shale, Rochester	1,982

Fresh water at 50 ft.; sulphur water at 507 ft.

Kent County—Continued

IMPERIAL OIL, LTD.

M. O'Brien No. 1, lot 15, con. II, Lake Erie survey, Harwich tp.

Location: 400 ft. S., 915 ft. W.
Driller: R. McPherson.
Completed: Oct. 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	138
Brown and blue shale	193
Hamilton	428
Brown lime	668
Sharp, brown and grey lime	922
Brown lime	1,081
Brown and blue lime	1,411
Salt and lime	1,545
Brown lime	1,821

Show of gas at 470 ft.
Fresh water at 138 ft.; sulphur water at 472 ft.

IMPERIAL OIL, LTD.

M. Rigby No. 1, lot 16, con. III, Lake Erie survey, Harwich tp.

Location: 1,278 ft. N., 500 ft. E.
Driller: R. McPherson.
Completed: Apr. 27, 1953.
Rock pressure: 855 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	160
Huron	265
Hamilton	465
Brown lime	755
Sharp, brown and grey lime	885
Brown and grey lime	961
Sharp, brown and grey lime	1,022
Brown lime	1,186
Brown and blue lime	1,294
Brown lime	1,329
Brown and grey lime	1,367
Brown lime	1,416
Brown and blue lime	1,545
Brown lime	1,555
Brown and blue lime	1,580
Brown lime	1,614
Brown lime and gypsum	1,649
Brown lime	1,675
Grey lime	1,680
Brown lime	1,855

Gas at 1,554 and 1,564 ft.
Fresh water at 130 ft.; black, sulphur water at 630–40 ft.; salt water at 1,778–88 ft.

IMPERIAL OIL, LTD.

A. Ramboer No. 1, lot 9, con. IV, River Thames survey, Harwich tp.

Location: 1,200 ft. N., 600 ft. W.
Driller: R. McPherson.
Completed: Dec. 8, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	65
Black shale	144
Hamilton	334
Brown and grey lime	669
Sharp, brown and grey lime	870
Brown lime	1,011
Brown and blue lime	1,245
Brown and blue lime and gypsum	1,288
Brown and blue lime	1,334
Lime and salt	1,495
Brown lime	1,573
Dark-grey lime	1,584
Brown lime and gypsum	1,613
Brown lime	1,630
Grey lime	1,638
Brown lime	1,862
Grey lime	1,896
Grey shale	1,902

Fresh water at 60 ft.; sulphur water at 507–17 ft.; salt water at 1,655 ft.

IMPERIAL OIL, LTD.

M. Rigby No. 2, lot 15, con. III, Lake Erie survey, Harwich tp.

Location: 3,049 ft. N., 50 ft. W.
Driller: English and Mullin.
Completed: June 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	150
Black shale	209
Hamilton	427
Grey lime	434
Brown lime	601
Water sand	612
Sharp, brown lime	948
Brown lime	1,002
Water sand	1,015
Brown lime	1,070
Brown and blue lime and shale	1,163
Blue shale and gypsum	1,198
Brown and blue lime	1,430
Salt	1,456
Blue and brown lime	1,465
Salt and lime	1,535
Brown lime	1,591
Grey lime	1,618
Brown lime	1,924
Grey lime	1,960
Shale, Rochester	1,965

Fresh water at 86 ft.; sulphur water at 601 ft.

Kent County—Continued

IMPERIAL OIL, LTD.

B. Steel No. 1, lot 17, con. III, Lake Erie survey, Harwich tp.

Location: 1,700 ft. N., 300 ft. W.
Driller: R. McPherson.
Completed: Feb. 5, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	145
Black shale	215
Hamilton	466
Brown lime	779
Sharp, brown lime	1,043
Brown lime	1,163
Brown and blue lime and gypsum	1,168
Brown lime	1,206
Brown lime and gypsum	1,220
Brown and blue lime	1,539
Brown lime	1,593
Blue and brown lime	1,599
Brown lime	1,640
Grey lime	1,654
Brown lime	1,701
Grey lime	1,708
Brown lime	1,950
Grey lime	1,965
Blue shale	1,981

Show of gas at 1,521 and 1,588–90 ft.
Fresh water at 131 ft.; sulphur water at 515 ft.; black water at 632 ft.; salt water at 1,604–11 ft.

CONSOLIDATED WEST PETROLEUM CO., LTD.

Province of Ontario No. 8, in Lake Erie, opposite lot 181, Talbot Rd. range, Romney tp.

Location: 7,500 ft. S. of Talbot Rd., 300 ft. W.
Driller: R. McMaster and Sons.
Completed: July 30, 1953.
Rock pressure: 300 lb.
Result: producing gas well.

Formation	Depth ft.
Rig floor to bottom, clay, gravel, and sand	165
Grey, brown, and buff limestone	373
Sharp lime	530
Buff, grey, and brown, compact to crystalline, limestone	720
Grey and brown lime, gypsum, shale, and anhydrite	827
Grey shale and gypsum	1,062
Gypsum and anhydrite with a little shale	1,081
Grey and brown lime	1,231

Gas at 1,081–24 and 1,164–1,224 ft.
Black sulphur water at 532 ft.

CONSOLIDATED WEST PETROLEUM CO., LTD.

Province of Ontario No. 9, in Lake Erie, opposite lot 180, Talbot Rd. range, Romney tp.

Location: 8,700 ft. S. of Talbot Rd., 300 ft. E.
Driller: R. McMaster and Sons.
Completed: Oct. 9, 1953.
Rock pressure: 300 lb.
Result: producing gas well.

Formation	Depth ft.
Derrick floor to bottom of lake	64
Clay and sand	160
Grey-brown shale	167
Grey-brown and buff lime	430
Cherty and arenaceous limestone	545
Grey, buff, and brown lime	715
Grey shale and gypsum	839
Brown lime and gypsum	862
Gypsum, shale, and anhydrite	892
Buff and grey lime	940
Grey shale and gypsum	1,058
Gypsum	1,077
Grey and brown crystalline lime	1,160
Grey and brown lime with gypsum	1,166
Grey and brown lime	1,224

Gas at 1,077–1,101, 1,166, and 1,186 ft.
Black sulphur water at 534 ft.

UNION GAS CO. OF CANADA, LTD.

R. Baldwin No. 4, gore B, con. II, Romney tp.

Location: 751 ft. S., 3,550 ft. W.
Driller: J. Ashton.
Completed: Oct. 30, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	169
Hamilton	185
Grey lime	531
Sharp lime	614
Brown lime	709
Blue lime	819
Blue lime and gypsum	871
Brown and blue lime	997
Blue lime and gypsum	1,088
Brown lime	1,231
Grey lime	1,256
Brown lime	1,352

Gas at 1,135–1,231 and 1,295 ft.
Fresh water at 169 ft.; sulphur water at 600 and 653 ft.; salt water at 1,248 and 1,306 ft.

UNION GAS CO. OF CANADA, LTD.

L. Cunningham No. 4, lot 167, Talbot Rd. range, Tilbury East tp.

Location: 365 ft. S., 125 ft. E.
Elevation: 640+3 ft.
Driller: J. Ashton.
Completed: Dec. 4, 1953.
Rock pressure: 190 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	155
Hamilton shale	315
Grey and brown lime	598
Sharp lime	681
Brown lime	726
Blue lime and gypsum	763
Brown lime	783
Blue lime and gypsum	808
Brown lime	839
Blue lime and gypsum	870
Blue and brown lime	953
Brown and grey lime	1,000
Brown lime	1,053
Blue lime	1,209
Brown lime	1,336
Grey lime	1,385

Gas at 1,245–57, 1,269–94, and 1,336–72 ft.
Fresh water at 152–55 ft.; sulphur water at 598 and 675 ft.

Lambton County

IMPERIAL OIL, LTD.—No. 366

E. Wight No. 1, lot 14, con. II, Bosanquet tp.

Location: 430 ft. S., 790 ft. W.
Elevation: 737 ft.
Driller: R. McMaster and Sons.
Completed: Feb. 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	45
Hamilton	300
Brown lime	705
Sharp lime	948
Brown lime	1,014
Blue and brown lime	1,198
Grey lime	1,250
Lime and salt	1,320
Brown and grey lime	1,390
Salt and lime	1,430
Blue lime	1,478
Brown lime	1,498
Salt and lime	1,804
Brown and grey lime	1,915
Salt	1,985
Brown lime	2,142
Grey lime	2,213
Grey shale	2,222

Fresh water at 35, and 88-105 ft.; black, sulphur water at 385 ft.; salt water at 2,140 ft.

IMPERIAL OIL, LTD.—No. 379

R. Gates No. 1, lot 1, con. XIV, Brooke tp.

Location: 2,000 ft. S., 100 ft. W.
Elevation: 693+2 ft.
Driller: R. McMaster and Sons.
Completed: May 8, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	47
Black shale	121
Hamilton	393
Grey and brown lime	626
Lime and gypsum	645
Grey lime	711
Grey lime and gypsum	776
Sharp lime	980
Brown and grey lime	1,073
Blue and grey lime	1,140
Blue shale and gypsum	1,225
Blue, brown, and grey lime	1,385
Salt and lime	1,393
Brown lime	1,400
Salt and lime	1,416
Blue shale and grey and blue lime	1,493
Lime and salt	1,760
Brown and grey lime	1,873
Blue lime and blue shale	1,909
Bottom salt	1,995
Brown lime	2,227
Shale, Rochester	2,242

Sulphur, black water at 524 ft.

E. L. ROTH—No. 37

Myers Bros. No. 5, lot 8, con. II, Brooke tp.

Location: 840 ft. S., 300 ft. W.
Driller: R. Lather.
Completed: May 26, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	58
Black shale	67
Top rock	135
Top soap	270
Middle lime	285
Lower soap	313
Grey lime	320
Brown lime	435
Sharp lime	470
Brown lime	575

Fresh water at 58 ft.; sulphur water at 435 and 575

UNION GAS CO. OF CANADA, LTD.—BROOKE No. 5

S. Gardiner No. 1, lot 5, con. VI, Brooke tp.

Location: 100 ft. S., 100 ft. W.
Elevation: 690+2 ft.
Driller: Wayne Kiser and Son.
Completed: Nov. 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	61
Black shale	151
Hamilton	405
Brown lime	783
Sharp lime	923
Brown lime	1,018
Blue lime and gypsum	1,027
Brown lime	1,042
Blue and brown lime and gypsum	1,178
Brown and blue lime	1,273
Lime and salt	1,397
Blue lime and gypsum	1,384
Salt and lime	1,640
Brown lime	1,778
Salt and lime	1,834
Brown lime	1,954
Brown and grey lime	1,972
Brown lime	2,002
Brown and grey lime	2,050
Grey lime	2,072
Grey shale	2,079

Show of oil at 473 ft.
Fresh water at 55 ft.; sulphur water at 503 and 573 ft.; salt water at 1,984 and 2,002 ft.

UNION GAS CO. OF CANADA, LTD.—BROOKE No. 2

J. and L. Hrynuik No. 1, lot 6, con. IV, Brooke tp.

Location: 1,000 ft. S., 75 ft. W. of C. L.
Elevation: 687+2 ft.
Driller: Ehde and Meier.
Completed: June 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	65
Black shale	175
Hamilton	449
Brown lime	780
Sharp lime	1,020
Brown lime	1,080
Blue and brown lime and gypsum	1,220
Blue and brown lime	1,450
Salt and lime	1,595
Brown lime	1,672
Grey and blue lime	1,750
Salt	1,784
Brown lime	1,880
Grey lime	1,892
Lime and gypsum	1,916
Brown lime	1,940
Grey lime	2,020
Grey shale	2,022

Fresh water at 55 ft.; sulphur water at 560 and 670 ft.; salt water at 1,642 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—BROOKE NO. 4

R. and B. Johnston No. 1, lot 7, con. IV, Brooke tp.

Location: 2,100 ft. S., 150 ft. E. of C. L.
Elevation: 685+2 ft.
Driller: W. Kiser and Son.
Completed: Oct. 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	55
Black shale	218
Hamilton	525
Grey lime	567
Brown lime	930
Sharp lime	1,175
Brown lime	1,260
Blue lime and gypsum	1,268
Blue and brown lime	1,328
Blue lime and gypsum	1,401
Brown lime	1,515
Brown and blue lime	1,539
Blue lime and gypsum	1,605
Brown lime	1,737
Blue lime and gypsum	1,743
Brown lime	1,882
Grey and brown lime	1,894
Grey lime	1,906
Brown lime	1,977
Grey lime	2,007
Rochester	2,013

Fresh water at 53 ft.; sulphur water at 590 and 610 ft.; salt water at 1,912 ft.

UNION GAS CO. OF CANADA, LTD.—BROOKE NO. 6

W. and A. Watson No. 1, lot 7, con. V, Brooke tp.

Location: 100 ft. S. of C. L., 900 ft. E.
Elevation: 689+2 ft.
Driller: Meier and Shaw.
Completed: Dec. 5, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Black shale	150
Hamilton	400
Brown lime	730
Sharp lime	925
Brown lime	1,000
Lime and gypsum	1,020
Brown lime	1,040
Blue and brown lime and gypsum	1,165
Blue and brown lime and shale	1,350
Lime and salt	1,390
Brown lime	1,400
Salt and lime	1,620
Brown lime	1,690
Blue and brown lime	1,756
Salt and lime	1,790
Brown lime	1,908
Lime and gypsum	1,932
Brown lime	1,962
Grey lime	2,022
Grey shale	2,028

Gas at 1,800 ft.
Sulphur water at 490 ft.; salt water at 1,938–50 ft.

UNION GAS CO. OF CANADA, LTD.—BROOKE NO. 3

M. and K. Kuchta No. 1, lot 6, con. IV, Brooke tp.

Location: 1,000 ft. S., 600 ft. W.
Elevation: 684 ft.
Driller: Meier and Shaw.
Completed: Aug. 20, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	61
Black shale	160
Hamilton	437
Brown lime	770
Sharp lime	980
Brown lime	1,040
Brown and blue lime	1,080
Blue and brown lime and gypsum	1,115
Blue, brown, and grey lime	1,390
Brown and grey lime	1,430
Salt and lime	1,610
Brown lime	1,736
Salt and lime	1,760
Brown lime and gypsum	1,772
Brown lime	1,874
Brown lime and gypsum	1,886
Brown lime	1,922
Grey lime	2,014
Grey shale	2,016

Fresh water at 60 ft.; sulphur water at 490 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 168

A. Babcock No. 1, lot 14, con. IV, Dawn tp.

Location: 550 ft. N., 1,600 ft. W.
Elevation: 619 ft.
Driller: W. Kiser and Son.
Completed: July 23, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Black shale	245
Hamilton	462
Brown lime	867
Sharp lime	1,105
Brown lime	1,175
Grey, and blue lime and gypsum	1,327
Brown and blue lime	1,384
Blue lime and gypsum	1,398
Brown and blue lime	1,450
Blue lime and gypsum	1,545
Brown and grey lime	1,698
Grey lime and gypsum	1,708
Brown lime	1,813
Grey lime	1,845
Brown lime	1,864
Grey lime	1,887
Brown lime	1,898
Grey lime	1,970
Grey shale	1,978

Sulphur water at 523 ft.; salt water at 1,845 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 171

M. Boyle No. 1, lot 14, con. V, Dawn tp.

Location: 400 ft. S., 650 ft. E.
Elevation: 623+3 ft.
Driller: W. Kiser and Son.
Completed: Sept. 18, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Black shale	225
Hamilton	445
Brown and grey lime	860
Sharp lime	1,025
Brown and grey lime	1,090
Lime and gypsum	1,110
Grey and brown lime	1,134
Blue lime and gypsum	1,240
Brown and blue lime	1,290
Lime and gypsum	1,319
Brown, grey and blue lime	1,420
Blue lime and gypsum	1,524
Grey lime	1,568
Brown lime	1,616
Grey lime	1,700
Lime and gypsum	1,707
Brown lime	1,797
Grey lime and gypsum	1,829
Brown lime	1,865
Brown and grey lime	1,905
Grey lime	1,962
Grey shale	1,965

Show of oil at 1,610 ft.
Sulphur water at 474 ft.; salt water at 1,755 and 1,846 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 177

W. Cook No. 1, lot 14, con. IX, Dawn tp.

Location: 150 ft. N., 1,100 ft. W.
Elevation: 621+3 ft.
Driller: W. Kiser and Son.
Completed: Dec. 21, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	30
Black shale	155
Hamilton	365
Brown lime	720
Sharp lime	836
Brown lime	918
Lime and gypsum	950
Grey and brown lime	1,292
Salt and lime	1,488
Brown lime	1,552
Grey lime	1,614
Lime and gypsum	1,627
Brown lime	1,709
Grey lime	1,740
Lime and gypsum	1,748
Brown lime	1,794
Grey lime	1,894
Grey shale	1,896

Show of oil at 1,627–32 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 175

C. Butler No. 1, lot 16, con. XI, Dawn tp.

Location: 800 ft. S., 1,600 ft. E.
Elevation: 631+5 ft.
Driller: W. Kiser and Son.
Completed: Dec. 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	35
Black shale	80
Hamilton	300
Brown lime	670
Sharp lime	834
Brown lime	928
Lime and gypsum	966
Blue, grey, and brown lime	1,320
Salt and lime	1,519
Brown lime	1,586
Grey lime	1,646
Lime and gypsum	1,664
Brown lime	1,750
Black lime	1,790
Lime and gypsum	1,807
Brown lime	1,876
Grey lime	1,933
Grey shale	1,936

Sulphur water at 404 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 160

E. and E. Fowler No. 1, lot 33, con. X, Dawn tp.

Location: 100 ft. N., 100 ft. E.
Elevation: 644 ft.
Driller: W. Kiser and Son.
Completed: June 1, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	84
Brown shale	100
Hamilton	340
Grey lime	346
Brown lime	730
Sharp lime	890
Brown lime	998
Blue and brown lime and gypsum	1,014
Brown and grey lime	1,040
Blue and brown lime and gypsum	1,056
Grey and blue lime	1,160
Brown lime	1,180
Brown and blue lime and gypsum	1,186
Brown and blue lime	1,375
Salt and lime	1,613
Brown lime	1,673
Grey, brown and blue lime	1,753
Salt	1,797
Brown lime	1,873
Brown and grey lime	1,921
Grey lime	1,939
Brown lime	1,957
Grey lime	2,025

Show of gas at 1,797 and 1,803 ft.
Fresh water at 84 ft.; sulphur water at 520 and 530 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 169

S. and M. Gadsby No. 1, lot 34, con. XII, Dawn tp.

Location: 284 ft. S., 75 ft. W.
Elevation: 668 ft.
Driller: W. Kiser and Son.
Completed: Aug. 10, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Black shale	104
Hamilton	420
Brown lime	886
Sharp lime	1,142
Brown lime	1,235
Blue lime and gypsum	1,241
Brown lime	1,276
Blue lime and gypsum	1,292
Brown and blue lime	1,448
Brown and grey lime	1,524
Blue lime	1,574
Grey lime	1,627
Brown lime	1,688
Grey lime	1,765
Salt and lime	1,795
Brown lime	1,911
Grey lime and gypsum	1,923
Brown lime	1,958
Grey lime	2,032
Grey shale	2,034

Gas at 1,633–70 ft.
Fresh water at 60 ft.; sulphur water at 553 ft.; salt water at 1,662 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 172

D. and A. Lidster No. 1, lot 14, con. XII, Dawn tp.

Location: 250 ft. S., 2,100 ft. E.
Elevation: 623+2 ft.
Driller: Kiser Drilling Co.
Completed: Oct. 12, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	35
Black shale	80
Hamilton	300
Brown lime	400
Sharp grey lime	430
Brown lime	660
Sharp lime	870
Brown and grey lime	935
Blue lime and gypsum	956
Brown and blue lime	1,010
Blue lime and gypsum	1,091
Brown, grey, and blue lime	1,319
Salt	1,480
Brown lime	1,550
Grey lime	1,608
Brown lime	1,668
Grey lime	1,698
Brown lime	1,758
Brown and grey lime	1,836
Grey lime	1,881
Blue shale	1,890

Fresh water at 30 ft.; sulphur water at 361 ft.; salt water at 1,872 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 173

E. and G. Kolmegies No. 1, lot 12, con. X, Dawn tp.

Location: 210 ft. N., 655 ft. E.
Elevation: 605+5 ft.
Driller: W. Kiser and Son.
Completed: Nov. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	10
Black shale	166
Hamilton	369
Brown lime	677
Sharp lime	835
Brown lime	920
Brown lime and gypsum	950
Brown lime	974
Blue and brown lime	1,300
Salt and lime	1,455
Brown lime	1,534
Grey lime	1,588
Lime and gypsum	1,600
Brown lime	1,675
Black lime	1,701
Lime and gypsum	1,720
Brown lime	1,808
Grey lime	1,880
Grey shale	1,882

Fresh water at 16 and 55 ft.; sulphur water at 448 ft.; salt water at 1,726 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 170

H. Mawlam No. 2, lot 23, con. XIV, Dawn tp.

Location: 600 ft. S., 1,600 ft. E.
Elevation: 654+3 ft.
Driller: W. Kiser and Son.
Completed: Sept. 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	52
Black shale	150
Hamilton	416
Brown lime	502
Sharp, grey lime	514
Brown lime	538
Sharp, grey lime	591
Brown and grey lime	788
Sharp lime	1,048
Brown lime	1,152
Blue lime and gypsum	1,199
Grey, brown, and blue lime	1,520
Brown lime	1,582
Grey lime	1,638
Lime and gypsum	1,645
Brown lime	1,739
Grey lime	1,753
Brown lime	1,795
Brown and grey lime	1,815
Grey lime	1,914
Blue shale	1,920

Gas at 1,530–40 ft.
Show of oil at 1,753 ft.
Fresh water at 52 ft.; sulphur water at 502 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 174

G. Scott No. 1, lot 13, con. X, Dawn tp.

Location: 500 ft. S., 600 ft. E.
Elevation: 622+3 ft.
Driller: W. Kiser and Son.
Completed: Nov. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	40
Black shale	145
Hamilton	355
Brown lime	720
Sharp lime	833
Brown lime	915
Blue and brown lime and gypsum	1,066
Grey and brown lime	1,294
Salt and lime	1,470
Brown lime	1,541
Grey lime	1,604
Brown lime	1,688
Grey lime	1,738
Brown lime	1,766
Grey lime	1,890
Grey shale	1,893

Gas at 1,610–16 ft. and 1,622–28 ft.
Oil at 1,610–16 ft.
Sulphur water at 450 and 600 ft.; salt water at 1,610 and 1,870 ft.

UNION GAS CO. OF CANADA, LTD.—ENNISKILLEN NO. 24

D. Anderson No. 1, lot 7, con. VIII, Enniskillen tp.

Location: 700 ft. S., 200 ft. E.
Driller: Kiser Drilling Co.
Completed: Sept. 5, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	63
Brown shale	106
Hamilton	373
Brown lime	815
Sharp lime	1,010
Brown lime	1,096
Brown lime and gypsum	1,102
Brown and blue lime	1,302
Lime and salt	1,362
Brown and grey lime	1,446
Lime and salt	1,500
Brown and blue lime	1,584
Lime and salt	1,608
Brown lime	1,636
Salt	1,846
Brown lime	1,912
Grey lime	2,008
Salt	2,075
Brown lime	2,123
Dark-brown lime	2,216
Grey and brown lime	2,240
Grey lime	2,322
Grey shale	2,327

Show of gas at 402 ft.
Fresh water at 63 ft.; sulphur water at 505 ft.

R. FAIRBANK—No. 2

R. Fairbank No. 2, lot 14, con. X, Enniskillen tp.

Location: 60 ft. S., 700 ft. E.
Elevation: 646+1 ft.
Driller: W. Hussey.
Completed: July 20, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	90
Top lime	130
Upper soap	250
Middle lime	270
Hard, grey shale	305
Grey lime	360
Buff lime	415
Brown lime	465
Buff lime	475
Grey, sandy lime	485

Oil at 415–65 ft.
Fresh water at 74 ft.; sulphur water at 482 ft.

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 167

Z. Moore No. 1, lot 28, con. I, Enniskillen tp.

Location: 200 ft. N., 575 ft. W.
Elevation: 525 ft.
Driller: W. Kiser and Son.
Completed: June 18, 1953.
Rock pressure: 912 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	40
Black shale	130
Hamilton	383
Brown lime	494
Sharp lime	506
Brown lime	601
Brown lime and gypsum	607
Brown lime	758
Sharp lime	1,020
Brown lime	1,102
Brown lime and gypsum	1,149
Grey and brown lime	1,173
Blue lime and gypsum	1,190
Blue, brown, and grey lime	1,477
Brown lime	1,523
Grey lime	1,553
Brown lime	1,622

Gas at 1,498–1,523, 1,553–69, and 1,577–1,622 ft.
Fresh water at 40 ft.; sulphur water at 494 and 536 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—DAWN No. 164

B. Warren No. 1, lot 29, con. I, Enniskillen tp.

Location: 1,600 ft. N., 796 ft. E.
Elevation: 670 ft.
Driller: W. Kiser and Son.
Completed: Feb. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	45
Huron	145
Hamilton	405
Brown lime	639
Brown lime and gypsum	645
Brown lime	693
Brown lime and gypsum	701
Brown lime	810
Sharp lime	1,133
Brown lime	1,228
Brown lime and gypsum	1,234
Grey and blue lime	1,276
Blue and brown lime and gypsum	1,282
Grey and brown lime	1,526
Grey lime	1,617
Brown lime	1,680
Grey lime	1,737
Brown lime	1,974
Light-grey lime	2,040

Fresh water at 45 ft.; sulphur water at 549 and 591 ft.; salt water at 1,844 ft.

I. CARROTHERS—No. 1

T. Page No. 1, lot 29, con. X, Euphemia tp.

Location: 960 ft. S., 1,403 ft. E.
Elevation: 695 ft.
Driller: R. Lather.
Completed: Aug. 11, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	90
Top rock	140
Top soap	278
Middle lime	298
Lower soap	315
Grey lime	323
Brown lime	350

Oil at 340 ft.
Fresh water at 90 ft.; sulphur water at 340 ft.

DEMARAY, NICHOLS, PARKINSON, AND JEWELL—No. 2

M. Walker No. 4, lot 28, con. IX, Euphemia tp.

Location: 10 ft. N. of C. L., 425 ft. E. of C. L.
Elevation: 676 ft.
Driller: Demaray and Nichols.
Completed: Jan. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	75
Top rock	122
Upper soap	260
Middle lime	275
Lower soap	295
Dark-grey lime	299
Buff lime	377
Sharp, sandy lime	404

Show of oil at 320 ft.
Sulphur water at 312 ft.; black sulphur water at 404 ft.; fresh water at 85 ft.

DEMARAY, NICHOLS, PARKINSON, AND JEWELL—No. 6

M. Walker No. 5, lot 28, con. IX, Euphemia tp.

Location: 270 ft. S., 1,000 ft. W.
Driller: R. Lather.
Completed: July 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	69
Top rock	121
Top soap	260
Middle lime	275
Lower soap	295
Grey lime	300
Brown lime	315

Show of oil at 313 ft.
Fresh water at 69 ft.; sulphur water at 313 ft.

E. R. MCGAFFEY—No. 6

W. and H. Davis No. 1, lot 18, con. V, Euphemia tp.

Location: 314 ft. N., 373 ft. W.
Elevation: 650 ft.
Driller: E. R. McGaffey.
Completed: Oct. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	73
Upper shale, lime streaks	207
Middle lime	223
Lower soap	241
Dark streak	246
Soap	247
Lower lime	367
Oriskney sand	368

Show of gas at 249 ft.
Salt water at 153 ft.

E. R. MCGAFFEY—No. 5

O. and B. Rolston No. 1, lot 17, con. V, Euphemia tp.

Location: 150 ft. N. of C. L., 350 ft. W. of C. L.
Driller: E. R. McGaffey.
Completed: May 21, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	166
Lime shell	176
Soap	184
Lime, shell, and soap	192
Middle lime	209
Lower lime	229
Dark streak	235
Lower lime	252

Oil at 229–34 ft.
Fresh water at 149–69 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 405

K. Anderson No. 2, lot 22, con. VII, Moore tp.

Location: 1,450 ft. S., 750 ft. W.
Driller: Union Rotary Corp.
Completed: Sept. 15, 1953.
Rock pressure: 762 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	135
Black shale	267
Hamilton	522
Brown lime	885
Sharp sand	1,125
Brown lime	1,220
Brown lime and gypsum	1,335
Blue and brown lime and gypsum	1,467
Salt	1,515
Blue lime	1,520
Salt	1,527
Brown and blue lime and gypsum	1,623
Salt	1,630
Blue lime and gypsum	1,763
Salt	1,972
Brown lime	2,012
Gypsum, brown lime, and shale	2,122
Salt	2,163
Brown lime	2,223
Blue lime and gypsum	2,250
Brown lime	2,395
Grey lime	2,490
Grey shale	2,494

Gas at 2,247–2,349 ft.

IMPERIAL OIL, LTD.—No. 419

J. and V. Burns No. 1, lot 19, con. X, Moore tp.

Location: 800 ft. S., 375 ft. E.
Elevation: 647+6 ft.
Driller: Union Rotary Corp.
Completed: Dec. 2, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	140
Black shale	229
Hamilton	508
Brown lime	970
Sharp sand	1,080
Brown lime	1,190
Blue and brown lime	1,380
Salt	1,409
Brown lime	1,429
Salt	1,472
Blue lime	1,496
Salt and lime	1,522
Blue and brown lime	1,530
Salt	1,564
Brown and blue lime	1,588
Salt	1,657
Brown and blue lime	1,739
Salt	1,772
Brown lime	1,840
Salt	2,124
Brown lime	2,244
Grey lime	2,280
Gypsum	2,310
Brown lime	2,450

Gas at 2,308–2,411 ft.
Oil at 2,411–49 ft.

IMPERIAL OIL, LTD.—No. 365

M. Blake No. 1, lot 17, con. VII, Moore tp.

Location: 900 ft. N., 650 ft. W.
Elevation: 636 ft.
Driller: Stubble and Stubble.
Completed: Feb. 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	139
Black shale	235
Hamilton	490
Brown lime	680
Brown lime and gypsum	827
Brown and grey lime	875
Brown and grey lime, sharp	1,127
Grey and brown lime	1,220
Grey lime, shale, and gypsum	1,227
Grey lime	1,257
Blue and brown lime	1,370
Brown and blue lime, gypsum	1,409
Brown lime and salt	1,483
Brown lime	1,600
Grey and blue shale	1,680
Salt and lime	1,945
Brown lime	1,988
Grey lime	2,089
Salt	2,141
Brown lime	2,231
Grey lime	2,342
Brown lime	2,354
Grey lime	2,432
Grey shale	2,435

Show of gas at 510–15 and 2,214 ft.
Show of oil at 2,220 ft.
Fresh water at 139 ft.; black sulphur water 515–25 ft.; salt water at 2,225 ft.

IMPERIAL OIL, LTD.—No. 362

C. Celnor No. 1, lot 20, con. VIII, Moore tp.

Location: 50 ft. S., 325 ft. W.
Elevation: 649 ft.
Driller: R. McPherson.
Completed: Jan. 22, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	145
Hamilton	538
Brown lime	935
Sharp, grey and brown lime	1,149
Brown lime	1,242
Brown and blue lime	1,314
Brown and blue lime and gypsum	1,446
Lime and salt	1,470
Brown lime	1,501
Lime and salt	1,564
Brown lime	1,668
Lime and salt	1,698
Brown and blue lime and blue shale	1,721
Lime and salt	2,050
Brown lime	2,191
Lime and salt	2,290
Brown lime	2,406
Brown lime and gypsum	2,440
Brown lime	2,464
Grey lime	2,561
No samples—fire	2,581

Gas at 2,436 ft.
Oil at 2,319 and 2,436 ft.
Salt water at 2,437 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 376

O. Clemens No. 1, lot 21, con. IX, Moore tp.

Location: 1,620 ft. N., 820 ft. E.
Elevation: 651+7 ft.
Driller: Union Rotary Corp.
Completed: Mar. 30, 1953.
Rock pressure: 876 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	140
Black shale	280
Hamilton	570
Brown lime	975
Sharp sand	1,180
Brown lime	1,270
Brown lime and gypsum	1,320
Blue lime and shale	1,480
Salt	1,495
Blue lime	1,504
Salt	1,530
Brown and blue lime	1,558
Salt	1,624
Brown lime	1,699
Blue shale	1,814
Salt	1,832
Blue shale	1,840
Salt	1,850
Blue and brown lime	1,860
Salt	2,087
Brown lime	2,127
Grey lime and shale	2,230
Salt	2,295
Brown lime	2,360
Grey lime and shale	2,435
Gypsum	2,451
Brown lime	2,515
Grey lime	2,585
Grey shale	2,603

Gas at 2,234–2,345 ft.
Show of oil at 2,453–95 ft.

IMPERIAL OIL, LTD.—No. 344

R. Murray No. 1, lot 21, con. IX, Moore tp.

Location: 1,000 ft. N., 100 ft. W.
Elevation: 654+6 ft.
Driller: Union Rotary Corp.
Completed: Apr. 19, 1953.
Rock pressure: 876 lb.
Result: producing gas well.

Formation	Depth ft.
Previous depth, 1952	2,137
Brown lime	2,465
Grey lime	2,585
Grey shale	2,605

Gas at 2,135–2,360 ft.
Oil at 2,360–2,465 ft.

IMPERIAL OIL, LTD.—No. 392

R. Medley No. 2, lot 20, con. IX, Moore tp.

Location: 574 ft. N., 552 ft. E.
Elevation: 656+6 ft.
Driller: Union Rotary Corp.
Completed: July 4, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	150
Black shale	279
Hamilton	544
Brown lime	980
Sharp lime	1,180
Brown lime	1,279
Brown lime and gypsum	1,359
Blue lime and shale	1,458
Salt and gypsum in blue lime	1,495
Blue shale	1,500
Salt and anhydrite	1,530
Grey and blue lime	1,554
Lime and salt	1,570
Salt	1,625
Lime and shale	1,714
Salt	1,750
Brown lime and blue shale	1,835
Salt	2,105
Brown lime	2,135
Grey lime	2,262
Gypsum	2,279
Brown lime	2,319
Grey lime and gypsum	2,325
Brown lime	2,441

Gas at 2,287–2,303 and 2,325–2,400 ft.
Oil at 2,416–41 ft.

IMPERIAL OIL, LTD.—No. 387

G. Roberts No. 3, lot 19, con. VI, Moore tp.

Location: 465 ft. N., 100 ft. W.
Elevation: 632 ft.
Driller: Union Rotary Corp.
Completed: June 6, 1953.
Rock pressure: 650 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	130
Black shale	238
Hamilton	493
Brown lime	900
Sharp lime	1,095
Brown lime	1,195
Brown lime and gypsum	1,265
Blue and brown lime	1,400
Blue lime and gypsum	1,410
Salt	1,472
Blue lime and gypsum	1,545
Salt	1,575
Brown and blue lime	1,635
Salt	1,898
Brown lime	1,938
Brown and grey lime and gypsum	2,010
Gypsum	2,038
Salt	2,040
Gypsum	2,044
Brown lime	2,090
Brown and grey lime	2,094
Brown lime	2,324
Grey lime	2,407
Grey shale	2,411

Gas at 2,093–2,178 ft.
Show of oil at 2,277–99 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 391

E. and H. Strangway No. 1, lot 11, con. VIII, Moore tp.

Location: 950 ft. N., 900 ft. E.
Elevation: 642+3 ft.
Driller: C. Carter.
Completed: Aug. 3, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	128
Black shale	190
Hamilton	447
Grey and brown lime	812
Sharp, brown lime	1,037
Grey and brown lime	1,143
Lime and shale	1,200
Lime, shale, and gypsum	1,256
Blue shale and lime	1,327
Salt	1,334
Brown lime	1,342
Salt	1,372
Shale and lime	1,399
Lime and salt	1,466
Shale and lime	1,532
Lime, shale, and gypsum	1,540
Salt, lime, and shale	1,590
Lime and shale	1,664
Lime and salt	1,707
Brown lime	1,725
Salt and lime	1,947
Brown lime	2,088
Salt	2,185
Gypsum	2,191
Brown lime	2,400
Grey lime	2,437
Blue shale	2,444

Show of gas at 460 ft.
Show of oil at 2,344 ft.
Sulphur water at 473, 485, and 632 ft.; salt water at 1,070 ft.

IMPERIAL OIL LTD.—No. 403

V. Tracy No. 1, lot 24, con. I, Moore tp.

Location: 50 ft. N., 500 ft. E.
Elevation: 609 ft.
Driller: C. Carter.
Completed: Oct. 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	152
Blue shale	211
Black shale	423
Hamilton	650
Brown and grey lime and gypsum	1,031
Sharp, grey lime	1,170
Grey lime	1,252
Grey lime and shale	1,331
Blue shale and gypsum	1,430
Brown lime and shale	1,537
Lime and salt	1,572
Blue shale and grey lime	1,671
Salt and shale	1,703
Salt	1,949
Brown lime	2,037
Shale and lime	2,090
Salt	2,170
Gypsum	2,177
Brown lime	2,303
Gypsum and lime	2,320
Grey lime	2,442
Shale	2,447

Show of oil at 140 ft.
Sulphur water at 750 ft.; salt water at 1,213 ft.

IMPERIAL OIL, LTD.—No. 242

R. Trapp No. 1, lot 22, con. VII, Moore tp.

Location: 1,100 ft. N., 100 ft. W.
Elevation: 634+6 ft.
Driller: Union Rotary Corp.
Deepened: May 14, 1953.
Bottom hole pressure: 826 lb.
Result: producing gas well.

Formation	Depth ft.
Previous depth, 1950	1,996
Brown lime	2,386
Grey lime	2,486
Grey shale	2,505

Gas at 1,971–2,340 ft.
Oil at 2,340–85 ft.

IMPERIAL OIL, LTD.—No. 410

H. Williams No. 1, lot 10, con. II, Moore tp

Location: 3,150 ft. S., 100 ft. W.
Elevation: 622+6 ft.
Driller: Union Rotary Corp
Completed: Oct. 15, 1953.
Rock pressure: 990 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	125
Black shale	268
Hamilton	530
Brown lime	930
Sharp sand	1,110
Brown lime	1,200
Brown and grey lime	1,260
Brown and blue lime	1,470
Blue lime, shale, and gypsum	1,600
Salt	1,729
Brown lime	1,789
Blue lime and shale	1,810
Gypsum	1,821
Brown lime	2,228
Gypsum and lime	2,348
Grey shale	2,360

Gas at 1,822–2,155 ft.
Show of oil at 2,155–98 ft.
Salt water at 2,155–98 ft.

UNION GAS CO. OF CANADA, LTD.—MOORE No. 8

B. Bradley and Lambton Loan and Investment Co. No. 1, lot 8, con. I, Moore tp.

Location: 637 ft. S., 530 ft. W.
Elevation: 622 ft.
Driller: Kiser Drilling Co.
Completed: July 29, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	110
Brown shale	240
Hamilton	485
Grey and brown lime	990
Sharp lime	1,110
Brown lime	1,230
Blue and brown lime	1,568
Salt	1,810
Brown lime	1,880
Blue lime	1,960
Salt	2,045
Brown lime	2,166
Grey lime	2,290
Grey shale	2,292

Sulphur water at 610 and 630 ft.; salt water at 2,274 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—MOORE No. 7

J. Rattray No. 2, lot 1, con. IV, Moore tp.

Location: 75 ft. N., 75 ft. W.
Elevation: 636 ft.
Driller: W. Kiser and Son.
Completed: Apr. 9, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	72
Black shale	149
Hamilton	503
Brown lime	1,038
Sharp lime	1,201
Brown lime	1,329
Brown and blue lime and gypsum	1,355
Brown, grey, and blue lime	1,728
Lime and salt	1,818
Brown lime	1,862
Brown, blue, and grey lime	1,946
Salt and lime	2,037
Brown lime	2,157
Brown lime and gypsum	2,163
Brown lime	2,193
Grey lime	2,281
Blue shale	2,285

Show of gas at 1,818–24 ft.
Fresh water at 69 ft.; sulphur water at 690 ft.; salt water at 1,856 and 2,175 ft.

IMPERIAL OIL, LTD.—No. 372

W. Manning No. 1, lot 28, con. XIII, Plympton tp.

Location: 300 ft. S., 400 ft. E.
Elevation: 685 ft.
Driller: R. McMaster and Sons.
Completed: Apr. 3, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	107
Black shale	131
Hamilton	460
Brown lime	500
Grey lime	629
Brown lime	732
Gypsum	753
Gypsum and lime	767
Brown lime	971
Sharp lime	1,121
Brown lime	1,242
Blue and brown lime	1,404
Brown lime and salt	1,600
Blue and grey lime	1,658
Salt	1,672
Grey lime	1,682
Salt	1,769
Blue lime	1,794
Salt and lime	1,829
Brown lime	1,854
Salt	2,095
Brown and grey lime	2,225
Salt	2,290
Brown and grey lime	2,550
Rochester (grey shale)	2,570
Medina (red and blue shale)	2,575

Fresh water at 90 ft.; sulphur water at 620 ft.

UNION GAS CO. OF CANADA, LTD.—MOORE No. 9

V. and E. Vye No. 1, lot 8, con. II, Moore tp.

Location: 800 ft. N., 850 ft. W.
Elevation: 622+2 ft.
Driller: Kiser Drilling Co.
Completed: Dec. 3, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	125
Brown shale	275
Hamilton	558
Brown lime	1,210
Sharp lime	1,405
Brown lime	1,582
Grey, blue and brown lime	1,915
Lime and gypsum	1,921
Brown lime	1,961
Dark-grey and brown lime	2,042
Lime and gypsum	2,048
Brown lime	2,102
Grey lime	2,160
Lime and gypsum	2,170
Brown lime	2,215
Grey lime	2,315
Grey shale	2,320

Shows of gas and oil at 2,180–85 ft.
Sulphur water at 618 ft.; salt water at 2,180 ft.

IMPERIAL OIL, LTD.—No. 388

A. Felton No. 1, lot 10, con. IX, Sarnia tp.

Location: 110 ft. N., 100 ft. W.
Elevation: 593+2 ft.
Driller: R. McMaster and Sons.
Completed: July 16, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	102
Black shale	236
Hamilton	502
Brown lime	846
Grey lime	970
Sharp lime	1,183
Brown lime	1,366
Blue shale and lime	1,490
Lime and salt	1,655
Brown lime	1,692
Lime and salt	1,716
Brown and blue lime	1,724
Lime and salt	1,768
Shale and lime	1,985
Salt	2,016
Brown lime	2,035
Lime and salt	2,305
Brown lime	2,340
Grey and brown lime	2,431
Salt	2,532
Gypsum	2,539
Brown lime	2,559
Brown and grey lime	2,590
Grey lime	2,662
Guelph	2,773
Rochester shale	2,884

Sulphur water at 625 and 695 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 393

E. Kleefman No. 1, lot 12, con. V, Sarnia tp.

Location: 200 ft. S., 500 ft. W.
Elevation: 591 ft.
Driller: Stubble and Stubble.
Completed: July 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	175
Hamilton	430
Brown lime	674
Brown lime and gypsum	737
Brown lime	845
Sharp, brown and grey lime	1,081
Brown lime	1,174
Blue, brown, and grey lime	1,258
Brown lime and gypsum	1,275
Brown and blue lime	1,410
Salt and lime	1,557
Grey and brown lime	1,567
Brown lime and gypsum	1,577
Lime and salt	1,600
Brown lime	1,609
Salt	1,640
Brown lime	1,660
Brown and blue lime	1,820
Lime and salt	1,878
Blue lime	1,947
Salt and lime	1,953
Lime and shale	1,978
Lime and salt	2,030
Brown lime	2,055
Salt and lime	2,277
Brown lime	2,341
Dark-grey lime	2,425
Lime and salt	2,445
Salt	2,535
Brown lime and gypsum	2,550
Brown lime	2,665
Grey lime and gypsum	2,688
Brown lime	2,708
Grey lime	2,773

Fresh water at 95 ft.; sulphur water at 555 ft.; salt water at 2,580 ft.

IMPERIAL OIL, LTD.—No. 370

I. Moore No. 1, lot 7, con. IV, Sarnia tp.

Location: 1,000 ft. N., 100 ft. W.
Elevation: 620 ft.
Driller: R. McMaster and Sons.
Completed: Feb. 26, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	123
Hamilton	408
Brown lime	560
Water sand	602
Lime and gypsum	753
Grey lime	857
Brown and grey lime	1,202
Blue and brown lime	1,212
Blue shale and gypsum	1,234
Blue lime	1,242
Brown lime	1,301
Blue shale and gypsum	1,364
Salt lime and blue shale	1,491
Salt and brown lime	1,545
Brown lime and gypsum	1,559
Blue and brown lime	1,572
Salt and lime	1,632
Blue, brown, and grey lime	1,724
Salt and lime	1,767
Blue shale and gypsum	1,821
Blue shale	1,870
Salt and lime	1,960
Salt	2,038
Salt and lime	2,095
Salt	2,149
Brown lime	2,200
Grey and blue lime	2,280
Gypsum and limestone	2,298
Limestone and salt	2,398
Limestone and gypsum	2,403
Brown limestone	2,634

Show of gas at 408 ft.
Fresh water at 108 ft.; black sulphur water at 560 ft.

IMPERIAL OIL, LTD.—No. 404

W. Moore No. 1, lot 14, con. V, Sarnia tp.

Location: 950 ft. N., 150 ft. E.
Elevation: 605 ft.
Driller: Stubble and Stubble.
Completed: Sept. 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	122
Black shale	190
Hamilton	297
Brown and grey lime	689
Brown and grey lime and gypsum	1,005
Sharp, brown and grey lime	1,141
Brown and grey lime	1,229
Brown lime and gypsum	1,269
Brown and grey lime and gypsum	1,326
Blue, brown, and grey lime	1,469
Blue lime and salt	1,600
Brown and blue lime	1,621
Blue lime and salt	1,801
Brown lime and gypsum	1,835
Grey and brown lime and blue shale	2,014
Salt and brown lime	2,313
Brown and grey lime	2,462
Salt and lime	2,588
Brown lime	2,617
Brown lime and gypsum	2,643
Dark-brown and grey lime	2,751
Grey lime	2,820
Shale	2,825

Fresh water at 119 ft.; sulphur water at 620 ft.

IMPERIAL OIL, LTD.—No. 375

O. Caron No. 1, lot 5, con. IX, Sombra tp.

Location: 1,000 ft. N., 100 ft. W.
Elevation: 605+2 ft.
Driller: Stubble and Stubble.
Completed: Apr. 3, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	160
Huron	362
Hamilton	570
Grey and brown lime	1,030
Sharp, grey lime	1,078
Brown lime	1,141
Blue and brown lime	1,338
Brown and blue lime and gypsum	1,366
Brown lime	1,411
Brown lime and gypsum	1,428
Brown and grey lime	1,473
Grey shale	1,512
Salt, shale, and lime	1,770
Brown lime	1,852
Grey lime	1,920
Salt and limestone	1,971
Grey lime and gypsum	1,978
Brown lime	2,145
Grey lime	2,232
Grey shale, Rochester	2,238

Fresh water at 145 ft.; black sulphur water at 675 ft

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 383

G. Gray No. 1, lot 3, con. VI, Sombra tp.

Location: 2,000 ft. N., 200 ft. W.
Elevation: 585+2 ft.
Driller: C. Carter.
Completed: June 8, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	145
Huron	410
Hamilton	655
Brown lime	717
Grey lime	738
Brown lime	753
Grey lime	818
Brown lime	1,082
Sharp lime	1,178
Brown lime	1,248
Blue shale and brown lime	1,523
Lime and gypsum	1,540
Brown lime and blue shale	1,640
Brown lime and salt	1,679
Brown lime	1,689
Salt and lime	1,698
Brown lime	1,804
Lime and shale	1,839
Lime and gypsum	1,854
Salt and gypsum	1,859
Salt	1,898
Gypsum	1,906
Grey and brown lime	2,088
Grey lime	2,167

Show of oil at 1,920 ft.
Fresh water at 140 ft.; black water at 760 ft.; salt water at 1,100 and 2,050 ft.

IMPERIAL OIL, LTD.—No. 382

W. Hinnegan No. 2, lot 5, con. XI, Sombra tp.

Location: 800 ft. S., 500 ft. E.
Elevation: 608 ft.
Driller: Stubble and Stubble.
Completed: June 19, 1953.
Rock pressure: 925 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	178
Black shale	390
Hamilton	609
Grey lime	762
Brown lime and gypsum	900
Brown lime	1,010
Sharp lime	1,125
Brown lime	1,217
Grey and brown lime	1,590
Salt and lime	1,854
Brown lime	1,919
Grey and blue lime	1,975
Light-grey lime and gypsum	1,999
Salt and gypsum	2,049
Brown lime	2,087
Grey lime	2,116
Brown lime	2,142
Grey lime	2,173
Brown and grey lime	2,190
Grey lime	2,312
Grey shale	2,318

Gas at 2,069–75 ft.
Show of oil at 2,121 ft.
Fresh water at 155 ft.; sulphur water at 640 ft.

IMPERIAL OIL, LTD.—No. 363

H. Henry No. 1, lot 5, con. XI, Sombra tp.

Location: 450 ft. N., 440 ft. W.
Elevation: 607 ft.
Driller: C. Carter.
Completed: Feb. 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	190
Black and blue shale	380
Hamilton	587
Grey and brown lime	810
Sharp lime	885
Grey lime	964
Sharp lime	1,089
Grey lime	1,113
Water sand	1,147
Sand and lime	1,177
Grey lime and blue shale	1,342
Brown lime	1,402
Lime, shale, and gypsum	1,415
Brown and blue lime	1,435
Brown lime	1,555
Lime and salt	1,795
Brown lime	1,962
Salt	2,026
Gypsum and salt	2,035
Gypsum and lime	2,037
Brown lime	2,139
Lime and shale	2,178
Blue shale and lime	2,231
Grey lime	2,295
Grey shale	2,300

Black salt water at 606 ft.; sulphur water at 1,115 and 2,220 ft.

IMPERIAL OIL, LTD.—No. 395

St. Clair Gordon No. 1, lot 6, con. XI, Sombra tp.

Location: 1,600 ft. S., 1,020 ft. E.
Elevation: 611 ft.
Driller: Stubble and Stubble.
Completed: Aug. 14, 1953.
Rock pressure: 923 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	180
Black shale	375
Hamilton	595
Brown and grey lime	1,026
Sharp, grey lime	1,128
Brown lime	1,200
Blue and brown lime	1,572
Salt and shells	1,821
Brown lime	1,934
Grey lime	2,024
Salt	2,042
Brown lime	2,047
Grey lime	2,051
Brown lime	2,102
Grey lime	2,132
Brown and grey lime	2,143
Grey lime	2,177
Brown and grey lime	2,194
Light-grey lime	2,220

Gas at 2,042–47, 2,056–60, and 2,064–66 ft.
Show of oil at 2,185 ft.
Fresh water at 145 ft.; sulphur water at 702 ft.; salt water at 2,185 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 402

M. Strangway No. 1, lot 10, con. IX, Sombra tp.

Location: 1,400 ft. N., 350 ft. W.
Elevation: 582 ft.
Driller: English and Mullin.
Completed: Sept. 11, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	111
Grey, blue, and black shale	320
Hamilton	550
Brown and grey lime	1,041
Sharp lime	1,168
Brown lime and shale	1,285
Brown lime and gypsum	1,301
Blue shale	1,388
Blue lime	1,396
Brown lime	1,410
Blue shale and gypsum	1,418
Brown lime	1,527
Blue lime	1,607
Brown and blue lime	1,661
Brown lime	1,720
Grey lime	1,761
Brown lime	1,765
Blue lime	1,771
Brown lime and gypsum	1,820
Brown lime	1,884

Small show of gas at 108 ft.
Fresh water at 108 ft.; sulphur water at 608 ft.; salt water at 1,877 ft.

IMPERIAL OIL, LTD.—No. 413

E. Workman No. 1, lot 6, con. XI, Sombra tp.

Location: 1,400 ft. N., 300 ft. W.
Elevation: 607+2 ft.
Driller: English and Mullin.
Completed: Nov. 3, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	172
Black shale	365
Hamilton	579
Grey and brown lime and gypsum	998
Sharp, brown and grey lime	1,100
Brown and grey lime	1,176
Brown and blue lime and blue shale	1,565
Salt	1,821
Brown lime	1,952
Blue lime	1,976
Blue lime and gypsum	1,985
Salt	2,015
Salt and gypsum	2,022
Brown lime	2,196
Grey lime	2,211
Brown lime	2,238
Grey lime	2,330
Blue shale	2,335

Fresh water at 159 ft.; sulphur water at 693 ft.

IMPERIAL OIL, LTD.—No. 373

W. Wadsworth No. 1, lot 3, con. VI, Sombra tp.

Location: 500 ft. N., 80 ft. E.
Elevation: 373 ft.
Driller: C. Carter.
Completed: Mar. 31, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	152
Huron	400
Hamilton	695
Brown lime	768
Lime and water sand	778
Grey lime	815
Brown lime	967
Grey lime and water sand	1,021
Brown lime	1,103
Grey lime	1,247
Brown lime	1,313
Blue shale and brown lime	1,618
Lime and gypsum	1,641
Blue shale and lime	1,740
Brown lime	1,853
Blue shale, lime, and gypsum	1,883
Gypsum	1,898
Brown lime	2,012
Lime and gypsum	2,021
Brown lime	2,057
Grey lime	2,162
Rochester	2,166

Gas at 1,898–1,903, 1,907–14, and 1,943 ft.
Show of oil at 1,943 ft.
Fresh water at 137 ft.; black sulphur water at 820 ft.; salt water at 1,742 ft.

STANWELL OIL AND GAS, LTD.—No. 1

M. O'Leary No. 1, lot A, con. VI, Sombra tp.

Location: 250 ft. S., 100 ft. E.
Elevation: 587 ft.
Driller: R. McPherson.
Completed: Nov. 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	152
Black shale	376
Hamilton	589
Brown lime	965
Sharp lime	1,146
Brown lime	1,227
Lime and gypsum	1,237
Blue and brown lime	1,252
Lime and gypsum	1,309
Blue and brown lime	1,371
Lime and gypsum	1,395
Blue and grey lime and shale	1,563
Shale and gypsum	1,598
Salt	1,750
Brown lime	1,830
Lime and gypsum	1,899
Grey lime	1,913
Salt	1,954
Brown lime	2,019
Lime and gypsum	2,089
Brown lime	2,213
Rochester	2,228

Surface gas at 137–52 ft.
Fresh water at 137 ft.; salt water at 718, 739, and 754 ft.

Lambton County—Continued

UNION GAS CO. OF CANADA, LTD.—DAWN NO. 165

E. and E. Selman No. 1, lot 22, con. XIV, Sombra tp.

Location: 350 ft. S., 750 ft. E.
Elevation: 615 ft.
Driller: W. Kiser and Son.
Completed: Feb. 17, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	99
Grey shale	155
Black shale	300
Hamilton	521
Brown lime	934
Sharp lime	1,043
Brown lime	1,117
Brown and blue lime and gypsum	1,135
Brown and grey lime	1,158
Brown lime and gypsum	1,184
Brown, grey, and blue lime	1,493
Salt and lime	1,741
Brown and grey lime	1,891
Salt and lime	1,963
Brown and grey lime	2,077
Brown and grey lime and gypsum	2,107
Brown lime	2,125
Grey lime	2,209
Blue shale	2,217

Fresh water at 95 ft.; sulphur water at 580 ft.; salt water at 2,143 ft.

IMPERIAL OIL, LTD.—NO. 401

R. Brandon No. 1, lot 10, con. IV, north of Egremont Rd., Warwick tp.

Location: 800 ft. S., 300 ft. W.
Elevation: 736 ft.
Driller: R. McMaster and Sons.
Completed: Sept. 22, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	65
Black shale	115
Hamilton	370
Brown and grey lime and gypsum	874
Sharp lime	1,010
Brown lime	1,102
Brown lime and blue shale	1,250
Salt and lime	1,304
Brown lime	1,330
Salt and blue shale	1,405
Brown and grey lime	1,469
Blue shale and salt	1,537
Brown lime and shale	1,582
Salt and lime	1,750
Brown lime	1,802
Grey lime	1,824
Blue shale and brown lime	1,840
Lime and gypsum	1,846
Brown lime	1,965
Grey lime	1,987
Brown and grey lime	2,054
Grey and blue lime	2,274

Gas at 224 ft.
Fresh water at 60 ft.; sulphur water at 645 ft.; salt water at 2,135 ft.

IMPERIAL OIL, LTD.—NO. 416

C. Fuller No. 1, lot 26, con. II, south of Egremont Rd., Warwick tp.

Location: 1,800 ft. S., 600 ft. E.
Elevation: 820+2 ft.
Driller: R. McMaster and Sons.
Completed: Nov. 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	136
Black shale	152
Hamilton	443
Brown and grey lime	665
Brown lime and gypsum	730
Sharp lime	806
Brown lime	869
Sharp lime	1,028
Brown and grey lime	1,115
Blue and brown lime and blue shale	1,404
Salt and lime	1,428
Blue shale	1,501
Salt, shale, and lime	1,555
Salt	1,742
Brown lime	1,860
Blue lime	1,893
Salt and lime	1,900
Salt and gypsum	1,930
Lime and gypsum	1,962
Brown lime	2,053
Lime and gypsum	2,092
Brown and grey lime	2,115
Grey lime	2,164
Black shale	2,177

Fresh water at 56 ft.; sulphur water at 562 ft.

IMPERIAL OIL, LTD.—NO. 384

G. and E. Hollingsworth No. 1, lot 12, con. III, south of Egremont Rd., Warwick tp.

Location: 2,000 ft. S., 100 ft. W.
Driller: R. McMaster and Sons.
Completed: June 25, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	46
Black shale	65
Hamilton	332
Brown lime	801
Sharp lime	889
Brown lime	930
Blue and brown lime	1,028
Blue lime and gypsum	1,040
Blue and brown lime	1,294
Lime and salt	1,302
Brown and blue lime	1,423
Salt	1,557
Brown lime	1,831

Gas at 1,760–1,831 ft.
Oil at 347, and 1,831 ft.
Fresh water at 45 ft.; sulphur water at 490 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 399

G. Hollingsworth No. 2, lot 12, con. III, south of Egremont Rd., Warwick tp.

Location: 1,800 ft. S., 50 ft. W.
Elevation: 725+6 ft.
Driller: Union Rotary Corp.
Completed: Aug. 11, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	53
Black shale	78
Hamilton	350
Brown lime	774
Sharp sand	939
Brown lime	1,046
Brown and blue lime and gypsum	1,265
Blue lime and gypsum	1,335
Salt and lime	1,364
Blue lime and gypsum	1,435
Salt	1,569
Brown and blue lime	1,646
Brown lime	2,128
Grey lime	2,233
Grey shale	2,250

Gas at 1,835–47 and 1,753–1,835 ft.
Oil at 1,847–81 and 1,881–1,911 ft.

IMPERIAL OIL, LTD.—No. 407

F. McManus No. 1, lot 13, con. III, south of Egremont Rd., Warwick tp.

Location: 1,300 ft. N., 100 ft. E.
Elevation: 731+2 ft. (cable rig).
731+6 ft. (rotary rig).
Driller: Stubble and Stubble.
Completed: Nov. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	58
Black shale	90
Hamilton	363
Grey and brown lime	728
Sharp lime	948
Brown lime	1,047
Lime and gypsum	1,070
Blue and brown lime	1,335
Salt and lime	1,364
Blue shale	1,429
Salt and lime	1,640
Brown lime	1,740
Gypsum	1,762
Brown lime	2,037

Show of oil at 1,922–88 ft.
Fresh water at 53 ft.; sulphur water at 487 ft.; salt water at 1,990 ft.

IMPERIAL OIL, LTD.—No. 415

C. Hollingsworth No. 3, lot 12, con. III, south of Egremont Rd., Warwick tp.

Location: 500 ft. S., 200 ft. W.
Elevation: 723+2 ft.
Driller: Stubble and Stubble.
Completed: Nov. 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	50
Black shale	85
Hamilton	349
Brown and grey lime and gypsum	778
Sharp, grey lime	952
Brown lime	1,043
Brown lime and gypsum	1,059
Blue and brown lime and gypsum	1,246
Brown lime and salt	1,257
Grey, blue and brown lime	1,330
Brown lime and salt	1,345
Brown and blue lime and blue shale	1,430
Salt and lime	1,440
Brown and grey lime	1,451
Brown lime and salt	1,700
Brown, grey, and blue lime	1,790
Grey and brown lime and gypsum	1,806
Brown and grey lime	2,090
Grey lime	2,173
Grey lime and blue shale	2,193

Show of oil at 1,871 ft.
Fresh water at 44 ft.; sulphur water at 474–83 ft.; salt water at 2,118 ft.

IMPERIAL OIL, LTD.—No. 398

A. Rawlings No. 1, lot 5, con. I, south of Egremont Rd., Warwick tp.

Location: 300 ft. N., 350 ft. E.
Elevation: 708+2 ft.
Driller: R. McMaster and Sons.
Completed: Aug. 27, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	67
Black shale	144
Hamilton	433
Grey and brown lime	865
Sharp lime	1,025
Brown and grey lime and blue shale	1,109
Shaly grey and brown lime and blue shale	1,295
Salt and shale	1,327
Brown lime	1,332
Salt and lime	1,425
Brown lime	1,488
Salt and lime	1,565
Lime and gypsum	1,599
Brown lime	1,607
Blue shale	1,627
Lime and salt	1,872
Brown lime	1,972
Grey shale	2,008
Brown lime	2,019
Salt and lime	2,107
Gypsum	2,121
Brown lime	2,340
Lime and shale	2,350

Sulphur water at 518 ft.

Lambton County—Continued

IMPERIAL OIL, LTD.—No. 414

A. Straatman No. 1, lot 12, con. III, south of Egremont Rd., Warwick tp.

Location: 2,000 ft. S., 658 ft. E.
Elevation: 720+2 ft.
Driller: Stubble and Stubble.
Completed: Nov. 18, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	60
Black shale	80
Hamilton	360
Grey and brown lime	777
Sharp, brown and grey lime	946
Brown lime	1,041
Brown lime and gypsum	1,112
Blue, brown, and grey lime	1,251
Brown lime and salt	1,260
Brown and grey lime	1,330
Grey lime and blue shale	1,448
Brown lime and salt	1,712
Brown lime	1,738
Grey lime	1,764
Grey and brown lime	1,826
Blue shale	1,841
Grey and brown lime and gypsum	1,866
Brown lime	2,126
Grey lime	2,193
Shale	2,197

Oil at 1,990 ft.
Fresh water at 47 ft.; sulphur water at 478 ft.; salt water at 2,040–53 ft.

CAN-AMERICAN SYNDICATE–UNION GAS CO. OF CAN., LTD.—No. 1

J. and W. McDougall No. 1, lot 30, con. VI, south of Egremont Rd., Warwick tp.

Location: 2,800 ft. N., 100 ft. W.
Elevation: 760+2 ft.
Driller: Meier and Shaw.
Completed: Oct. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	90
Hamilton	340
Brown lime	688
Sharp lime	846
Brown and grey lime	932
Brown lime and gypsum	988
Brown and blue lime	1,013
Brown and blue lime and gypsum	1,022
Brown lime	1,053
Brown and blue lime and gypsum	1,061
Brown, blue, and grey lime	1,494
Brown lime	1,536
Brown, blue, and grey lime	1,591
Lime and gypsum	1,615
Brown lime	1,868
Brown and grey lime	1,887
Grey lime	2,020
Grey shale	2,023

Show of oil at 342 and 390 ft.
Fresh water at 50 ft.; sulphur water at 342 and 390 ft.; salt water at 1,797 ft.

WILSON-SULLIVAN DEVELOPMENT CO.—No. 61

C. Davidson No. 3, lot 25, con. VI, south of Egremont Rd., Warwick tp.

Location: 2,400 ft. N., 225 ft. W.
Elevation: 802+1 ft.
Driller: Wilson-Sullivan Development Co.
Completed: Apr. 23, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	119
Grey lime	134
Upper soap	316
Middle lime	336
Lower soap	367
Dark-grey lime	369
Brown lime	408

Oil at 369 ft.
Fresh water at 119 ft.

Lincoln County

V. BARTLETT

V. Bartlett No. 2, lot 10, con. I, Caistor tp.

Location: 30 ft. N., 730 ft. W.
Driller: R. Mandley and Son.
Completed: Jan. 20, 1953.
Rock pressure: 49 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	46
Brown lime	120
Niagara	299
Shale	340
Clinton	370
Red Medina	407
Shale	458
White Medina	474
Red shale	476

Gas at 384 ft.
Fresh water at 53 ft.; black water at 173 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 137A

A. Beamer No. 3, lot 2, con. IV, Caistor tp.

Elevation: 630 ft. S. of C. L., 570 ft. W.
Driller: R. Mandley and Son.
Completed: Oct. 19, 1953.
Rock pressure: 101 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	56
Niagara	287
Shale	327
Clinton	356
Red Medina	397
Shale	427
Red shale	432
Grey shale	447
White Medina	498

Gas at 339, 371, and 451 ft.
Fresh water at 56 ft.; sulphur water at 176 ft.

Lincoln County—Continued

THE GRIMSBY NATURAL GAS CO., LTD.—No. 133A

R. Killins No. 1, lot 5, con. IV, Caistor tp.

Location: 320 ft. E., 380 ft. S.
Driller: R. Mandley and Son.
Completed: July 27, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	58
Niagara	286
Shale	333
Clinton	356
Red Medina	399
Shale	446
White Medina	459
Red shale	461

Show of gas at 453 ft.
Fresh water at 73 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 134A

R. Killins No. 2, lot 5, con. IV, Caistor tp.

Location: 1,350 ft. N., 400 ft. E.
Driller: R. Mandley and Son.
Completed: Aug. 24, 1953.
Rock pressure: 138 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	55
Niagara	280
Shale	318
Clinton	349
Red Medina	386
Shale	443
White Medina	452
Red shale	454

Gas at 353 ft.
Fresh water at 58 ft.; black water at 72 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 135A

R. Killins No. 3, lot 5, con. IV, Caistor tp.

Location: 990 ft. N., 945 ft. W.
Driller: R. Mandley and Son.
Completed: Sept. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	68
Niagara	286
Shale	327
Clinton	352
Red Medina	394
Grey shale	439
White Medina	459
Red shale	461

Fresh water at 71 ft.; sulphur water at 210 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 136A

R. Killins No. 4, lot 5, con. IV, Caistor tp.

Location: 2,200 ft. N., 450 ft. W.
Driller: R. Mandley and Son.
Completed: Sept. 28, 1953.
Rock pressure: 123 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	58
Niagara	284
Shale	324
Clinton	351
Red Medina	389
Grey shale	444
White Medina	456
Red shale	458

Gas at 371 ft.
Fresh water at 54 ft.; sulphur water at 197 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 132A

H. Sorge No. 1, lot 5, con. IV, Caistor tp.

Location: 300 ft. S., 300 ft. E.
Driller: R. Mandley and Son.
Completed: July 10, 1953.
Rock pressure: 75 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	75
Niagara	289
Shale	318
Clinton	351
Red Medina	391
Shale	439
White Medina	459
Red shale	460

Gas at 330 and 373 ft.
Fresh water at 82 ft.; black water at 210 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 131A

J. Zumstein No. 1, lot 1, con. IV, Caistor tp.

Location: 1,550 ft. N., 700 ft. W.
Driller: R. Mandley and Son.
Completed: Feb. 16, 1953.
Rock pressure: 86 lb.
Result: producing gas well.

Formation	Depth ft.
Surface:	51
Brown lime	70
Niagara	297
Shale	324
Clinton	353
Red Medina	398
Grey shale	446
White Medina	463
Red shale	505

Gas at 338 and 452 ft.
Fresh water at 56, 127, and 248 ft.

Lincoln County—Continued

THE GRIMSBY NATURAL GAS CO., LTD.

J. Zumstein No. 3, lot 1, con. IV, Caistor tp.

Location: 2,472 ft. S., 534 ft. E.
Driller: R. Mandley and Son.
Completed: Nov. 2, 1953.
Rock pressure: 125 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	59
Niagara	284
Shale	332
Clinton	354
Red Medina	403
Shale	434
Red Shale	438
Grey shale	453
White Medina	464
Red shale	504

Gas at 367 and 461 ft.
Fresh water at 66 ft.

THE GRIMSBY NATURAL GAS CO., LTD.—No. 139A

J. Zumstein No. 4, lot 1, con. IV, Caistor tp.

Location: 1,565 ft. S., 420 ft. E.
Driller: R. Mandley and Son.
Completed: Nov. 18, 1953.
Rock pressure: 98 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	56
Niagara	285
Shale	325
Clinton	352
Red Medina	393
Grey shale	443
White Medina	457
Red shale	497

Gas at 356 and 462 ft.
Fresh water at 57 ft.; black water at 80 ft.

THE GRIMSBY NATURAL GAS CO., LTD.

J. Zumstein No. 5, lot 1, con. IV, Caistor tp.

Location: 545 ft. S., 500 ft. E.
Driller: R. Mandley and Son.
Completed: Dec. 30, 1953.
Rock pressure: 108 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	79
Niagara	286
Shale	323
Clinton	350
Red Medina	388
Grey shale	443
White Medina	455
Red shale	495

Gas at 327, 354, 365, and 448 ft.
Fresh water at 59 and 155 ft.

Middlesex County

IMPERIAL OIL, LTD.

W. Arand No. 1, lot 8, con. II N., Adelaide tp.

Location: 1,500 ft. N., 60 ft. E.
Elevation: 758 ft.
Driller: R. McMaster and Sons.
Completed: Oct. 26, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	185
Hamilton	287
Grey and brown lime	637
Sharp sand and lime	877
Grey and brown lime	1,002
Blue shale and brown lime	1,230
Salt and lime	1,264
Blue shale	1,348
Salt, shale, brown lime, gypsum, and blue shale	1,574
Brown lime	1,644
Grey lime and shale	1,724
Salt and gypsum	1,755
Grey lime	1,790
Brown lime	1,832
Grey shale	1,850
Shale and gypsum	1,870
Brown and grey lime	1,998
Lime and shale	2,009
Shale	2,015

Fresh water at 40–90 and 165 ft.; sulphur water at 343 and 385 ft.

IMPERIAL OIL, LTD.—No. 381

A. Stephenson No. 1, lot 6, con. III, Caradoc tp.

Location: 750 ft. S., 1,010 ft. W.
Elevation: 757+2 ft.
Driller: Stubble and Stubble.
Completed: June 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	201
Soapstone	271
Grey lime	317
Brown lime	362
Grey lime	368
Brown and grey sharp lime	447
Brown and grey lime	592
Brown and grey lime, sharp	744
Brown and grey lime	831
Brown and grey lime and gypsum	930
Brown and grey lime	1,153
Brown lime and salt	1,270
Salt	1,305
Brown lime	1,340
Grey and brown lime	1,481
Brown lime and gypsum	1,499
Brown lime	1,553
Brown and grey lime	1,562
Brown lime	1,642
Grey lime	1,668
Grey lime and shale	1,678
Grey shale	1,684
Red shale	1,743
Blue shale	1,784
Blue shale and lime	1,804
Grey lime	1,832
Grey lime and shale	1,842
Blue and grey lime and red shale	1,853
Red shale	1,859

Fresh water at 196 ft.; black sulphur water at 390 ft.; salt water at 1,416, 1,499, and 1,660 ft.

Middlesex County—Continued

IMPERIAL OIL, LTD.—No. 371

J. Campbell No. 1, lot 19, con. II, Ekfrid tp.

Location: 2,100 ft. N., 100 ft. W.
Elevation: 736+2 ft.
Driller: English and Mullin.
Completed: Feb. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	108
Grey and black shale	120
Hamilton	402
Brown lime	530
Sharp sand	575
Brown lime	880
Sharp sand	940
Blue lime	1,070
Blue lime, shale, and gypsum	1,170
Brown lime	1,195
Blue shale, brown lime and gypsum	1,203
Brown and blue lime	1,295
Blue lime and gypsum	1,320
Blue and brown lime	1,596
Brown lime and gypsum	1,636
Brown lime	1,798
Grey lime	1,817
Grey shale	1,825

Fresh water at 105–20 ft.; black water at 486 ft.; salt water at 1,636 ft.

UNION GAS CO. OF CANADA, LTD.—METCALFE NO. 2

R. and G. Phillips No. 1, lot 1, con. XII, Metcalfe tp.

Location: 1,650 ft. S., 200 ft. W.
Elevation: 732+2 ft.
Driller: Meier and Shaw.
Completed: Dec. 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	125
Hamilton	405
Brown lime	783
Sharp lime	930
Brown lime	1,010
Lime and gypsum	1,115
Blue and brown lime	1,273
Blue and grey lime	1,390
Brown lime	1,446
Grey lime	1,500
Lime and gypsum	1,512
Brown lime	1,569
Brown and grey lime	1,617
Lime and gypsum	1,647
Brown lime	1,746
Brown and grey lime	1,783
Grey lime	1,808
Grey shale	1,811

Fresh water at 123 ft.; sulphur water at 530 ft.; sal t water at 1,430, 1,512, 1,665, and 1,758 ft.

UNION GAS CO. OF CANADA, LTD.—MOSALD NO. 54

D., J., and C. Dobie No. 1, lot 24, range III, south of Longwoods Rd., Ekfrid tp.

Location: 2,398 ft. N., 132 ft. E.
Elevation: 694+2 ft.
Driller: Meier and Shaw.
Completed: Sept. 15, 1953.
Rock pressure: 575 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	190
Hamilton	430
Brown lime	700
Sharp lime	880
Brown lime	920
Blue and brown lime	970
Lime and gypsum	1,010
Blue lime	1,050
Blue lime and gypsum	1,100
Brown and blue lime	1,200
Lime and gypsum	1,230
Brown and blue lime	1,300
Brown lime	1,317
Blue lime	1,323
Brown lime	1,353
Dark-grey lime	1,401
Lime and gypsum	1,407
Brown lime	1,431
Lime and gypsum	1,437
Brown and grey lime	1,467
Brown lime	1,479
Grey lime	1,497
Brown lime	1,602

Gas at 1,308–17 ft.
Sulphur water at 570 ft.; salt water at 1,515 ft.

UNION GAS CO. OF CAN., LTD.–IMPERIAL OIL, LTD.—No. 21

R. Werden No. 1, lot 21, con. XII, Metcalfe tp.

Location: 1,500 ft. S., 500 ft. W.
Elevation: 729+2 ft.
Driller: W. Kiser and Son.
Completed: Sept. 11, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	100
Black shale	160
Hamilton	475
Brown lime	710
Brown lime and gypsum	730
Brown lime	830
Sharp lime	1,015
Brown lime	1,105
Blue lime and gypsum	1,224
Brown, blue, and grey lime	1,313
Brown lime and gypsum	1,319
Brown, grey, and blue lime	1,451
Salt and lime	1,463
Brown lime	1,522
Grey lime	1,597
Brown lime	1,687
Grey lime	1,777
Brown lime	1,813
Grey lime	1,872
Grey shale	1,880

Fresh water at 90 ft.; sulphur water at 575 and 590 ft.; salt water at 1,747 ft.

Middlesex County—Continued

DOMINION PETROLEUM CO., LTD.

J. Gillies No. 1, lot 10, con. IV, Mosa tp.

Location: 1,600 ft. S., 930 ft. E.
Elevation: 710 ft.
Driller: E. McLaughlin.
Completed: July 16, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	112
Hamilton	317
Grey lime	330
Brown lime	350
Buff lime	374
Hard, grey lime	392
Brown lime	416
Hard, light-grey lime	429

Show of oil at 330 ft.
Fresh water at 112 ft.; sulphur water at 416–29 ft.

DOMINION PETROLEUM CO., LTD.

D. Secord No. 21, lot 6, con. VI, Mosa tp.

Location: 316 ft. S., 716 ft. E.
Elevation: 702+1 ft.
Driller: E. McLaughlin.
Completed: Sept. 15, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	81
Upper Soap	213
Middle lime	233
Lower soap	253
Grey lime	328
Soft, brown lime	347
Hard, grey lime	358
Soft, brown lime	373
Grey lime	380

Oil at 328–47 and 358–73 ft.

DOMINION PETROLEUM CO., LTD.

D. Secord No. 22, lot 6, con. VI, Mosa tp.

Location: 795 ft. S. of C. L., 525 ft. E.
Elevation: 702+1 ft.
Driller: E. McLaughlin.
Completed: Dec. 2, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	81
Upper soap	221
Middle lime	240
Lower soap	258
Hard, grey lime	330
Soft, brown lime	354
Hard, grey lime	358
Soft, brown lime	377
Grey lime	386

Oil at 330–54 and 358–77 ft.
Fresh water at 81 ft.

DOMINION PETROLEUM CO., LTD.

D. Secord No. 23, lot 6, con. VI, Mosa tp.

Location: 1,080 ft. S. of C. L., 520 ft. E.
Elevation: 699+1 ft.
Driller: E. McLaughlin.
Completed: Dec. 2, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	82
Upper soap	221
Middle lime	242
Lower soap	261
Hard, grey lime	325
Brown lime	330
Hard, grey lime	340
Soft, brown lime	352
Hard, grey lime	361
Soft, brown lime	379
Hard, grey lime	385

Oil at 264, 340–52, and 361–79 ft.
Fresh water at 83 ft.

DOMINION PETROLEUM CO., LTD.

D. Secord No. 24, lot 6, con. VI, Mosa tp.

Location: 145 ft. S. of C. L., 600 ft. E.
Elevation: 702+1 ft.
Driller: E. McLaughlin.
Completed: Dec. 29, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	82
Soap	211
Middle lime	230
Soap	247
Grey lime	325
Brown lime	330
Grey lime	335
Brown lime	345
Grey lime	355
Soft, brown lime	369
Grey and brown lime	384

Oil at 325–30 and 355–69 ft.
Fresh water at 82 ft.; salt water at 166 ft.

DOMINION PETROLEUM CO., LTD.

Walker Bros. No. 53, lot 6, con. VI, Mosa tp.

Location: 663 ft. N. of C. L., 425 ft. E.
Driller: E. McLaughlin.
Completed: Aug. 13, 1953.
Result: producing oil well.

Formation	Depth ft.
Surface	78
Soap and lime shells	208
Grey lime	228
Lower soap	258
Hard, grey lime	325
Brown lime	335
Hard, grey lime	337
Brown lime	374
Hard, grey lime	384

Oil at 325–35 and 337–67 ft
Fresh water at 80 ft.

Middlesex County—Continued

DRAWSON RED LAKE GOLD MINES, LTD.—No. 2

A. Carmichael No. 1, lot 13, range III S., Mosa tp.

Location: 2,700 ft. S., 642 ft. E.
Elevation: 650+2 ft.
Driller: R. McMaster and Sons.
Completed: Aug. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	200
Hamilton	343
Big lime	595
Sharp stone, white with grey	826
Lime	1,030
Blue shale	1,065
Lime and blue shale	1,340
Brown lime	1,348
Brown and blue lime	1,388
Blue lime	1,410
Gypsum	1,420
Brown lime	1,501

Gas at 1,334 and 1,422 ft.
Fresh water at 160 ft.; black water at 485 ft.

DRAWSON RED LAKE GOLD MINES, LTD.—No. 1

A. Marks No. 1, lot 13, range II S., Mosa tp.

Location: 1,000 ft. S., 166 ft. W.
Elevation: 685 ft.
Driller: R. McMaster and Sons.
Completed: June 30, 1953.
Rock pressure: 650 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	166
Soap	412
Brown lime	802
Sharp lime with gypsum	943
Ligh sand	967
Brown lime	1,027
Grey lime	1,058
Blue lime	1,163
Grey lime	1,192
Grey lime and gypsum	1,340
Brown lime	1,410
Grey lime	1,460
Lime and gypsum	1,473
Brown lime	1,477

Gas at 1,472 and 1,477 ft.
Fresh water at 140 ft.; black water at 575, 635, and 680 ft.

IMPERIAL OIL, LTD.—No. 418

J. Munro No. 1, lot 3, con. X, Mosa tp.

Location: 100 ft. N., 100 ft. E.
Elevation: 705+2 ft.
Driller: C. Carter.
Completed: Dec. 17, 1953
Result: dry hole.

Formation	Depth ft.
Surface	62
Black shale	156
Hamilton	370
Grey and brown lime, water sand, and gypsum	830
Grey lime and sharp sand	1,047
Grey and brown lime	1,130
Lime and shale	1,161
Shale, lime, and gypsum	1,447
Lime and shale	1,482
Brown lime	1,561
Blue shale	1,594
Brown lime	1,747
Grey lime and gypsum	1,769
Brown lime	1,819
Grey lime	1,890
Grey lime and shale	1,902

Show of gas at 162 ft.
Sulphur water at 162, 465, and 590 ft.; salt water at 1,634, 1,793, and 1,830 ft.; fresh water at 60 ft.

WESTERN ASHLEY MINERALS, LTD.—No. 8

E. Carman No. 1, lot 17, range I N., Mosa tp.

Location: 1,500 ft. S., 500 ft. E.
Driller: G. Rawlings.
Completed: Apr. 4, 1953.
Rock pressure: 660 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	111
Black shale	116
Hamilton	365
Brown lime	668
Sharp lime	928
Brown lime	994
Lime and gypsum	1,156
Brown and grey lime	1,295
Grey and blue lime	1,389
Brown lime	1,439
Brown and grey lime	1,478
Lime and gypsum	1,494
Brown lime	1,504
Brown lime and gypsum	1,510
Brown lime	1,530
Brown and grey lime	1,565
Grey lime and gypsum	1,577
Brown lime	1,732
Grey lime	1,755
Grey lime and shale	1,767
Blue shale	1,805
Shale and lime	1,811
Brown and grey lime	1,826
Shale and lime	1,837
Shale	1,857
Blue and pink shale	1,890
Blue and grey shale	1,923
Blue shale and grey shale	1,928
Blue and grey lime	1,946
Blue shale and lime	1,952
Blue and red shale	1,958
Red shale	1,962

Gas at 1,494, and 1,508 ft.
Sulphur water at 570 ft.

Norfolk County

DOMINION NATURAL GAS CO., LTD.

J. Church No. 1, lot 23, con. III, Charlotteville tp.

Location: 384 ft. N., 50 ft. E.
Driller: D. Werner.
Completed: Oct. 9, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	119
Lime	185
Flint	327
Sharp sand	376
Lime and shale	792
Niagara	998
Shale	1,064
Clinton	1,081
Red Medina	1,115
Grey shale	1,184
White Medina	1,195
Red shale	1,198

Show of gas at 1,065 and 1,070 ft.
Sulphur water at 131, 146, 287, and 756 ft.

DOMINION NATURAL GAS CO., LTD.

A. Fick No. 1, lot 20, con. VI, Charlotteville tp.

Location: 50 ft. S., 450 ft. W.
Driller: A. E. Hoover estate.
Completed: Feb. 16, 1953.
Rock pressure: 485 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	224
Lime and shale	335
Flint	435
Lime and shale	855
Niagara	1,077
Shale	1,130
Clinton	1,165
Red Medina	1,200
Grey shale	1,238
White Medina	1,253
Red shale	1,262

Gas at 1,147–60 ft.
Fresh water at 230 ft.; sulphur water at 490 ft.

DOMINION NATURAL GAS CO., LTD.

W. Hawryluf No. 1, lot 18, con. VII, Charlotteville tp.

Location: 2,200 ft. S., 1,000 ft. W.
Driller: H. Emerson.
Completed: Aug. 6, 1953.
Rock pressure: 385 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	218
Brown lime	330
Flint	463
Lime and shale	858
Niagara	1,085
Shale	1,142
Clinton	1,174
Red Medina	1,209
Shale	1,245
White Medina	1,272
Red shale	1,275

Gas at 1,155–62 ft.
Fresh water at 247 ft.; black water at 576 ft.

DOMINION NATURAL GAS CO., LTD.

W. Hawryluf No. 2, lot 18, con. VII, Charlotteville tp.

Location: 1,350 ft. N. of C. L., 50 ft. E. of C. L.
Driller: H. Emerson.
Completed: Oct. 13, 1953.
Rock pressure: 502 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	228
Brown lime	360
Flint	485
Lime and shale	880
Niagara	1,105
Shale	1,169
Clinton	1,209
Red Medina	1,244
Shale	1,283
White Medina	1,295
Red shale	1,304

Gas at 1,181–1,203 ft.
Fresh water at 229 ft.; sulphur water at 325 ft.

DOMINION NATURAL GAS CO., LTD.

S. Hudson No. 1, lot 19, con. VIII, Charlotteville

Location: 550 ft. N., 950 ft. E.
Driller: A. E. Hoover estate.
Completed: Sept. 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	193
Lime and shale	350
Flint	450
Lime and shale	840
Niagara	1,065
Shale	1,120
Clinton	1,150
Red Medina	1,190
Grey shale	1,234
White Medina	1,248
Red shale	1,252

Gas at 1,135 ft.
Fresh water at 196 ft.; sulphur water at 285 ft.

DOMINION NATURAL GAS CO., LTD.

M. Kent No. 1, lot 19, con. VII, Charlotteville tp.

Location: 50 ft. N., 1,230 ft. E.
Driller: A. E. Hoover estate.
Completed: June 6, 1953.
Rock pressure: 575 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	227
Lime and shale	339
Flint	459
Lime and shale	850
Niagara	1,073
Shale	1,135
Clinton	1,167
Red Medina	1,207
Grey shale	1,245
White Medina	1,260
Red shale	1,267

Gas at 1,142–48 ft.
Fresh water at 230 and 254 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

M. Kent No. 2, lot 19, con. VII, Charlotteville tp.

Location: 1,250 ft. N., 785 ft. W.
Driller: A. E. Hoover estate.
Completed: July 31, 1953.
Rock pressure: 540 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	228
Lime	340
Flint	450
Lime and shale	845
Niagara	1,075
Shale	1,132
Clinton	1,170
Red Medina	1,210
Grey shale	1,248
White Medina	1,252
Red shale	1,265

Gas at 1,170 ft.
Fresh water at 233 ft.; sulphur water at 390 ft.

DOMINION NATURAL GAS CO., LTD.

A. Kozak No. 1, lot 18, con. VII, Charlotteville tp.

Location: 1,150 ft. N., 50 ft. E.
Driller: H. Emerson.
Completed: June 15, 1953.
Rock pressure: 410 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	229
Brown lime	300
Flint	465
Lime and shale	860
Niagara	1,091
Shale	1,152
Clinton	1,177
Red Medina	1,217
Shale	1,255
White Medina	1,278
Red shale	1,280

Gas at 1,168–76 ft.
Fresh water at 250 ft.; sulphur water at 425 ft.

DOMINION NATURAL GAS CO., LTD.

A. Kozak No. 1, lot 19, con. VII, Charlotteville tp.

Location: 542 ft. N., 50 ft. E.
Driller: H. Emerson.
Completed: May 5, 1953.
Rock pressure: 490 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	238
Brown lime	338
Flint	462
Lime and shale	860
Niagara	1,080
Shale	1,140
Clinton	1,192
Red Medina	1,222
Shale	1,250
White Medina	1,264
Red shale	1,270

Gas at 1,150–63 ft.
Fresh water at 239 ft.; sulphur water at 400 ft.

DOMINION NATURAL GAS CO., LTD.

M. Landon No. 1, lot 18, con. VI, Charlotteville tp.

Location: 50 ft. S., 1,075 ft. W.
Driller: A. E. Hoover estate.
Completed: Apr. 9, 1953.
Rock pressure: 570 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	218
Lime and shale	335
Flint	460
Lime and shale	855
Niagara	1,097
Shale	1,143
Clinton	1,173
Red Medina	1,213
Grey shale	1,250
White Medina	1,265
Red shale	1,274

Gas at 1,160–68 ft.
Fresh water at 223 ft.; black water at 422 ft.

DOMINION NATURAL GAS CO., LTD.

H. Lichach No. 1, lot 18, con. VIII, Charlotteville tp.

Location: 1,600 ft. N., 500 ft. W.
Driller: H. Emerson.
Completed: Dec. 14, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	212
Brown lime	335
Flint	437
Lime and shale	832
Niagara	1,060
Shale	1,117
Clinton	1,153
Red Medina	1,193
Shale	1,228
White Medina	1,242
Red shale	1,245

Fresh water at 216 ft.; black water at 320 ft.

DOMINION NATURAL GAS CO., LTD.

M. and M. Margetan No. 2, lot 23, con. II, Charlotteville tp.

Location: 100 ft. N., 1,000 ft. E.
Driller: D. Werner.
Completed: Mar. 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	169
Lime	245
Flint	379
Sharp sand	435
Lime and shale	848
Niagara	1,053
Shale	1,119
Clinton	1,134
Red Medina	1,172
Grey shale	1,242
White Medina	1,255
Red shale	1,256

Sulphur water at 183, 379, and 860 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

W. Nagy and associates No. 1, lot 18, con. VIII, Charlotteville tp.

Location: 450 ft. N., 50 ft. W.
Driller: H. Emerson.
Completed: Apr. 1, 1953.
Rock pressure: 465 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	196
Brown lime	335
Flint	445
Lime and shale	845
Niagara	1,078
Shale	1,130
Clinton	1,167
Red Medina	1,207
Shale	1,245
White Medina	1,257
Red shale	1,270

Gas at 1,147–64 ft.
Fresh water at 204 ft.; sulphur water at 300 ft.

DOMINION NATURAL GAS CO., LTD.

F. Springman No. 1, lot 20, con. VII, Charlotteville tp.

Location: 1,150 ft. N., 450 ft. E.
Driller: A. E. Hoover estate.
Completed: Dec. 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	234
Lime	366
Flint	450
Lime and shale	856
Niagara	1,078
Shale	1,133
Clinton	1,168
Red Medina	1,208
Grey shale	1,250
White Medina	1,262
Red shale	1,268

Gas at 1,153 ft.
Fresh water at 244 ft.; black water at 565 ft.

DOMINION NATURAL GAS CO., LTD.

A. and M. Vasko No. 1, lot 23, con. II, Charlotteville tp.

Location: 50 ft. N. of road, 50 ft. W. of road.
Driller: D. Werner.
Completed: Jan. 10, 1953.
Rock pressure: 546 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	183
Lime	265
Flint	389
Sharp sand	442
Lime and shale	853
Niagara	1,068
Shale	1,135
Clinton	1,150
Red Medina	1,187
Grey shale	1,235

Gas at 1,183–84 ft.
Sulphur water at 205, 389, and 842 ft.

DOMINION NATURAL GAS CO., LTD.

A. and M. Vasko No. 2, lot 22, con. II, Charlotteville tp.

Location: 50 ft. N. of road, 1,250 ft. W. of road.
Driller: D. Werner.
Completed: May 18, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	193
Lime	265
Flint	400
Sharp sand	457
Lime and shale	869
Niagara	1,081
Shale	1,148
Clinton	1,165
Red Medina	1,201
Grey shale	1,270
White Medina	1,282
Red shale	1,286

Show of gas at 1,165 and 1,198 ft.
Sulphur water at 200 and 227 ft.; salt water at 960 ft.

DOMINION NATURAL GAS CO., LTD.

A. and M. Vasko No. 3, lot 23, con. III, Charlotteville tp.

Location: 250 ft. N., 475 ft. E.
Driller: D. Werner.
Completed: July 28, 1953.
Rock pressure: 520 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	137
Lime	220
Flint	343
Sharp sand	405
Lime and shale	812
Niagara	1,021
Shale	1,092
Clinton	1,107
Red Medina	1,143
Grey shale	1,194

Gas at 1,139–42 ft.
Sulphur water at 142, 155, and 343 ft.; black water at 905 ft.

DOMINION NATURAL GAS CO., LTD.

G. Gehring No. 2, lot 41, con. II, south of Talbot Rd., Middleton tp.

Location: 800 ft. S. of C. L., 1,100 ft. E.
Driller: H. Nauman.
Completed: Aug. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	177
Lime	308
Flint	410
Lime	462
Lime and shale	812
Niagara	1,043
Shale	1,104
Clinton	1,124
Red Medina	1,158
Grey shale	1,220
White Medina	1,232
Red shale	1,238

Gas at 1,123 ft.
Fresh water at 187 and 218 ft.; black water at 879 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

G. and J. Knabb, No. 1, lot 41, con. I, south of Talbot Rd., Middleton tp.

Location: 900 ft. N., 50 ft. E.
Driller: W. Hodgson.
Completed: Aug. 10, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	191
Lime	324
Flint	422
Lime	495
Shale	550
Lime and shale	820
Niagara	1,053
Shale	1,116
Clinton	1,136
Red Medina	1,176
Grey shale	1,231
White Medina	1,238
Red shale	1,242

Show of gas at 1,124 ft.
Fresh water at 200 ft.; sulphur water at 830 ft.; black water at 930 ft.

DOMINION NATURAL GAS CO., LTD.

M. and E. Lauwaert No. 1, lot 41, con. II, south of Talbot Rd., Middleton tp.

Location: 600 ft. S., 50 ft. W.
Driller: W. Hodgson.
Completed: Oct. 30, 1953.
Rock pressure: 535 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	184
Lime	318
Flint	420
Lime	485
Shale	558
Lime and shale	814
Niagara	1,052
Shale	1,111
Clinton	1,131
Red Medina	1,171
Grey shale	1,226
White Medina	1,232
Red shale	1,237

Gas at 1,128–30 and 1,135–36 ft.
Fresh water at 200 ft.; sulphur water at 470 ft.; black water at 855 ft.

DOMINION NATURAL GAS CO., LTD.

M. and E. Lauwaert No. 2, lot 42, con. II, south of Talbot Rd., Middleton tp.

Location: 3,100 ft. S., 1,000 ft. E.
Driller: H. Nauman.
Completed: Nov. 6, 1953.
Rock pressure: 480 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	180
Lime	317
Flint	414
Lime	467
Lime and shale	811
Niagara	1,043
Shale	1,102
Clinton	1,122
Red Medina	1,160
Grey shale	1,220
White Medina	1,232
Red shale	1,237

Gas at 1,121–22 ft.
Muddy water at 181 ft.; fresh water at 224 ft.; black water at 855 ft.; salt water at 990 ft.

DOMINION NATURAL GAS CO., LTD.

B. Pasler No. 3, lot 34, con. I, south of Talbot Rd., Middleton tp.

Location: 1,250 ft. N., 50 ft. W.
Driller: H. Nauman.
Completed: Mar. 10, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	182
Lime	317
Flint	410
Lime	447
Lime and shale	818
Niagara	1,068
Shale	1,128
Clinton	1,146
Red Medina	1,176
Grey shale	1,238
White Medina	1,247
Red shale	1,252

Fresh water at 186, 202, and 363 ft.; sulphur water at 867 ft.

DOMINION NATURAL GAS CO., LTD.

J. Plancke No. 1, lot 39, con. II, south of Talbot Rd., Middleton tp.

Location: 850 ft. N. of C. L., 50 ft. W.
Driller: E. Shank.
Completed: Oct. 30, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	209
Lime	335
Flint	445
Lime	511
Shale	601
Lime and shale	844
Niagara	1,076
Shale	1,132
Clinton	1,151
Red Medina	1,191
Grey shale	1,245
White Medina	1,249
Red shale	1,251

Fresh water at 217 ft.; sulphur water at 335 and 398 ft.

DOMINION NATURAL GAS CO., LTD.

R. Quance Co., Ltd. No. 1, lot 41, con. II, south of Talbot Rd., Middleton tp.

Location: 250 ft. N., 50 ft. E.
Driller: H. Nauman.
Completed: May 29, 1953.
Rock pressure: 400 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	196
Lime	320
Flint	423
Lime	478
Lime and shale	832
Niagara	1,065
Shale	1,127
Clinton	1,147
Red Medina	1,177
Grey shale	1,238
White Medina	1,249
Red shale	1,254

Gas at 1,136–37 and 1,141–42 ft.
Fresh water at 211 ft.; sulphur water at 251, 347, and 795 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

M. and I. Vanderheede No. 1, lot 41, con. II, south of Talbot Rd., Middleton tp.

Location: 200 ft. S., 50 ft. E.
Driller: W. Hodgson.
Completed: June 4, 1953.
Rock pressure: 575 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	180
Lime	315
Flint	415
Lime	475
Shale	565
Lime and shale	816
Niagara	1,048
Shale	1,106
Clinton	1,126
Red Medina	1,165
Grey shale	1,220
White Medina	1,228
Red shale	1,232

Gas at 1,114–20 ft.
Fresh water at 190 ft.; black water at 437 ft.; salt water at 830 ft.

DOMINION NATURAL GAS CO., LTD.

M. and J. Van De Walle No. 2, lot 40, con. II, south of Talbot Rd., Middleton tp.

Location: 1,550 ft. S., 50 ft. E.
Driller: W. Hodgson.
Completed: Feb. 20, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	187
Lime	315
Flint	427
Lime	462
Shale	552
Lime and shale	832
Niagara	1,058
Shale	1,117
Clinton	1,137
Red Medina	1,177
Shale	1,229
White Medina	1,237
Red shale	1,241

Fresh water at 190 and 320 ft.; sulphur water at 540 ft.; black water at 870 ft.

DOMINION NATURAL GAS CO., LTD.

M. and J. Van De Walle No. 3, lot 40, con. II, south of Talbot Rd., Middleton tp.

Location: 50 ft. S., 210 ft. E.
Driller: E. Shank.
Completed: Aug. 21, 1953.
Rock pressure: 585 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	191
Lime	320
Flint	416
Lime	477
Shale	569
Lime and shale	823
Niagara	1,061
Shale	1,121
Clinton	1,141
Red Medina	1,180
Grey shale	1,235
White Medina	1,240
Red shale	1,243

Gas at 1,136–38 ft.
Fresh water at 199 ft.; sulphur water at 330 ft.; black water at 376 ft.

GEORGE W. MORRIS

G. Zimmer No. 1, lot 35, con. II, north of Talbot Rd., Middleton tp.

Location: 225 ft. N., 100 ft. W.
Driller: W. McKillop.
Completed: Oct. 24, 1953.
Result: producing gas well.

Formation	Depth ft.
Surface	125
Brown lime	202
Grey and brown lime	258
Brown lime	280
Flint	389
Brown lime and shale	414
Brown lime, shale, and gypsum	424
Brown lime	435
Brown lime, shale, and gypsum	457
Grey lime, shale, and gypsum	483
Brown lime	499
Grey lime, shale, and gypsum	510
Brown lime	525
Brown lime and shale	613
Grey lime, shale, and gypsum	687
Brown lime, shale, and gypsum	703
Brown lime and shale	723
Grey and brown lime and shale	759
Guelph	784
Niagara	1,045
Shale	1,096
Clinton	1,120
Red shale	1,122

Gas at 1,102 and 1,116 ft.
Sulphur water at 129, 231, and 937 ft.

MOUNT PETROLEUM CORPORATION OF CANADA, LTD.

G. Robinson No. 1, lot 26, con. I, north of Talbot Rd., Middleton tp.

Location: 2,210 ft. S., 780 ft. E.
Driller: W. McKillop.
Completed: Aug. 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	156
Brown lime	182
Brown lime and shale	204
Brown lime	281
Brown lime and shale	316
Flint	433
Brown lime	449
Brown and grey lime and shale	459
Brown lime	470
Grey lime, shale, and gypsum	559
Brown lime and shale	663
Brown lime	684
Brown and grey lime, shale, and gypsum	761
Brown lime and shale	828
Brown lime	843
Guelph	868
Niagara	1,094
Shale	1,140
Clinton	1,156
Red shale	1,161
Red and blue shale	1,176
Red shale	1,192
Blue shale	1,223
Grey lime and shale	1,258
White Medina	1,263
Queenston red	1,264

Gas at 1,146–48 ft.
Sulphur water at 162, 217, and 868 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD

M. Cattle and M. Cross No. 2, lot 19, con. XIII, North Walsingham tp.

Location: 900 ft. S., 350 ft. E.
Driller: D. Irving.
Completed: Feb. 25, 1953.
Rock pressure: 495 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	206
Grey lime	355
Flint	485
Brown lime	525
Lime and shale	930
Niagara	1,155
Shale	1,212
Clinton	1,237
Red Medina	1,277
Shale	1,328
White Medina	1,332
Red shale	1,335

Gas at 1,227 and 1,229 ft.
Fresh water at 210 ft.; sulphur water at 245 ft.; black water at 365 ft.; salt water at 925 ft.

DOMINION NATURAL GAS CO., LTD.

J. Czarlau No. 2, lot 24, con. XIII, North Walsingham tp.

Location: 50 ft. N., 50 ft. E.
Driller: R. Mandley and Son.
Completed: Jan. 8, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	188
Lime	340
Flint	465
Lime and shale	885
Niagara	1,100
Shale	1,160
Clinton	1,182
Red Medina	1,202
Shale	1,268
White Medina	1,286
Red shale	1,288

Show of gas at 1,170 ft.
Black water at 200, 425, 890, and 1,000 ft.

DOMINION NATURAL GAS CO., LTD.

A. and O. De Vriendt No. 1, lot 16, con. XIII, North Walsingham tp.

Location: 200 ft. N., 50 ft. E. of C. L.
Driller: R. Nauman.
Completed: June 19, 1953.
Rock pressure: 557 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	237
Grey lime	396
Flint	528
Brown lime	604
Shale and gypsum	685
Lime and shale	955
Niagara	1,183
Shale	1,245
Clinton	1,268
Red Medina	1,299
Grey lime	1,353
White Medina	1,367
Red shale	1,371

Gas at 1,261–65 ft.
Sulphur water at 285 ft.; salt water at 1,085 ft.

DOMINION NATURAL GAS CO., LTD.

A. and O. De Vriendt No. 2, lot 16, con. XIII, North Walsingham tp.

Location: 1,320 ft. N., 50 ft. E. of C. L.
Driller: R. Nauman.
Completed: Oct. 12, 1953.
Rock pressure: 565 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	233
Grey lime	396
Flint	534
Brown lime	608
Shale and gypsum	690
Lime and shale	954
Niagara	1,179
Shale	1,238
Clinton	1,260
Red Medina	1,293
Grey shale	1,346
White Medina	1,361
Red shale	1,365

Gas at 1,256–58 ft.
Sulphur water at 283 and 402 ft.; salt water at 972 ft.; black water at 1,097 ft.

DOMINION NATURAL GAS CO., LTD.

H. De Walle No. 1, lot 3, con. XIV, North Walsingham tp.

Location: 350 ft. S., 50 ft. W.
Driller: E. Benner.
Completed: Mar. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	247
Brown lime	411
Flint	566
Lime and shale	1,001
Niagara	1,245
Grey shale	1,294
Clinton	1,319
Red Medina	1,334
Blue shale	1,404
White Medina	1,419
Red shale	1,424

Show of gas at 1,311–13 ft.
Fresh water at 254 ft.; black water at 302 ft.

DOMINION NATURAL GAS CO., LTD.

H. De Walle No. 2, lot 3, con. XIV, North Walsingham tp.

Location: 350 ft. S., 550 ft. E.
Driller: E. Benner.
Completed: July 27, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	251
Brown lime	415
Flint	574
Lime and shale	1,005
Niagara	1,250
Shale	1,301
Clinton	1,325
Red Medina	1,345
Shale	1,410
White Medina	1,425
Red shale	1,429

Show of gas at 1,316 ft.
Fresh water at 262 ft.; black water at 319 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

H. and M. De Walle No. 3, lot 3, con. XIV, North Walsingham tp.

Location: 2,400 ft. S., 900 ft. W.
Driller: E. Benner.
Completed: Dec. 9, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	256
Brown lime	426
Flint	579
Lime and shale	1,005
Niagara	1,255
Shale	1,307
Clinton	1,332
Red Medina	1,347
Shale	1,427
White Medina	1,432
Red shale	1,434

Fresh water at 264 ft.; black water at 305 ft.

DOMINION NATURAL GAS CO., LTD.

A. and J. Hagerman No. 1, lot 23, con. XII, North Walsingham tp.

Location: 1,200 ft. S., 50 ft. E.
Driller: R. Mandley and Son.
Completed: Apr. 2, 1953.
Rock pressure: 478 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	185
Lime	330
Flint	455
Lime and shale	885
Niagara	1,105
Shale	1,155
Clinton	1,178
Red Medina	1,204
Shale	1,264
White Medina	1,280
Red shale	1,284

Gas at 1,157 ft.
Fresh water at 180 ft.; sulphur water at 200 ft.; black water at 360 and 995 ft.

DOMINION NATURAL GAS CO., LTD.

A. and J. Hagerman No. 2, lot 23, con. XII, North Walsingham tp.

Location: 1,000 ft. N., 50 ft. E.
Driller: R. Mandley and Son.
Completed: Nov. 3, 1953.
Rock pressure: 500 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	150
Lime	320
Flint	435
Lime and shale	860
Niagara	1,090
Shale	1,145
Clinton	1,170
Red Medina	1,198
Shale	1,260
White Medina	1,270
Red shale	1,273

Gas at 1,156–62 ft.
Fresh water at 155 ft.; black water at 178, 375, and 1,000 ft.

DOMINION NATURAL GAS CO., LTD.

J. Howick No. 1, lot 18, con. XII, North Walsingham tp.

Location: 1,700 ft. N., 250 ft. W.
Driller: R. Nauman.
Completed Jan. 19, 1953.
Rock pressure: 590 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	204
Grey lime	368
Flint	482
Brown lime	550
Shale and gypsum	628
Lime and shale	922
Niagara	1,148
Shale	1,206
Clinton	1,235
Red Medina	1,263
Grey shale	1,323
White Medina	1,331
Red shale	1,335

Gas at 1,219–20 and 1,226 ft.
Sulphur water at 214, 267, and 374 ft.; salt water at 948 ft.

DOMINION NATURAL GAS CO., LTD.

R. Jamieson No. 1, lot 18, con. XII, North Walsingham tp.

Location: 1,500 ft. N., 975 ft. E.
Driller: R. Nauman.
Completed: June 8, 1953.
Rock pressure: 542 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	215
Grey lime	368
Flint	496
Brown lime	578
Shale and gypsum	648
Lime and shale	927
Niagara	1,148
Shale	1,210
Clinton	1,240
Red Medina	1,266
Grey shale	1,328
White Medina	1,336
Red shale	1,340

Gas at 1,224 and 1,226 ft.
Sulphur water at 218, 292, and 456 ft.; salt water at 951 ft.

DOMINION NATURAL GAS CO., LTD.

R. Jamieson No. 2, lot 19, con. XII, North Walsingham tp.

Location: 350 ft. N., 1,175 ft. E.
Driller: J. Nauman.
Completed: Aug. 27, 1953.
Rock pressure: 579 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	196
Grey lime	358
Flint	496
Brown lime	568
Shale and gypsum	646
Lime and shale	915
Niagara	1,136
Shale	1,199
Clinton	1,225
Red Medina	1,253
Grey shale	1,314
White Medina	1,322
Red shale	1,326

Gas at 1,211 and 1,217 ft.
Sulphur water at 197 and 274 ft.; salt water at 924 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

R. Jamieson No. 3, lot 19, con. XII, North Walsingham tp.

Location: 1,500 ft. N., 975 ft. E.
Driller: R. Nauman.
Completed: Nov. 16, 1953.
Rock pressure: 545 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	200
Grey lime	372
Flint	496
Brown lime	564
Shale and gypsum	642
Lime and shale	920
Niagara	1,136
Shale	1,199
Clinton	1,225
Red Medina	1,253
Grey shale	1,317
White Medina	1,323
Red shale	1,326

Gas at 1,213 and 1,216 ft.
Sulphur water at 267 and 562 ft.; salt water at 935 ft.

DOMINION NATURAL GAS CO., LTD.

J. and M. Konkoly No. 1, lot 22, con. XII, North Walsingham tp.

Location: 450 ft. S. of C. L., 50 ft. W.
Driller: R. Mandley and Son.
Completed: Aug. 17, 1953.
Rock pressure: 535 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	159
Lime	320
Flint	448
Lime and shale	870
Niagara	1,100
Shale	1,150
Clinton	1,177
Red Medina	1,200
Shale	1,262
White Medina	1,276
Red shale	1,280

Gas at 1,170 ft.
Fresh water at 168 ft.; sulphur water at 325 and 380 ft.; black water at 400 and 1,025 ft.

DOMINION NATURAL GAS CO., LTD.

G. Pepper No. 2, lot 17, con. XII, North Walsingham tp.

Location: 50 ft. S., 125 ft. E.
Driller: R. Nauman.
Completed: Jan. 3, 1953.
Rock pressure: 560 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	239
Grey lime	401
Flint	534
Brown lime	609
Shale and gypsum	677
Lime and shale	956
Niagara	1,182
Shale	1,241
Clinton	1,263
Red Medina	1,294
Grey shale	1,355
White Medina	1,363
Red shale	1,365

Gas at 1,254 and 1,260 ft.
Sulphur water at 247, 265, and 434 ft.; salt water at 982 ft.

DOMINION NATURAL GAS CO., LTD.

C. and M. Van Acker No. 1, lot 17, con. XIII, North Walsingham tp.

Location: 50 ft. S., 500 ft. W.
Driller: D. Irving.
Completed: May 12, 1953.
Rock pressure: 520 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	210
Grey lime	375
Flint	505
Brown lime	550
Lime and shale	925
Niagara	1,156
Shale	1,220
Clinton	1,240
Red Medina	1,280
Shale	1,329
White Medina	1,335
Red shale	1,343

Gas at 1,234 and 1,236 ft.
Sulphur water at 255, 395, and 950 ft.

DOMINION NATURAL GAS CO., LTD.

C. and M. Van Acker No. 2, lot 17, con. XIII, North Walsingham tp.

Location: 1,250 ft. S., 400 ft. W.
Driller: D. Irving.
Completed: Sept. 19, 1953.
Rock pressure: 500 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	217
Grey lime	375
Flint	500
Brown lime	550
Shale	640
Brown lime and shale	925
Niagara	1,155
Shale	1,220
Clinton	1,243
Red Medina	1,283
Blue shale	1,338
White Medina	1,342
Red shale	1,348

Gas at 1,234–38 ft.
Fresh water at 225 ft.; sulphur water at 320 ft.; black water at 405 ft.; salt water at 945 ft.

DOMINION NATURAL GAS CO., LTD.

C. and M. Van Acker No. 3, lot 17, con. XIII, North Walsingham tp.

Location: 2,450 ft. S., 400 ft. W.
Driller: D. Irving.
Completed: Dec. 24, 1953.
Rock pressure: 540 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	221
Grey lime	380
Flint	510
Brown lime	575
Shale	680
Brown lime and shale	930
Niagara	1,160
Shale	1,220
Clinton	1,242
Red Medina	1,282
Blue shale	1,337
White Medina	1,343
Red shale	1,350

Gas at 1,234 ft.
Black water at 223 and 240 ft.; salt water at 835 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

M. Van Louwe and L. Le Sage No. 1, lot 17, con. XIII, North Walsingham tp.

Location: 1,050 ft. N., 250 ft. E.
Driller: J. Reasor.
Completed: Apr. 7, 1953.
Rock pressure: 560 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	235
Grey lime	398
Flint	530
Brown lime	602
Shale and gypsum	686
Lime and shale	955
Niagara	1,176
Shale	1,234
Clinton	1,254
Red Medina	1,283
Grey lime	1,340
White Medina	1,356
Red shale	1,359

Gas at 1,247 ft.
Sulphur water at 237 and 276 ft.; salt water at 965 ft.

DOMINION NATURAL GAS CO., LTD.

A. and M. Verstraeton No. 1, lot 18, con. XII, North Walsingham tp.

Location: 1,625 ft. S., 450 ft. W.
Driller: R. Nauman.
Completed: Mar. 24, 1953.
Rock pressure: 510 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	211
Grey lime	368
Flint	495
Brown lime	564
Shale and gypsum	647
Lime and shale	922
Niagara	1,149
Shale	1,207
Clinton	1,234
Red Medina	1,262
Grey shale	1,328
White Medina	1,332
Red shale	1,336

Gas at 1,220–23 ft.
Sulphur water at 238, 368, and 952 ft.

DOMINION NATURAL GAS CO., LTD.

J. and R. Chanyi No. 1, lot 6, con. XIII, Windham tp.

Location: 50 ft. S., 50 ft. W.
Driller: S. Lyons.
Completed: Apr. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	144
Grey lime	184
Flint	237
Grey lime	288
Shale	360
Lime and shale	624
Niagara	954
Shale	1,006
Clinton	1,046
Red Medina	1,081
Shale	1,128
White Medina	1,132
Red shale	1,134

Gas at 1,013 ft.
Fresh water at 146, 188, 220, and 388 ft.

DOMINION NATURAL GAS CO., LTD.

A. and O. De Groot No. 1, lot 8, con. XIV, Windham tp.

Location: 50 ft. S. of C. L., 625 ft. W.
Driller: S. Lyons.
Completed: Aug. 26, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	136
Lime	230
Flint	300
Brown lime	350
Shale	435
Brown lime and shale	667
Niagara	993
Shale	1,049
Clinton	1,079
Red Medina	1,120
Shale	1,172
White Medina	1,180
Red shale	1,182

Gas at 1,061 ft.
Fresh water at 140 ft.; black water at 175, 275, and 300 ft.

DOMINION NATURAL GAS CO., LTD.

Smith and De Groot No. 5, lot 8, con. XIV, Windham tp.

Location: 1,700 ft. S., 650 ft. E.
Driller: I. Smelser.
Completed: Feb. 28, 1953.
Rock pressure: 596 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	158
Lime	213
Flint	311
Brown lime	378
Shale	460
Brown lime	559
Shale and lime	715
Niagara	994
Shale	1,048
Clinton	1,076
Red Medina	1,120
Grey shale	1,170
White Medina	1,178
Red shale	1,225

Gas at 1,171–78 ft.
Fresh water at 158 ft.; sulphur water at 200 ft.

DOMINION NATURAL GAS CO., LTD.

S. and E. Deming No. 1, lot 4, con. XIII, Windham tp.

Location: 50 ft. S., 1,700 ft. W.
Driller: W. Garringer.
Completed: Oct. 23, 1953.
Rock pressure: 470 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	139
Lime and shale	150
Flint	210
Lime and shale	565
Niagara lime	903
Shale	957
Clinton	992
Red Medina	1,010
Shale	1,072
White Medina	1,082
Red shale	1,083

Gas at 970–77 ft.
Fresh water at 130 and 137 ft.; sulphur water at 165 and 260 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

Dougherty and Winters No. 1, lot 10, con. XIII, Windham tp.

Location: 350 ft. S., 250 ft. E.
Driller: W. Garringer.
Completed: Sept. 30, 1953.
Rock pressure: 407 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	176
Lime and shale	215
Flint	310
Lime and shale	675
Niagara	985
Shale	1,045
Clinton	1,075
Red Medina	1,100
Blue shale	1,165
White Medina	1,171
Red shale	1,173

Gas at 1,056–61 ft.
Fresh water at 179 ft.; sulphur water at 302 ft.

DOMINION NATURAL GAS CO., LTD.

Dougherty and Winters No. 2, lot 10, con. XIII, Windham tp.

Location: 307 ft. S., 530 ft. W.
Driller: W. Garringer.
Completed: Dec. 19, 1953.
Rock pressure: 490 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	180
Lime and shale	225
Flint	320
Lime and shale	675
Niagara	985
Shale	1,050
Clinton	1,080
Red Medina	1,105
Blue shale	1,165
White Medina	1,178
Red shale	1,180

Gas at 1,063 ft.
Fresh water at 184 and 210 ft.; sulphur water at 295 ft.

DOMINION NATURAL GAS CO., LTD.

G. and J. Goodlet No. 1, lot 9, con. XII, Windham tp.

Location: 300 ft. N., 610 ft. E.
Driller: S. Lyons.
Completed: June 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	149
Brown lime	210
Flint	270
Brown lime	331
Shale	400
Lime and shale	651
Niagara	962
Grey shale	1,020
Clinton	1,051
Red Medina	1,096
Shale	1,144
White Medina	1,146
Red shale	1,150

Fresh water at 155 ft.; black water at 336, 375, and 550 ft.

DOMINION NATURAL GAS CO., LTD.

L. Goodlet No. 3, lot 8, con. XIII, Windham tp.

Location: 1,250 ft. S., 50 ft. N.
Driller: S. Lyons.
Completed: Jan. 27, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	136
Grey lime	180
Flint	246
Grey lime	310
Shale	382
Brown lime and shale	627
Niagara	975
Shale	1,030
Clinton	1,058
Red Medina	1,098
Shale	1,146
White Medina	1,150
Red shale	1,152

Fresh water at 138, 175, and 205 ft.

DOMINION NATURAL GAS CO., LTD.

I. Kleinman No. 1, lot 10, con. XIV, Windham tp.

Location: 1,200 ft. S., 250 ft. W.
Driller: W. Garringer.
Completed: July 21, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	184
Lime and shale	225
Flint	325
Lime and shale	685
Niagara	985
Shale	1,050
Clinton	1,075
Red Medina	1,100
Shale	1,165
White Medina	1,175
Red shale	1,177

Gas at 1,170 ft.
Fresh water at 187 ft.; sulphur water at 235 and 765 ft.

DOMINION NATURAL GAS CO., LTD.

J. McSloy No. 1, lot 10, con. XIV, Windham tp.

Location: 75 ft. S., 750 ft. E.
Driller: W. Garringer.
Completed: May 8, 1953.
Rock pressure: 500 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	186
Lime and shale	225
Flint	315
Lime and shale	685
Niagara	985
Shale	1,047
Clinton	1,075
Red Medina	1,100
Grey shale	1,165
White Medina	1,176
Red shale	1,178

Gas at 1,064 ft.
Fresh water at 190 ft.; sulphur water at 495 ft.

Norfolk County—Continued

DOMINION NATURAL GAS CO., LTD.

P. Mahu and S. Cebulak No. 1, lot 9, con. XIII, Windham tp.

Location: 250 ft. N., 650 ft. W.
Driller: W. Garringer.
Completed: Feb. 7, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	176
Lime and shale	220
Flint	300
Lime and shale	670
Niagara	970
Shale	1,040
Clinton	1,065
Red Medina	1,090
Blue shale	1,150
White Medina	1,162
Red shale	1,163

Gas at 1,050 ft.
Fresh water at 178 and 225 ft.; sulphur water at 850 ft.

DOMINION NATURAL GAS CO., LTD.

S. Perrish No. 2, lot 8, con. XIV, Windham tp.

Location: 1,360 ft. N., 700 ft. E.
Driller: S. Lyons.
Completed: Nov. 2, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	136
Brown lime	220
Flint	290
Brown lime	345
Shale	425
Lime and shale	650
Niagara	1,012
Shale	1,079
Clinton	1,113
Red Medina	1,153
Shale	1,212
White Medina	1,220
Red shale	1,223

Show of gas at 1,092–1,102 ft.
Fresh water at 150 ft.; black water at 200, 240, 285, and 350 ft.

O. HONSBERGER

O. Honsberger No. 1, lot 3, con. XIV, Windham tp.

Location: 60 ft. N., 220 ft. E.
Driller: G. Warren.
Completed: Oct. 10, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	106
Lime	130
Flint	230
Grey lime	275
Shale and gypsum	350
Lime and shale	545
Niagara	910
Shale	975
Clinton	1,012
Red Medina	1,020
Shale	1,088
White Medina	1,099
Red shale	1,103

Show of gas at 991 ft.
Fresh water at 124 and 150 ft.; black water at 320 ft.; salt water at 1,099 ft.

WALTER GAS SYNDICATE, LTD.

B. Cole No. 3, lot 9, con. XIV, Windham tp.

Location: 1,330 ft. S. of road, 360 ft. E.
Driller: S. Lyons and Son.
Completed: Mar. 15, 1953.
Rock pressure: 550 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	185
Brown lime	269
Flint	320
Brown lime	375
Shale	445
Lime and shale	713
Niagara	995
Shale	1,057
Clinton	1,087
Red Medina	1,127
Blue shale	1,178
White Medina	1,186
Red shale	1,217

Gas at 1,067 and 1,178–86 ft.
Fresh water at 190 ft.; black water at 375, 442, and 753 ft.

WALTER GAS SYNDICATE, LTD.

B. Cole No. 4, lot 9, con. XIV, Windham tp.

Location: 2,700 ft. S., 350 ft. E.
Driller: S. Lyons and Son.
Completed: May 4, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	166
Brown lime	240
Flint	315
Brown lime	370
Shale	440
Lime and shale	710
Niagara	995
Shale	1,051
Clinton	1,076
Red Medina	1,121
Blue shale	1,171
White Medina	1,178
Red shale	1,181

Fresh water at 167, 178, and 262 ft.; black water at 362 ft.

WALTER GAS SYNDICATE, LTD.

B. Cole No. 5, lot 9, con. XIV, Windham tp.

Location: 2,880 ft. S., 1,270 ft. E.
Driller: S. Lyons and Son.
Completed: Aug. 31, 1953.
Rock pressure: 620 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	142
Grey lime	232
Flint	300
Brown and grey lime	369
Shale	448
Lime and shale	689
Niagara	985
Shale	1,041
Clinton	1,067
Red Medina	1,109
Shale	1,159
White Medina	1,167
Red shale	1,195

Gas at 1,047 and 1,159–64 ft.
Fresh water at 143 and 183 ft.; black water at 259 and 298 ft.

Norfolk County—Continued

WALTER GAS SYNDICATE, LTD.

B. Cole No. 6, lot 9, con. XIV, Windham tp.

Location: 640 ft. N., 350 ft. W.
Driller: S. Lyons and Son.
Completed: Dec. 7, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	162
Lime	228
Flint	300
Brown and grey lime	360
Shale	432
Lime and shale	663
Niagara	1,024
Shale	1,051
Clinton	1,084
Red Medina	1,124
Blue shale	1,169
White Medina	1,176
Red shale	1,179

Fresh water at 164 and 214 ft.; black water at 248 and 298 ft.

WALTER GAS SYNDICATE, LTD.

S. Silverthorne No. 1, lot 19, con. XIII, Windham tp.

Location: 350 ft. N., 350 ft. E.
Driller: Walter Gas Syndicate, Ltd.
Completed: Mar., 1953.
Result: dry hole.

Formation	Depth ft.
Surface	140
Mixed lime	183
Flint	253
Shale	620
Niagara	970
Grey shale	1,025
Clinton	1,045
Red Medina	1,060
Blue shale	1,140
White Medina	1,145
Red shale	1,150

Fresh water at 142 and 147 ft.; sulphur water at 160 ft.

WALTER GAS SYNDICATE, LTD.

F. Mitchell No. 1, lot 21, con. VI, Woodhouse tp.

Location: 75 ft. N., 30 ft. E.
Driller: G. Schweyer.
Completed: June 9, 1953.
Rock pressure: 380 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	40
Flint	169
Lime and shale	530
Niagara	784
Shale	798
Guelph lime	815
Shale	860
Clinton	885
Red Medina	925
Blue shale	986
White Medina	998
Red shale	1,000

Gas at 865, 880, and 900–4 ft.
Sulphur water at 76 and 134 ft.

Oxford County

PRAIRIE GAS AND OIL CO., LTD.—No. 1

S. Rutherford No. 1, lot 25, con. IX, Dereham tp.

Location: 650 ft. S., 435 ft. E.
Driller: W. McKillop.
Completed: Apr. 27, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	241
Shelly broken rock	260
Brown and grey lime	272
Brown lime and shale	282
Brown and grey lime	344
Brown lime	396
Brown and grey lime	421
Brown lime	432
Flint	593
Brown lime	614
Brown and grey lime	624
Brown lime	636
Grey lime, shale, and gypsum	647
Brown and grey lime, shale, and gypsum	751
Brown lime and shale	804
Brown lime	820
Brown lime and shale	841
Brown lime	861
Brown lime and shale	942
Guelph	982
Niagara	1,002

Sulphur water at 252 and 559 ft.

SAMUEL SAPOWITCH—No. 1

R. Martin No. 1, lot 27, con. IX, South Norwich tp.

Location: 1,135 ft. S., 490 ft. E.
Driller: W. McKillop.
Completed: Dec. 7, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	135
Brown lime	223
Brown and grey lime	296
Flint	418
Grey and brown lime	428
Brown lime and shale	470
Brown lime and shale and gypsum	491
Grey lime, shale, and gypsum	557
Brown and grey lime, shale, and gypsum	577
Brown lime and shale	587
Brown lime	598
Brown lime, shale and gypsum	619
Brown lime	628
Brown lime and shale	664
Brown lime, shale, and gypsum	685
Grey lime, shale, and gypsum	695
Brown lime and shale	706
Grey lime, shale, and gypsum	737
Brown lime and shale	772
Brown lime	777
Grey and brown lime and shale	807
Brown lime and shale	832
Grey lime and shale	837
Guelph	865
Niagara	1,084
Shale	1,134
Clinton	1,154
Red Medina	1,156

Fresh water at 136 ft.; sulphur water at 234 and 1,017 ft.

Oxford County—Continued

TRI-COUNTY GAS AND OIL CO., LTD.

J. Stover No. 2, lot 22, con. XI, South Norwich tp.

Location: 980 ft. S., 585 ft. W.
Driller: W. McKillop.
Completed: Mar. 21, 1953.
Rock pressure: 520 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	79
Brown lime	101
Brown lime and shale	142
Grey and brown lime	156
Brown lime	219
Brown lime and shale	242
Flint	359
Brown lime	389
Grey lime	401
Brown lime	415
Grey lime, shale, and gypsum	486
Grey and brown lime and shale	502
Brown and grey lime and gypsum	585
Brown lime	595
Brown and grey lime and gypsum	656
Brown and grey lime	667
Brown lime	679
Brown lime and gypsum	690
Grey lime and gypsum	720
Brown lime	779
Guelph	794
Niagara	1,014
Shale	1,066
Clinton	1,087
Red Medina	1,108
Shale	1,136

Gas at 1,068 and 1,072 ft.
Sulphur water at 82, 116, and 871 ft.

DOMINION NATURAL GAS CO., LTD.

L. and E. Karn No. 1, lot 1, con. I, West Oxford tp.

Location: 50 ft. N., 250 ft. W.
Driller: R. Mandley and Son.
Completed: Mar. 18, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	234
Brown lime	297
Flint	366
Brown lime	416
Lime and shale	735
Grey lime and shale	1,155
Shale	1,174

Fresh water at 110 ft.; sulphur water at 260 and 460 ft.; black water at 580 and 781 ft.

DOMINION NATURAL GAS CO., LTD.

H. Ruckle No. 1, lot 16, con. II, West Oxford tp.

Location: 50 ft. S., 900 ft. E.
Driller: R. Mandley and Son.
Completed: June 15, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	146
Lime	246
Flint	316
Lime and shale	490
Lime	730
Brown, grey, and white lime	1,124
Shale	1,135

Sulphur water at 150 and 400 ft.; salt water at 742 ft.; black water at 756 ft.

DOMINION NATURAL GAS CO., LTD.

R. and D. Whatley No. 1, lot 12, con. I, West Oxford tp.

Location: 50 ft. S., 1,000 ft. E.
Driller: R. Mandley and Son.
Completed: Jan. 8, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	171
Brown lime	244
Flint	345
Brown lime	410
Lime and shale	749
Guelph lime	1,131
Shale	1,136

Fresh water at 81 and 210 ft.; sulphur water at 480 ft. salt water at 762 ft.

Simcoe County

GEORGE HEROUX IN TRUST[1]

D. Smith No. 1, lot 11, con. III, Essa tp.

Elevation: 750+2 ft.
Driller: E. Hirons.
Drilled: 1949.
Result: dry hole.

Formation	Depth ft.
Surface	400
Sherman Fall limestone	525
Rockland-Hull limestone	575
Leray limestone	595
Lowville limestone	665
Pamelia limestone	700
Precambrian granite	2,000

Show of gas at 710 ft.
Show of oil at 460, 680, 800, 915, and 1,178 ft.
Fresh water at 110, 210, and 290 ft.

[1]This well, begun in 1949, was not completed until 1950. Because of incomplete records the log has not been available for publication until the present volume.

Welland County

T. DI MARTILE AND MINERVA MINING SYNDICATE—NO. 1

D. Marr No. 1, lot 2, con. XII, Niagara River survey, Bertie tp.

Location: 1,320 ft. S., 1,200 ft. E.
Driller: T. Di Martile.
Completed: July 25, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	77
Lime and shale	376
Niagara	574
Shale	630
Clinton	660
Red Medina	727
Grey shale	756
White Medina	768
Red shale	783

Fresh water at 82 ft.; black water at 148 ft.

Welland County—Continued

T. Di Martile and Minerva Mining Syndicate—No. 2

D. Marr No. 2, lot 2, con. XII, Niagara River survey, Bertie tp.

Location: 1,320 ft. S., 2,280 ft. E.
Driller: T. Di Martile.
Completed: Sept. 2, 1953.
Rock pressure: 150 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	91
Lime and shale	398
Niagara	575
Shale	628
Clinton	660
Red Medina	723
Grey shale	749
White Medina	771
Red shale	850

Gas at 685, 723, and 763 ft.
Black water at 100 ft.

T. Di Martile and Minerva Mining Syndicate—No. 3

D. Marr No. 3, lot 2, con. XII, Niagara River survey, Bertie tp.

Location: 1,300 ft. S., 3,280 ft. W.
Driller: T. Di Martile.
Completed: Nov. 30, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	113
Lime and shale	390
Niagara	580
Shale	635
Clinton	667
Red Medina	734
Grey shale	763
White Medina	775
Red shale	845

Gas at 765 ft.
Fresh water at 117 ft.; black water at 155 ft.

Kin-Mar Gas Syndicate

T. Di Martile No. 1, lot 2, fronting upper end of Grand Island, Bertie tp.

Location: 500 ft. S., 1,720 ft. E.
Driller: T. Di Martile.
Completed: Oct. 19, 1953.
Rock pressure: 135 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	48
Lime and shale	317
Niagara	510
Shale	613
Clinton	644
Red Medina	707
Grey shale	745
White Medina	758
Red shale	765

Gas at 619 ft.
Fresh water at 54 ft.; black water at 118 ft.

Lapp Estate—No. 2

Lapp Estate No. 2, lot 13, con. VII, Niagara River survey, Bertie tp.

Location: 900 ft. N., 750 ft. W.
Driller: E. Nagel.
Completed: Apr., 1953.
Rock pressure: 65 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	89
Lime and shale	300
Niagara	500
Grey shale	590
Clinton	620
Red Medina	685
Grey shale	715
White Medina	750
Red shale	815

Gas at 8 and 735 ft.
Sulphur water at 89 ft.

Ralph M. Sider—No. 8

F. Lichtenberger No. 1, lot 12, con. VI, Niagara River survey, Bertie tp.

Location: 360 ft. S., 2,800 ft. W.
Driller: R. Sider.
Completed: Apr. 18, 1953.
Rock pressure: 70 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	46
Lime and shale	306
Niagara	506
Shale	598
Clinton	634
Red Medina	725
Grey shale	735
White Medina	762
Red shale	780

Gas at 606, 642, and 646 ft.
Sulphur water at 50 ft.; black water at 200 ft.

Ralph M. Sider—No. 9

F. Lichtenberger No. 2, lot 11, con. VI, Niagara River survey, Bertie tp.

Location: 1,690 ft. S., 60 ft. W.
Driller: R. Sider
Completed: June 5, 1953.
Rock pressure: 80 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	45
Lime and shale	310
Niagara	510
Shale	603
Clinton	640
Red Medina	733
Shale	743
White Medina	768
Red shale	771

Gas at 610 ft.
Fresh water at 48 ft.; black water at 200 ft.

Welland County—Continued

RALPH M. SIDER—No. 10

F. Lichtenberger No. 3, lot 12, con. VI, Niagara River survey, Bertie tp.

Location: 1,430 ft. S., 1,250 ft. W.
Driller: R. Sider.
Completed: Aug. 7, 1953.
Rock pressure: 65 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	49
Brown lime and shale	316
Niagara	508
Shale	604
Clinton	636
Red Medina	729
Shale	741
White Medina	768
Red shale	776

Gas at 611 and 643 ft.
Fresh water at 50 ft.; black water at 200 ft.

WELLAND COUNTY GAS SYNDICATE—No. 19

W. Eberly No. 1, lot 15, con. XIII, Niagara River survey, Bertie tp.

Location: 375 ft. S., 925 ft. W.
Driller: C. House.
Completed: Apr. 10, 1953.
Rock pressure: 80 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	54
Salina	285
Niagara	465
Rochester	536
Clinton	566
Red Medina	635
Manitoulin	658
White Medina	682
Queenston	690

Gas at 544 and 568 ft.
Fresh water at 56 ft.; black water at 75 and 300 ft.

CROWLAND GAS SYNDICATE—No. 41

G. Little No. 1, lot 16, con. V, Crowland tp.

Location: 900 ft. N., 75 ft. E.
Driller: W. Harris.
Completed: Apr. 15, 1953.
Rock pressure: 150 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	147
Lime and shale	220
Niagara	420
Grey shale	480
Clinton	518
Red Medina	575
Grey shale	597
White Medina	618
Red shale	668

Gas at 500 and 610 ft.
Fresh water at 160 ft.; black water at 220 ft.

CROWLAND GAS SYNDICATE—No. 43

J. Moore No. 1, lot 17, con. VI, Crowland tp.

Location: 1,450 ft. S., 50 ft. W.
Driller: W. Harris.
Completed: June, 1953.
Rock pressure: 125 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	138
Lime and shale	240
Niagara	445
Shale	492
Clinton	528
Red Medina	593
Shale	615
White Medina	632
Red shale	682

Gas at 500 and 625 ft.
Fresh water at 135 ft.; black water at 190 ft.

THE R. TIMMS CONSTRUCTION AND ENGINEERING, LTD.—No. 1

The R. Timms Construction and Engineering, Ltd. No. 1, lot 27, con. VI, Crowland tp.

Location: 230 ft. S., 157 ft. E.
Driller: Emerson and Rose.
Completed: July 9, 1953.
Rock pressure: 200 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	113
Shale	229
Niagara	426
Shale	469
Clinton	506
Red Medina	553
Grey shale	589
White Medina	613
Red shale	648

Gas at 481 ft.
Fresh water at 82 and 114 ft.; black water at 238 ft.

CROWLAND GAS SYNDICATE—No. 45

M. Wolf No. 1, lot 19, con. III, Crowland tp.

Location: 1,300 ft. S., 400 ft. W.
Driller: W. Harris.
Completed: Sept. 10, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	109
Lime and shale	190
Niagara	385
Shale	435
Clinton	470
Red Medina	525
Grey shale	560
White Medina	575
Red shale	577

Show of gas at 475 and 568 ft.
Fresh water at 112 ft.; black sulphur water at 160 ft.

Welland County—Continued

CROWLAND GAS SYNDICATE—No. 40

J. R. Bryan No. 2, lot 10, con. V, Humberstone tp.

Location: 2,350 ft. S., 1,225 ft. E.
Driller: Crowland Gas Syndicate.
Completed: Mar. 15, 1953.
Rock pressure: 110 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	57
Shale	278
Niagara	478
Shale	556
Clinton	594
Red Medina	649
Grey shale	679
White Medina	701
Red shale	763

Gas at 563–64, 602–4, and 690–92 ft.
Fresh water at 59 and 64 ft.; black water at 314 ft.

CROWLAND GAS SYNDICATE—No. 44

L. Ceeslak No. 2, lot 9, con. V, Humberstone tp.

Location: 1,930 ft. N., 1,175 ft. W.
Driller: Crowland Gas Syndicate.
Completed: July 11, 1953.
Rock pressure: 300 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	55
Shale	278
Niagara	475
Shale	554
Clinton	595
Red Medina	650
Shale	684
White Medina	701

Gas at 567, 601, 606, and 691–700 ft.
Fresh water at 59 and 164 ft.; sulphur water at 304 ft.

CROWLAND GAS SYNDICATE—No. 42

D. King No. 1, lot 15, con. IV, Humberstone tp.

Location: 2,020 ft. S. of railway, 50 ft. W.
Driller: E. Nagel.
Completed: July 16, 1953.
Rock pressure: 150 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	60
Lime and shale	300
Niagara	500
Grey shale	580
Clinton	612
Red Medina	667
Grey shale	697
White Medina	720
Red shale	745

Gas at 583, 624, and 642 ft.
Fresh water at 65 ft., black sulphur water at 330 ft.

CROWLAND GAS SYNDICATE—No. 47

M. Koabel No. 1, lot 9, con. V, Humberstone tp.

Location 800 ft. N., 360 ft. W.
Driller: Crowland Gas Syndicate.
Completed: Nov. 26, 1953.
Rock pressure: 250 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	69
Lime and shale	295
Niagara	495
Grey shale	560
Clinton	592
Red Medina	662
Grey shale	687
White Medina	707
Red shale	782

Gas at 570, 595, and 692 ft.
Fresh water at 70 ft.

CROWLAND GAS SYNDICATE—No. 46

C. Kramer No. 1, lot 16, con. IV, Humberstone tp.

Location: 1,620 ft. S., 10 ft. W.
Driller: E. Nagel and Son.
Completed: Aug. 21, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	54
Lime and shale	300
Niagara	500
Grey shale	580
Clinton	612
Red Medina	662
Grey shale	697
White Medina	720
Red shale	721

Show of gas at 588 and 720 ft.
Fresh water at 50 ft.

CROWLAND GAS SYNDICATE—No. 39

M. Stauth No. 2, lot 10, con. V, Humberstone tp.

Location: 1,922 ft. N., 100 ft. E.
Driller: Crowland Gas Syndicate.
Completed: Feb. 15, 1953.
Rock pressure: 165 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	70
Shale	280
Niagara	478
Shale	555
Clinton	594
Red Medina	649
Grey shale	680
White Medina	694
Red shale	753

Gas at 562–65, 598–600, and 682–86 ft.
Fresh water at 72 and 76 ft.; black water at 322 ft.

Welland County—Continued

DELL-BURN GAS CO., LTD.

E. Salsbury No. 4, lot 31, con. III, Humberstone tp.

Location: 2,000 ft. N., 3,000 ft. W.
Driller: Knight and Neale.
Completed: Feb. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	69
Gravel and shell rock	74
Lime and shale	347
Niagara	567
Shale	627
Clinton	667
Red Medina	722
Grey shale	756
White Medina	767
Red shale	769

Fresh water at 69 and 90 ft.; sulphur water at 160 and 230 ft.

DELL-BURN GAS CO., LTD.

E. Salsbury No. 5, lot 30, con. III, Humberstone tp.

Location: 100 ft. S., 1,900 ft. W.
Driller: Knight and Neale.
Completed: Mar. 24, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	100
Lime and shale	338
Niagara	565
Shale	625
Clinton	664
Red Medina	715
Grey shale	750
White Medina	761
Red shale	763

Gas at 668 ft.
Fresh water at 90 ft.; sulphur water at 107, 291, and 390 ft.

EDMUND GAS SYNDICATE—No. 3

C. Geyer No. 3, lot 9, con. IV, Humberstone tp.

Location: 2,650 ft. S., 350 ft. W.
Driller: K. Held and Son.
Completed: May 8, 1953.
Rock pressure: 115 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	70
Lime and shale	334
Niagara	524
Rochester	583
Clinton	614
Red Medina	678
Grey shale	709
White Medina	730
Red shale	760

Gas at 592, 635, and 758 ft.
Fresh water at 77 ft.; black water at 224 ft.

MEDINA GAS SYNDICATE—No. 3

C. Heximer No. 1, lot 7, con. V, Humberstone tp.

Location: 85 ft. S., 360 ft. W.
Driller: Crowland Gas Syndicate.
Completed: Jan. 23, 1953.
Rock pressure: 125 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	65
Lime and shale	230
Niagara	480
Grey shale	532
Clinton	568
Red Medina	633
Grey shale	660
White Medina	677
Red shale	720

Gas at 670 ft.
Fresh water at 40 ft.; black sulphur water at 235 ft.

RAYMOND NEFF—No. 6

G. Neff No. 2, lot 6, con. II, Humberstone tp.

Location: 4,450 ft. N., 660 ft. E.
Driller: K. Held and Son.
Completed: Feb. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	450
Niagara	601
Rochester	687
Clinton	718
Red Medina	783
Grey shale	809
White Medina	830
Red shale	832

RAYMOND NEFF—No. 5

G. Perry No. 2, lot 5, con. II, Humberstone tp.

Location: 3,100 ft. N., 500 ft. W.
Driller: K. Held and Son.
Completed: Jan. 15, 1953.
Rock pressure: 38 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	20
Lime and shale	405
Niagara	604
Rochester	690
Clinton	720
Red Medina	785
Grey shale	814
White Medina	832
Red shale	880

Gas at 827 ft.
Fresh water at 40 ft.; black water at 46 ft.

Welland County—Continued

ROBERT RAE—No. 3

R. Rae No. 3, lot 7, con. IV, Humberstone tp.

Location: 300 ft. N., 330 ft. W.
Driller: K. Held and Son.
Completed: Apr. 8, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	67
Lime and shale	335
Niagara	523
Rochester	583
Clinton	613
Red Medina	674
Grey shale	704
White Medina	727
Red shale	770

Gas at 519 and 709 ft.
Fresh water at 88 ft.; black water at 250 ft.

SHERKSTON GAS SYNDICATE—No. 11

M. Durliat No. 1, lot 7, con. V, Humberstone tp.

Location: 1,400 ft. N., 350 ft. W.
Driller: K. Held and Son.
Completed: Dec. 18, 1953.
Rock pressure: 180 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	52
Lime and shale	261
Niagara	485
Rochester	550
Clinton	585
Red Medina	644
Grey shale	675
White Medina	688

Gas at 686 ft.
Fresh water at 65 ft.; black water at 215 ft.

SHERKSTON GAS SYNDICATE—No. 10

M. Durliat No. 3, lot 7, con. IV, Humberstone tp.

Location: 1,300 ft. S., 1,000 ft. W.
Driller: K. Held and Son.
Completed: Nov. 5, 1953.
Rock pressure: 180 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	75
Lime and shale	315
Niagara	505
Rochester	569
Clinton	601
Red Medina	666
Grey shale	697
White Medina	713
Red shale	722

Gas at 680 ft.
Fresh water at 92 ft.; black water at 240 ft.

N. SIDER

J. Johnstone No. 1, lot 1, con. I, Humberstone tp.

Location: 50 ft. S., 330 ft. W.
Driller: K. Held and Son.
Completed: Mar. 12, 1953.
Rock pressure: 80 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	12
Flint	97
Lime and shale	460
Niagara	658
Rochester	749
Clinton	781
Red Medina	856
Grey shale	880
White Medina	894
Red shale	895

Gas at 796 ft.
Sulphur water at 52 and 292 ft.

STAR GAS SYNDICATE

F. Kucman No. 2, lot 18, con. IV, Humberstone tp.

Location: 75 ft. S., 650 ft. W.
Driller: R. Sider.
Completed: Feb. 20, 1953.
Rock pressure: 250 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	61
Brown lime and shale	313
Niagara lime	495
Grey shale	570
Clinton	604
Red Medina	684
Grey shale	694
White Medina	717
Queenston red shale	801

Gas at 614 and 710 ft.
Fresh water at 63 ft.; black water at 100 ft.

STAR GAS SYNDICATE

F. Kucman No. 3, lot 18, con. IV, Humberstone tp.

Location: 1,100 ft. S., 350 ft. W.
Driller: K. Held and Son.
Completed: Aug. 28, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	57
Lime and shale	287
Niagara	487
Rochester	570
Clinton	602
Red Medina	656
Grey shale	688
White Medina	703
Red shale	760

Show of gas at 708 ft.
Fresh water at 60 ft.

Welland County—Continued

F. WEAVER—No. 1

F. Weaver No. 1, lot 19, con. I, Humberstone tp.

Location: 500 ft. S. of railway, 375 ft. W.
Driller: K. Held.
Completed: July 27, 1953.
Rock pressure: 100 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	6
Flint	76
Lime and shale	429
Niagara	627
Rochester	691
Clinton	724
Red Medina	799
Grey shale	823
White Medina	836
Red shale	890

Gas at 770 and 828 ft.
Fresh water at 32 ft.; sulphur water at 240 ft.

L. WEAVER—No. 1

L. Weaver No. 1, lot 18, con. I, Humberstone tp.

Location: 3,000 ft. S. of railway, 30 ft. E.
Driller: K. Held and Son.
Completed: Sept. 30, 1953.
Rock pressure: 250 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	8
Flint	78
Lime and shale	424
Niagara	626
Rochester	692
Clinton	724
Red Medina	795
Grey shale	822
White Medina	835
Red shale	880

Gas at 770 ft.
Fresh water at 55 ft.; black water at 189 ft.

R. TIMMS—No. 1

Timmsdale Farms No. 1, lot 4, con. VIII, Pelham tp.

Location: 400 ft. S. of highway, 356 ft. W.
Driller: Emerson and Rose.
Completed: Apr. 30, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	300
Niagara	426
Shale	473
Clinton	505
Red Medina	543
Shale	580
White Medina	607
Red shale	615

Fresh water at 120, 160, and 301 ft.

E. S. FOX

Gainor Bros. No. 2, lot 225, Thorold tp.

Location: 1,435 ft. N., 560 ft. E.
Driller: Emerson and Rose.
Completed: Sept. 4, 1953.
Rock pressure: 155 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	72
Shale	120
Niagara	305
Shale	355
Clinton	391
Red Medina	442
Grey shale	485
White Medina	501

Gas at 363 ft.
Fresh water at 72, 86, and 124 ft.

E. S. FOX

Gainor Bros. No. 3, lot 225, Thorold tp.

Location: 475 ft. N., 360 ft. E.
Driller: Emerson and Rose.
Completed: Oct. 31, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	92
Shale	118
Niagara	325
Shale	384
Clinton	413
Red Medina	460
Grey shale	502
White Medina	523
Red shale	526

Fresh water at 86 and 97 ft.; black water at 205 ft.

ELGIN STEWART—No. 2

D. Faragalli No. 1, lot 232, Thorold tp.

Location: 350 ft. N., 1,250 ft. E.
Driller: E. Jarvis.
Completed: Oct. 13, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	102
Niagara	346
Shale	410
Clinton	440
Red Medina	490
Shale	520
White Medina	540

Gas at 510 ft.
Fresh water at 101 ft.; sulphur water at 215 ft.

ELGIN STEWART—No. 1

I. and E. Kukan No. 1, lot 224, Thorold tp.

Location: 350 ft. N., 500 ft. E.
Driller: E. Stewart.
Completed: Sept. 9, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	77
Niagara	300
Shale	360
Clinton	390
Red Medina	450
Shale	480
White Medina	500
Red shale	525

Gas at 499 ft.
Fresh water at 77 ft.; sulphur water at 195 ft.

Welland County—Continued

DELL-BURN GAS CO., LTD.

Provincial Gas Co. No. 1, lot 7, con. IV, Wainfleet tp.

Location: 3,000 ft. S., 360 ft. E.
Driller: Knight and Neale.
Completed: May 29, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	146
Lime and shale	298
Niagara	519
Shale	579
Clinton	615
Red Medina	670
Grey shale	699
White Medina	719
Red shale	721

Show of gas at 626 and 717 ft.
Fresh water at 146 ft.; sulphur water at 230 and 298 ft.

DELL-BURN GAS CO., LTD.

H. Timmerman No. 1, lot 1, con. IV, Wainfleet tp.

Location: 4,900 ft. S., 150 ft. W.
Driller: Besley and Root.
Completed: Dec. 30, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	82
Shale and lime	310
Niagara	535
Shale	595
Clinton	631
Red Medina	681
Shale	721
White Medina	733
Red shale	738

Fresh water at 82 ft.; sulphur water at 340 ft.

DELL-BURN GAS CO., LTD.

C. Willson No. 1, lot 10, con. III, Wainfleet tp.

Location: 350 ft. S., 2,000 ft. W.
Driller: Besley and Root.
Completed: Oct. 30, 1953.
Rock pressure: 280 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	142
Shale and lime	300
Niagara	525
Shale	585
Clinton	621
Red Medina	671
Grey shale	711
White Medina	725
Red shale	730

Gas at 645 ft.
Fresh water at 140 and 150 ft.; sulphur water at 325 ft.

DOMINION NATURAL GAS CO., LTD.

A. Barduk No. 1, lot 32, con. II, Wainfleet tp.

Location: 300 ft. S., 50 ft. E.
Driller: Emerson and Rose.
Completed: Dec. 11, 1953.
Rock pressure: 94 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	113
Shale	363
Niagara	556
Shale	619
Clinton	653
Red Medina	707
Grey shale	751
White Medina	765
Red shale	768

Gas at 665 ft.
Fresh water at 110 and 114 ft.; black water at 240 ft.

DOMINION NATURAL GAS CO., LTD.

E. Miskolczi No. 1, lot 34, con. II, Wainfleet tp.

Location: 1,225 ft. S., 100 ft W.
Driller: Emerson and Rose.
Completed: Oct. 17, 1953.
Rock pressure: 145 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	127
Shale	370
Niagara	560
Shale	628
Clinton	657
Red Medina	709
Grey shale	751
White Medina	764
Red shale	831

Gas at 757 ft.
Fresh water at 115 and 128 ft.; black water at 415 ft.

DOMINION NATURAL GAS CO., LTD.

J. and E. Vida No. 3, lot 33, con. II, Wainfleet tp.

Location: 1,500 ft. S., 100 ft. W.
Driller: Emerson and Rose.
Completed: Aug. 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	123
Shale	365
Niagara	568
Shale	629
Clinton	661
Red Medina	710
Grey shale	754
White Medina	768
Red shale	776

Gas at 632 and 672 ft.
Fresh water at 120 and 124 ft.; black water at 425 ft.

Welland County—Continued

THE KILLINS GAS SYNDICATE—No. 3

K. Overholt No. 1, lot 13, con. IV, Wainfleet tp.

Location: 350 ft. S., 75 ft. E.
Driller: Besley and Root.
Completed: Sept. 3, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	152
Lime and shale	232
Niagara	480
Shale	550
Clinton	586
Red Medina	636
Shale	677
White Medina	684
Red shale	689

Fresh water at 152 ft.; sulphur water at 380 ft.

LINCOLN NATURAL GAS CO., LTD.—No. 20

N. Jones No. 1, lot 55, con. VII, Wainfleet tp.

Location: 350 ft. N., 540 ft. E.
Driller: Patterson and Culver.
Completed: Apr. 30, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	78
Lime and shale	150
Niagara	370
Shale	415
Clinton	448
Red Medina	488
Shale	530
White Medina	546
Red shale	548

Show of gas at 485 ft.
Fresh water at 75 and 100 ft.; sulphur water at 130 ft.

LINCOLN NATURAL GAS CO., LTD.—No. 21

R. Sensbaugh No. 3, lot 59, con. VIII, Wainfleet tp.

Location: 100 ft. S., 500 ft. W.
Driller: Patterson and Culver.
Completed: Jan. 6, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	75
Lime and shale	120
Niagara	360
Shale	415
Clinton	445
Red Medina	480
Shale	530
White Medina	545
Red shale	550

Show of gas at 462 ft.
Fresh water at 76 ft.; sulphur water at 105, 240, and 340 ft.

C. SIMON—No. 1

C. Simon No. 1, lot 7, con. II, Wainfleet tp.

Location: 900 ft. N., 1,500 ft. W.
Driller: K. Held.
Completed: June 19, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	1
Lime and shale	400
Niagara	600
Rochester	677
Clinton	714
Red Medina	767
Grey shale	806
White Medina	819
Red shale	835

Fresh water at 55 ft.; black water at 170 ft.

MANOCK GAS SYNDICATE—No. 10

J. Kane No. 1, lot 16, con. V, Willoughby tp.

Location: 1,200 ft. S., 50 ft. W.
Driller: O. Culver.
Completed: May 25, 1953.
Rock pressure: 170 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	80
Lime and shale	120
Niagara	320
Shale	379
Clinton	406
Shale	409
Red Medina	472
Shale	496
White Medina	514
Red shale	575

Gas at 386 and 466 ft.
Fresh water at 92 ft.; black water at 305 ft.

MANOCK GAS SYNDICATE—No. 11

C. Somerville No. 1, lot 16, con. IV, Willoughby tp.

Location: 500 ft. S., 950 ft. E.
Driller: O. Culver.
Completed: July 15, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	77
Lime and shale	115
Niagara	315
Shale	373
Clinton	400
Shale	406
Red Medina	466
Shale	489
White Medina	507
Red shale	511

Sulphur water at 92 ft.; black water at 280 ft.

Welland County—Continued

ROY MORNINGSTAR

R. Morningstar No. 1, lot 2, con. III, Willoughby tp.

Location: 1,450 ft. N., 30 ft. E.
Driller: O. Culver.
Completed: Mar. 17, 1953.
Rock pressure: 50 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	53
Lime and shale	215
Niagara	415
Shale	489
Clinton	518
Red Medina	581
Shale	611
White Medina	630
Red shale	690

Gas at 624 ft.
Fresh water at 62 ft.; black water at 310 ft.

B. SIMONS

B. Simons No. 1, lot 3, con. I, Willoughby tp.

Location: 235 ft. N., 200 ft. W.
Driller: O. Culver.
Completed: Oct. 27, 1953.
Rock pressure: 60 lb.
Result: producing gas well.

Formation	Depth ft.
Surface	38
Lime and shale	220
Niagara	427
Shale	487
Clinton	518
Red Medina	583
Shale	608
White Medina	630
Red shale	680

Gas at 575 and 627 ft.
Fresh water at 40 and 70 ft.; black water at 315 ft.

J. F. WALSH

F. King No. 1, lot 6, con. V, Willoughby tp.

Location: 1,980 ft. N., 30 ft. W.
Driller: O. Culver.
Completed: Jan. 5, 1953.
Result: dry hole.

Formation	Depth ft.
Surface	52
Lime and shale	203
Niagara	403
Grey shale	459
Clinton	488
Shale	497
Red Medina	547
Shale	575
White Medina	596
Red shale	602

Fresh water at 63 ft.; black water at 210 and 300 ft.

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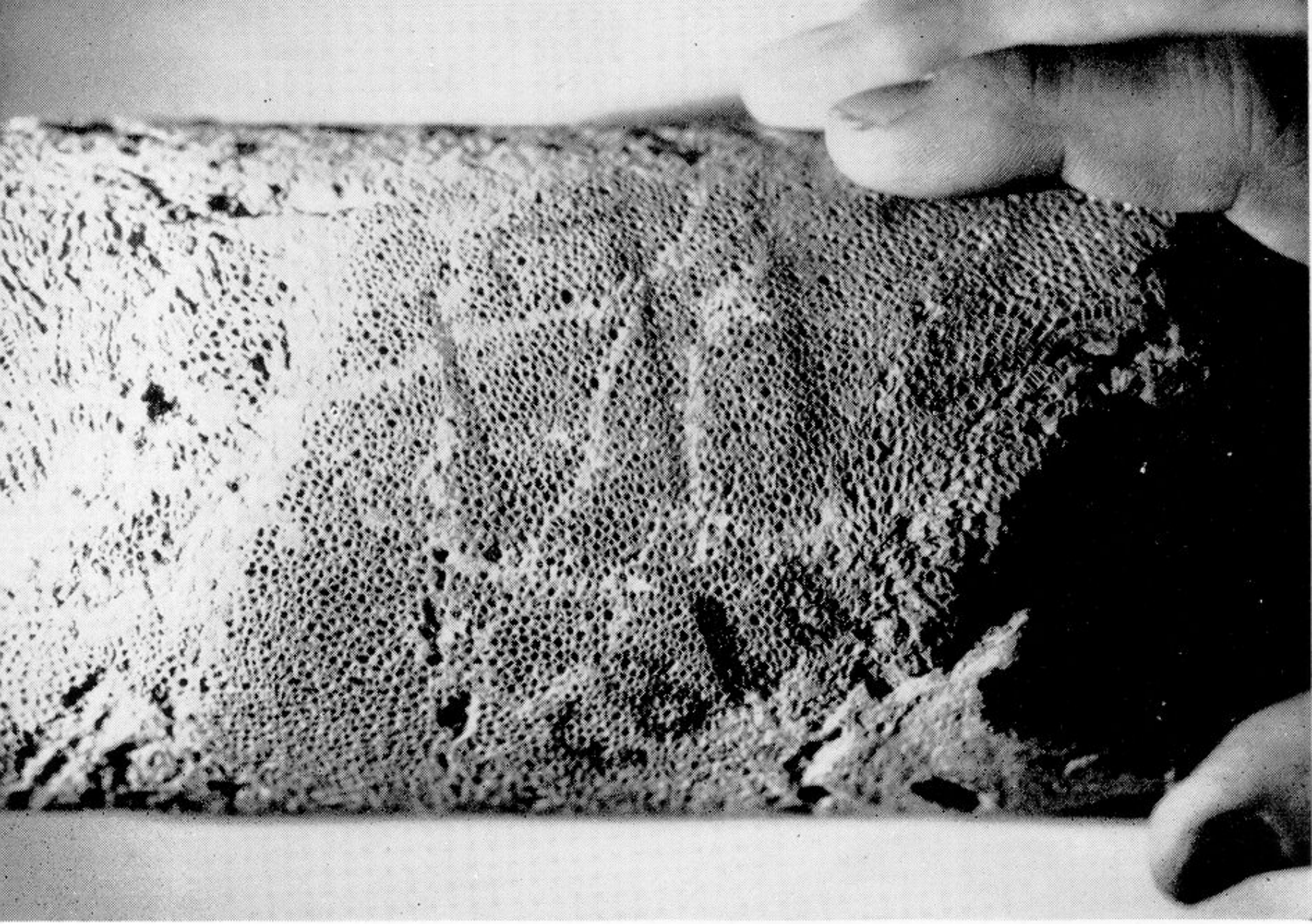
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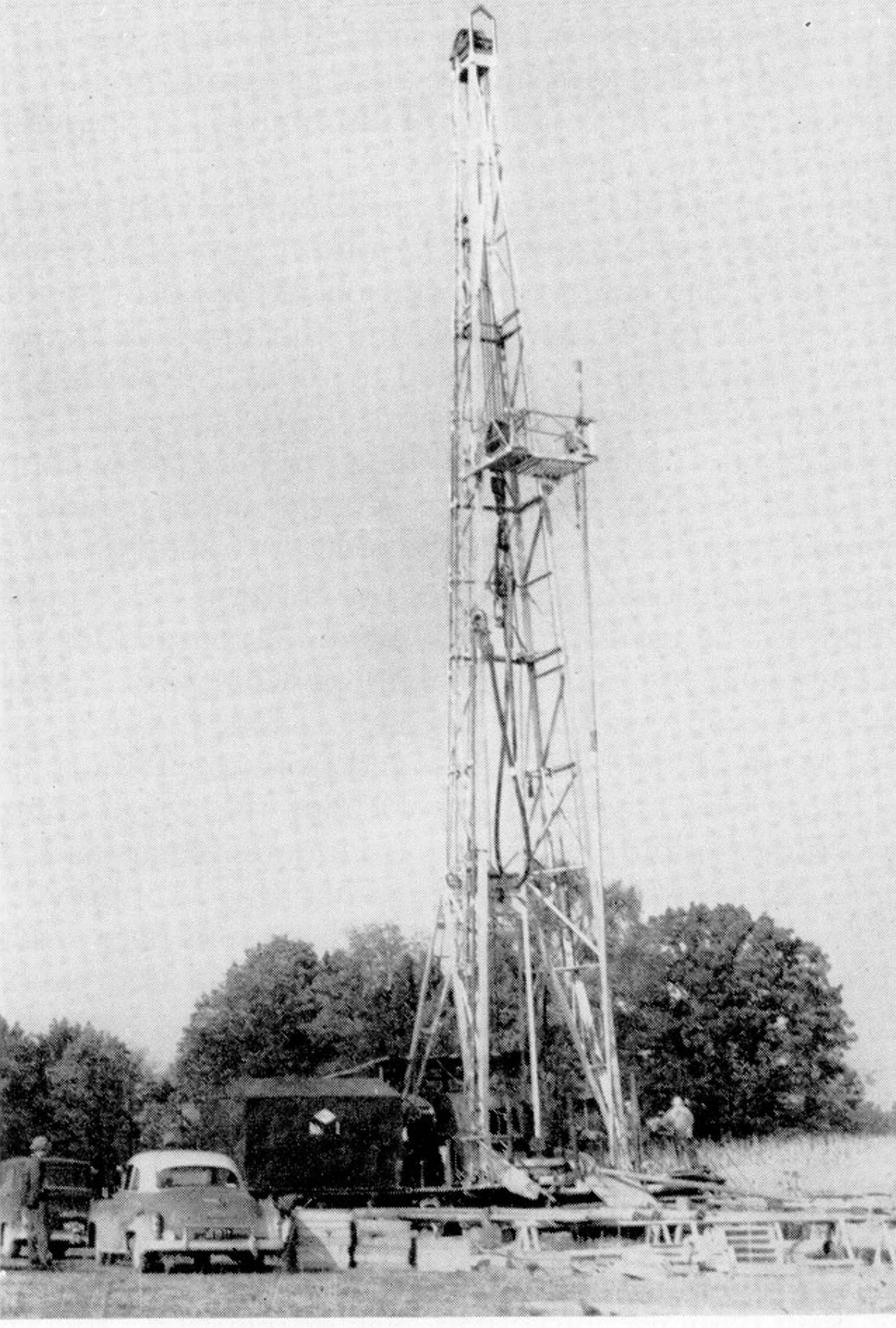
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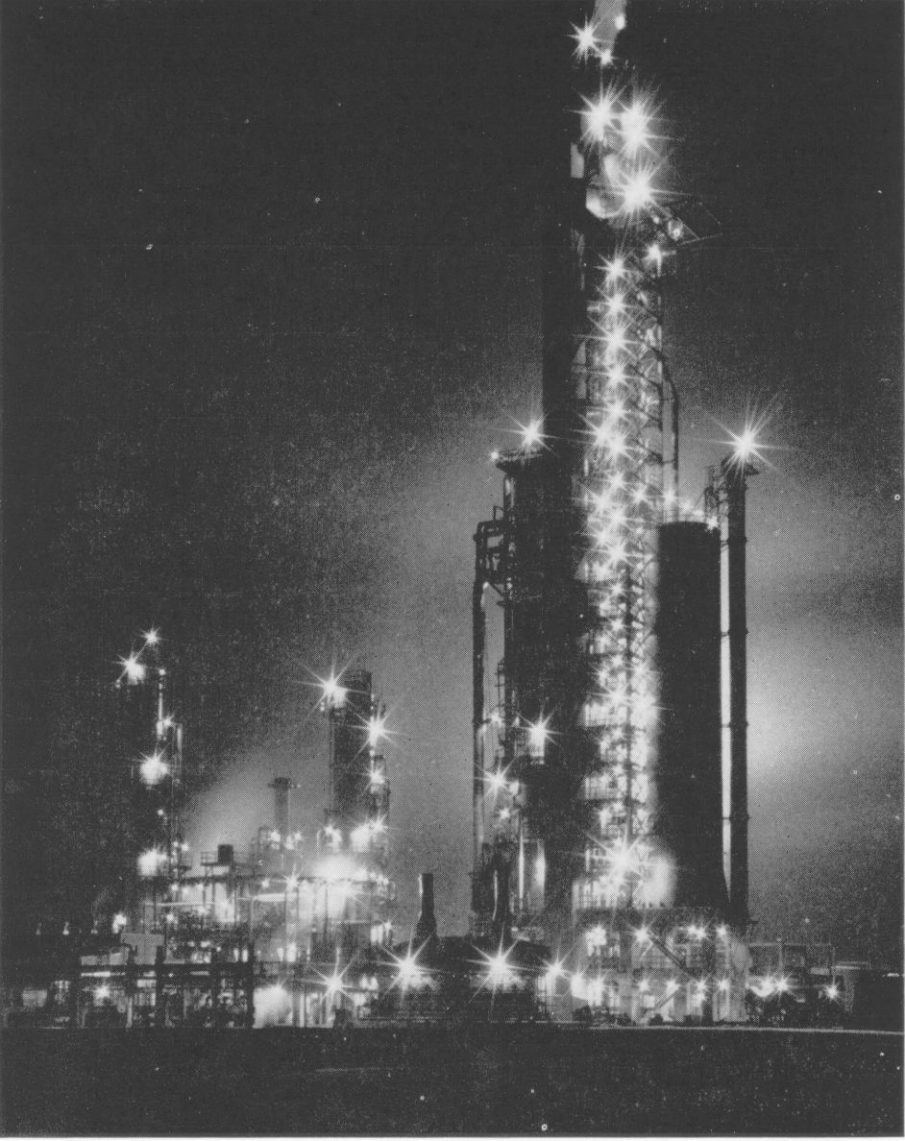


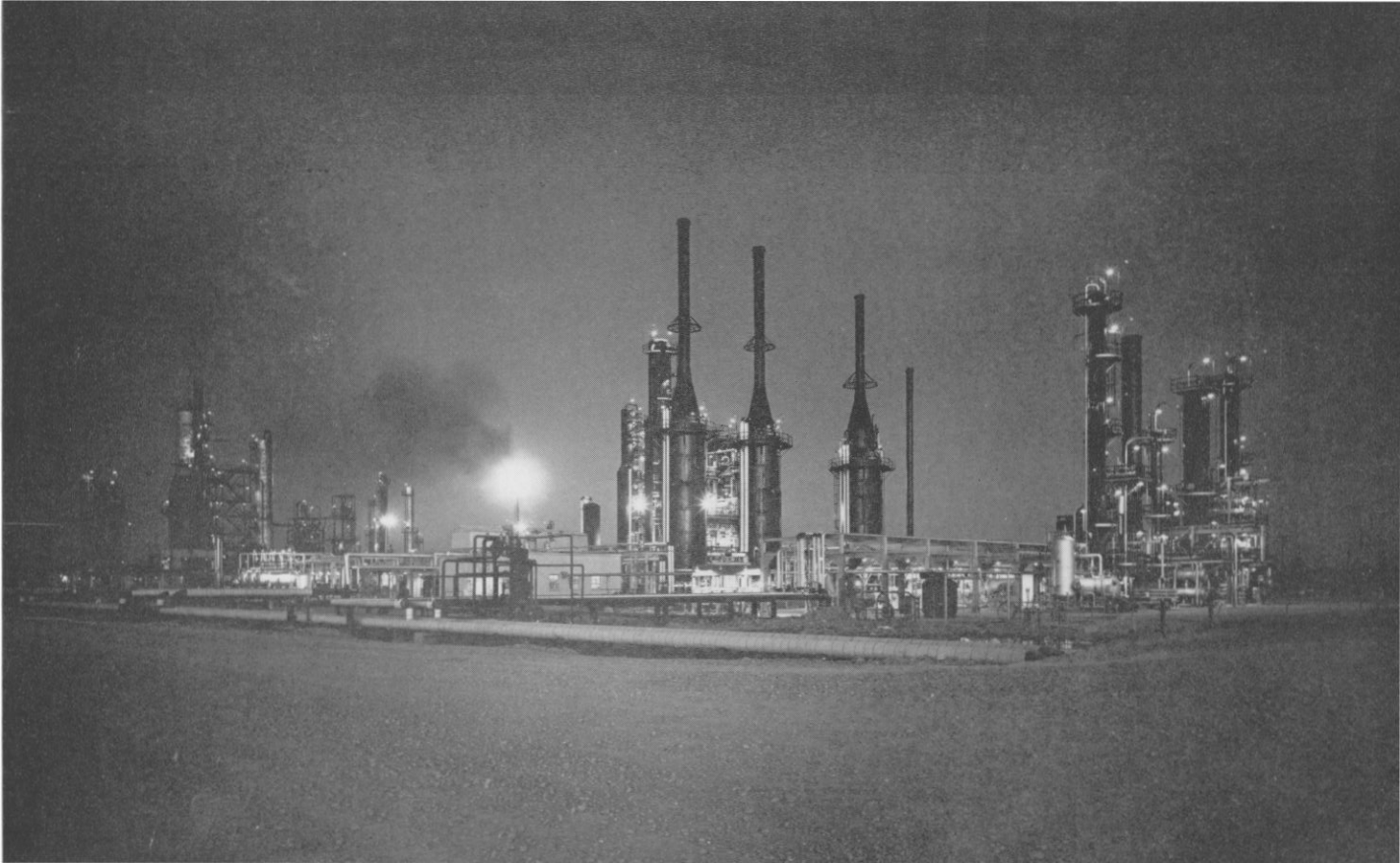














PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

M. E. HURST, *Provincial Geologist*

SIXTY-THIRD ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXIII, PART 4, 1954

Geology of Delhi Township

By

K. D. LAWTON

PRINTED BY ORDER OF

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1955

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GEOLOGICAL MAP (Coloured) AND PLAN
(In pocket at back of report)

Map No. 1954-1—Township of Delhi, District of Sudbury, Ontario.
Scale, 1 inch to ½ mile.
Surface Plan of Geology along Main Showing, New Delhi Mines, Limited

Geology of Delhi Township

By K. D. Lawton

INTRODUCTION

Delhi township is in the district of Sudbury, about 23 miles due west of the village of Timagami, which is on the Ontario Northland Railway. The area is easily accessible by air from either Sudbury or Timagami. Overland routes to Delhi township are either via Lake Timagami to the end of Obabika Inlet, across a portage to Obabika Lake and thence northward for about 4 miles to where the lake enters Delhi township, or from Glen Afton on the Canadian National Railways, by road for a distance of about 21 miles to "Stan's Camp" on Obabika Lake and from there by a 10-mile trip up the lake to the township.

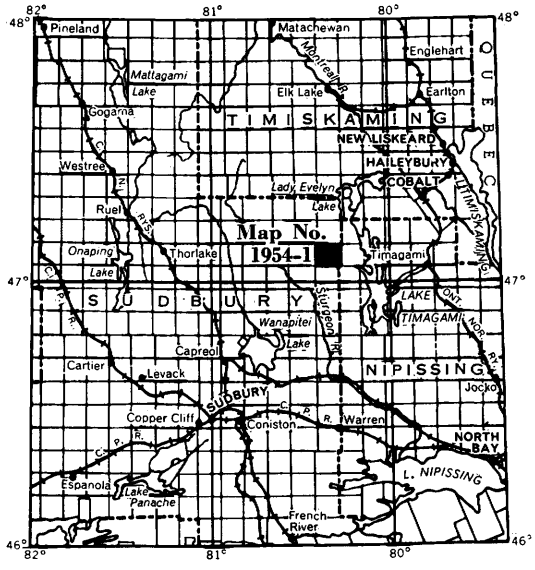


Figure 1 — Key map showing the location of Delhi township, district of Sudbury. Scale, 1 inch to 50 miles.

Recent exploration in the area has centred about the development of veins carrying lead, silver, and gold on the property of New Delhi Mines, Limited (formerly Delhi (Temagami) Gold Mines, Limited). A small amount of development work has also been done on a few other claim groups.

The most important veins so far discovered in Delhi township occur within ½ mile of the north boundary of the township. Accordingly it was thought wise to extend the mapping for a distance of 1 mile into the township of Shelburne lying immediately north of Delhi. This supplementary strip is included in map No. 1954–1.

The mapping on which this report is based was carried out during the summer

of 1951. The field work was semi-detailed in nature. Pace-and-compass traverses, spaced generally at quarter-mile intervals, served as a basis for obtaining information with which to make the geological map (No. 1954-1, in back pocket).

It should be understood that the areas marked as outcrop on the geological map are not composed entirely of exposed bedrock. The outcrops as shown are intended to outline areas in which bedrock exposure predominates or is only lightly covered by overburden. In most cases, small rock outcrops in close proximity to each other were not mapped separately but were combined with intervening areas of overburden and represented as a single outcrop on the map.

Acknowledgments

The writer wishes to express his appreciation for the willing co-operation and efficient work of his assistants, D. J. Emery, W. D. Harrison, and Peter Vernon. Mr. Emery was responsible for part of the mapping. Throughout the summer the party had the generous co-operation of George Hammond, resident engineer, New Delhi Mines, Limited. Accommodation for part of the field season was provided on the New Delhi property. It is a pleasure to acknowledge the assistance and courtesy extended by Mr. Hammond. Joseph Lahay suggested a camping site and kindly provided some equipment while the party was camped on Lahay Lake.

W. S. Savage, resident geologist for the Ontario Department of Mines at Swastika, spent two days with the author in September, 1952, visiting exposures of structural breccia outcropping in the vicinity of Wakimika Lake.

Previous Work

The earliest geological mapping in the general area of Lake Timagami was carried out by A. E. Barlow of the Geological Survey of Canada. His work was completed in 1897. In his report[1] Barlow gives a description, a paragraph in length, of the geology along Obabika Lake. A small part of Delhi township is included in map No. 138 (The Lake Temiskaming Sheet), which accompanies Barlow's report. The western limit of this map is a little west of Wakimika Lake.

Ten large parties were sent out in 1900 by the Ontario Bureau of Mines to explore northern Ontario.[2] Party No. 3, with J. L. R. Parsons as geologist, crossed the area en route from Lake Timagami to the Sturgeon River by way of Obabika Lake and the Obabika River.

W. G. Miller[3] describes briefly the geology along Obabika Lake. A map accompanying this report shows the geology in the vicinity of Obabika and Wakimika lakes.

The east limit of the Onaping map sheet, which accompanies a report by W. H. Collins,[4] is in Delhi township, a little east of Lahay Lake.

The most active and continuous prospecting in the township has been carried on by members of the L. J. Lahay family.

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[1]Alfred Ernest Barlow, *Report on the Geology and Natural Resources of the Area included by the Nipissing and Temiscaming Map-Sheets*, Geol. Surv. Can., annual rept., 1897, Vol. X, rept. I, p. 276.

[2]J. L. R. Parsons, *Report of the Survey and Exploration of Northern Ontario*, Dept. Crown Lands, Ontario, 1900.

[3]Willet G. Miller, *Iron Ores of Nipissing District*, Ont. Bur. Mines, Vol. X, 1901, pp. 160–80.

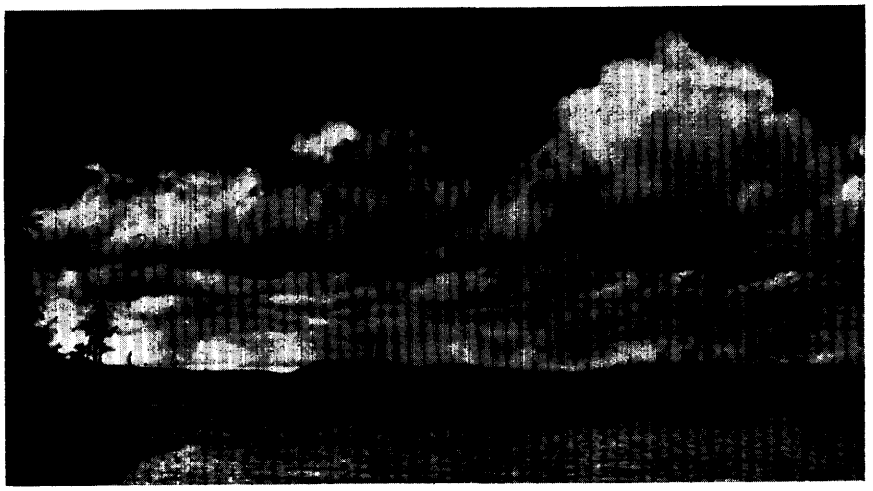
[4]W. H. Collins, *Onaping Map-Area*, Geol. Surv. Can., Mem. 95, 1917 (with map No. 179A, 'Onaping, Sudbury and Timiskaming Districts").

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H. C. COOK, *Problems of Sudbury Geology, Ontario*, Geol. Surv. Can., Bull. 3, 1946, Chap. IV, "Structural Features of Sudbury District," pp. 64–67.

Natural Resources

Lumbering has been recently carried out in the southeastern part of the township, principally in the area between Little Fry and Obabika lakes. Red pine was the principal timber cut; red pine and some white pine still line the shores of



View looking north from claim T.R.S.8742 of New Delhi Mines, Limited, on the southwest side of Wakimika Lake.

Obabika Lake. Poplar and birch are common throughout the area and jackpine, spruce, cedar, and balsam also occur in parts of the township.

The tourist business extends into the area. Fishing parties were quite numerous on Obabika and Wakimika lakes during July and August, 1951; these two lakes form part of a much travelled canoe route favoured by summer campers. The route extends from the north arm of Lake Timagami, through Diamond Lake into Wakimika Lake, down the Wakimika River into Obabika Lake, and then back into Lake Timagami via the northwest arm of that lake.

Topography

Delhi and Shelburne townships lie west of the height-of-land between the Montreal and Sturgeon rivers. Wakimika Lake flows by way of the Wakimika River into Obabika Lake. Drainage from here is by way of the Obabika River, a tributary of the Sturgeon River.

Outcroppings of Lorrain quartzite and Nipissing diabase produce the most rugged topography in the townships. In that part of the map area lying north of Obabika and east of Wakimika lakes, Lorrain quartzite outcrops as high ridges. Narrow linear valleys, often somewhat swampy, separate these ridges. The combination of high ridges, with steep-to-cliff faces and intervening deep valleys,

all with a general northerly trend, produces the most pronounced relief in the map area. Equally bold topography is found in the northwest part of Delhi township, west of Nasmith Creek. Quartzite cliffs, 50 to 100 feet high, are common. The general trend of valleys in this area is from a little west of north to northwest. In that part of Shelburne township west of Wakimika Lake the drift sheet is thicker and the topography less rugged.

Nipissing diabase outcrops as high ridges, distinguished from those of Lorrain quartzite by having a more rounded outline, with fewer cliff edges.

The area east and southwest of Little Fry Lake in the southern part of the township does not show any pronounced relief. The drift sheet is thick and outcrops of greywacke and conglomerate are rounded and low. Greywacke, outcropping along the west side of Obabika Lake south of the Obabika River, stands up prominently as high ridges paralleling the lake.

The centre of the township, exclusive of the areas already mentioned, is generally low and much of it is swampy. Bedrock is mostly thin-bedded greywacke and conglomerate, none of which outcrops with any pronounced relief. The Obabika River winds southwestward through country largely covered by glacial lake deposits. Sections of varved silt and clay exposed along the banks of the river, probably underlie most of the flat, swampy ground in the centre of the township as far north as mining claims T.R.S.8829 and T.R.S.8830 of the New Delhi group. The meandering of the river is so pronounced that in places small isolated oxbow lakes have resulted from the river eroding through its own crescent-shaped curves. South of Wakimika Lake along the Wakimika River, and in the extreme southwest corner of Delhi township, bedrock is not exposed, being overlain by glacial lake deposits.

GENERAL GEOLOGY

All the consolidated rocks in the area are of Precambrian age. The following subdivisions have been recognized:

Table of Formations

CENOZOIC	
RECENT:	Swamp and stream deposits.
PLEISTOCENE:	Boulder clay, glacial-lake silts, and sands.
	Great unconformity
PRECAMBRIAN	
POST-HURONIAN:	Olivine diabase dikes.
	Brecciation
	Granite.
	Intrusive contact
	"Nipissing" diabase (quartz metadiabase) and "red rock" (granophyre).
	Intrusive contact
COBALT SERIES:	
Lorrain Quartzite:	Mainly feldspathic quartzite.
Gowganda Formation:	Greywacke, laminated greywacke, impure quartzite: boulder conglomerate.

Cobalt Series

The succession of Huronian sedimentary rocks in Delhi and Shelburne townships consists of part of a single series, the Cobalt series. It is composed entirely of clastic sediments: greywacke, feldspathic quartzite, and conglomerate. On the basis of lithological character the rocks are separable into two quite distinct

formations, in conformity with the classical subdivision of the Cobalt series by Miller and Knight, and by Collins. The lower, Gowganda, formation is composed of greywacke, laminated greywacke, impure quartzite, and, characteristically, boulder conglomerate. The overlying Lorrain formation is mainly a feldspathic quartzite.

GOWGANDA FORMATION

Conglomerate

A conglomerate of fairly extensive distribution outcrops in the south half of Delhi township. Lithologically, it is typical of the boulder and pebble conglomerates occurring in the middle and upper parts of the Gowganda formation. It consists of boulders and pebbles of all shapes and sizes, scattered sparsely, and wholly at random, through an unstratified matrix. Subangular or rounded pebbles and boulders make up about 5–10 percent of the rock. Generally, they are from ½ to 1 inch in diameter, with exceptions having dimensions up to 18 inches. The boulders and pebbles include a great variety of rock materials; grey granite, granite gneiss, quartz, greenstone, slate, and porphyries are most common.

The matrix of the conglomerate is characterized by its dark-grey colour, its great dominance over the pebble components, and its greywacke-like appearance. Under the microscope it consists of a heterogeneous assemblage of mineral and rock fragments of many sizes, mostly angular in shape, set in a fine-grained "paste." The latter appears to be composed mostly of chlorite, epidote, and finely comminuted rock materials. Thin-section examination shows quartz, feldspars, and rock fragments to be notably fresh and angular. The matrix has the composition of a typical greywacke.

The characteristics mentioned suggest that this rock is a tillite. However, none of the boulders were observed to exhibit soled facets or striations. The absence of exposures of pre-Huronian basement rocks did not permit possible observation of a smoothed and striated surface beneath the "tillite" to confirm the indicated glacial origin.

Stratigraphically the conglomerate is conformably overlain and underlain by thin-bedded greywacke.

Greywacke

In places, the conglomerate described above grades, by a diminution of pebble content, into massive greywacke. This variety of greywacke is a dark-grey, fine-grained, massive rock, essentially the same as the matrix of the boulder conglomerate.

Another variety is a distinctly stratified, thinly bedded or "laminated" greywacke. It is common throughout the township, with excellent exposures to be seen along the west sides of Wakimika and Obabika lakes. In a typical exposure, each thin bed, about ¼ to ⅜ inches thick, is composed of two layers. The lower and coarser layer resists weathering better and generally bleaches lighter than the upper layer. The upper layer is darker and finer-grained. The result is a faintly corrugated, weathered surface, striped in alternating dark and light grey, or brown.

Interbeds of pink, fine-grained quartzite may occur with the greywacke. On the New Delhi claims these beds are abundant and reach a maximum thickness of 18 inches.

Impure quartzites are grouped with the greywacke on the geological map, and are most abundant in the transition zone between Gowganda greywacke and the overlying Lorrain quartzite.

LORRAIN QUARTZITE

In Delhi and Shelburne townships the lowermost part of the Lorrain formation outcrops with an estimated thickness of about 500 feet. It is a feldspathic quartzite, very uniform in character and appearance. Generally it is massive, of medium- to coarse-grained texture, and pale grey, green, or pink in colour. It is highly feldspathic in composition, and angular grains of fresh feldspar are conspicuous.

Under the microscope it is seen to be composed of about 70 percent quartz, 2 percent cherty quartz, 15 percent feldspar (combined sodic plagioclase and microcline), 8–10 percent sericite, and small amounts of chlorite and carbonate, plus minor amounts of leucoxene and heavy accessory minerals. The cementing material around the grains is mostly masses of flaky sericite with some cherty quartz and carbonate.

Primary structures in the quartzite are not conspicuous. Bedding planes are not readily seen except in the sides of hills and cliffs, where beds are a foot or more thick. Cross-bedding may be seen here and there, but its development was infrequent.

Interbedded with the quartzite are narrow brownish grey bands that are composed of thin beds of a fine-grained, undurated clay rock termed "argillite." Individual bands range up to a few feet in thickness but appear to have no great lateral extent.

Stratigraphically, the Lorrain quartzite conformably overlies the greywacke described above. By area, it may be seen from the geological map to be confined to the northeastern and northwestern parts of Delhi township and the southern part of Shelburne township.

The transition from the Gowganda formation into the overlying Lorrain quartzite is a gradual one with no evidence of any kind of unconformity. What may be called the transition zone is estimated to be about 50 feet thick and is composed of massive greywacke and impure quartzite.

"Nipissing" Diabase

The principal intrusive rock in Delhi township is a quartz diabase. It is a part of the widespread quartz-bearing basic intrusive of Keweenawan age termed "Nipissing" diabase by the late W. G. Miller.[1] It has a general distribution throughout the area between Cobalt, Gowganda, and Sudbury.

In Delhi township the quartz diabase has been intruded as a sill. It extends unbroken from the southwest corner of the township northward to the New Delhi mines showings located about ¾ to 1 mile west of Grassy Bay at the south end of Wakimika Lake. The sill is estimated to be at least 200 feet thick and has a general westerly dip of about 30 degrees.

Many contacts were observed between the bottom of the diabase and the underlying Huronian sediments. In the northwest part of claim T.R.4094 of the New Delhi group, a conformable contact between diabase and underlying thin-bedded Gowganda greywacke is exposed near the base of a hill. The contact, which has a strike and dip parallel to that of the beds, is sharp and clean, with no brecciation or shearing evident. Some 700 feet south and about 150 feet east of the No. 4 post of claim T.R.4090 of the New Delhi group, a lower contact of the diabase sill is exposed on a 25-foot-high cliff face. Here, complete conformity is lacking. For a distance of about 20 feet below the contact, thin beds of greywacke are highly contorted. Immediately below the diabase, the greywacke is fractured,

[1] Willet G. Miller, *The Cobalt-Nickel Arsenides and Silver Deposits of Temiscaming*, Ont. Bur. Mines, Vol. XIX, 1910, pt. 2, p. 91.

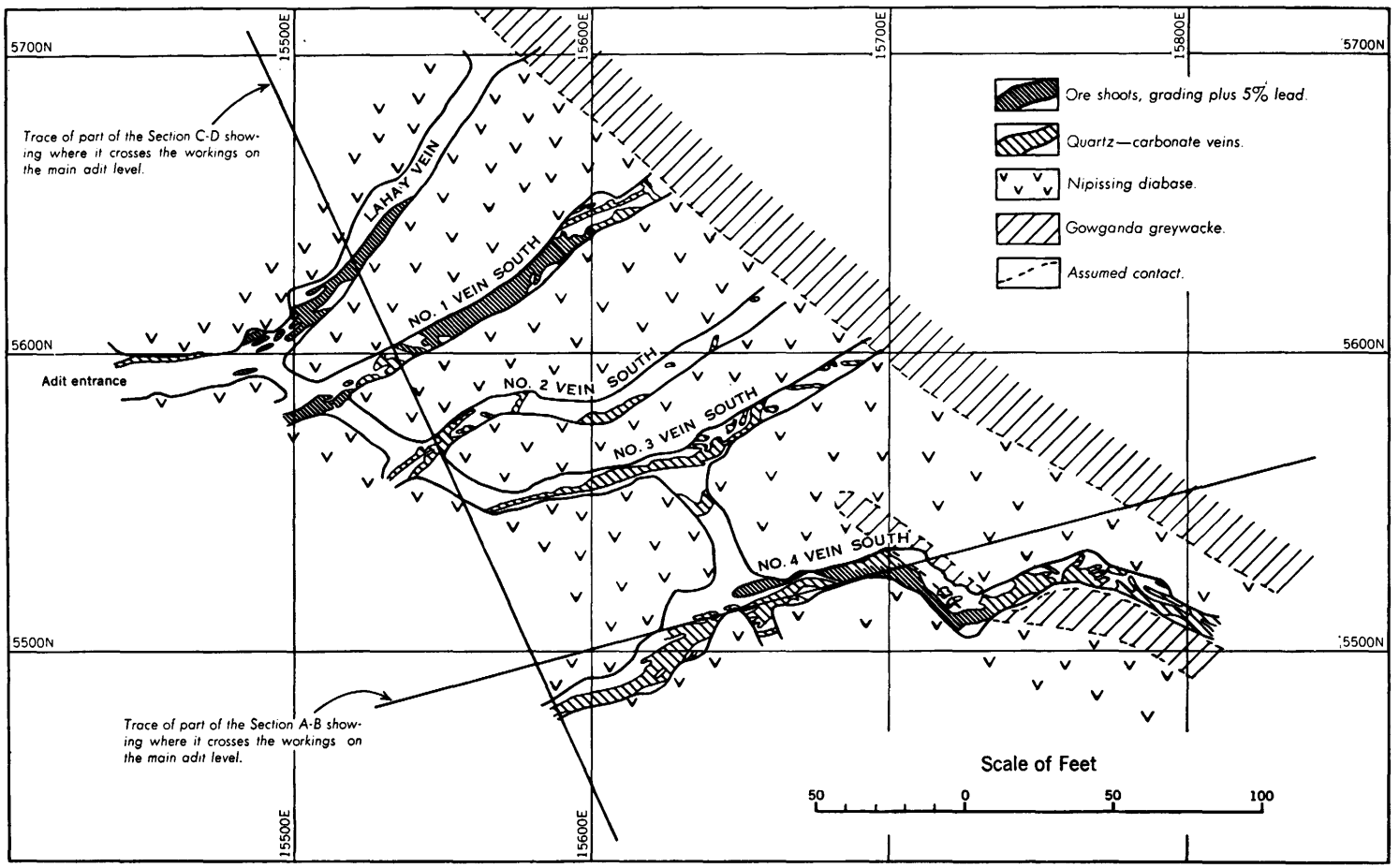


Figure 3 — Geological plan of the main adit level, New Delhi Mines, Limited. Diagrammatic cross-sections A-B and C-D accompany the surface plan in the pocket at the back of this report.

In November, 1950, underground exploration of the vein system was begun from an adit level. In all, 880 feet of drifting was done on 5 veins encountered at this horizon. Four holes were also drilled below the adit level, and these indicated persistence of the veins at least 200 feet below this horizon. Four ore shoots with a combined length of 381 feet were found, and three development faces were in ore when underground work ceased.

In a report dated June 29, 1951, L. R. Simard, consulting geologist for the company, estimated that there were 54,000 tons of ore, from surface to 200 feet below the adit level. The recoverable net value of this ore at the property was estimated to be $20.25 per ton.[1] The dimensions and grade of the ore shoots developed on the adit level are summarized by Mr. Simard as follows:

Vein	Length	Average width	Gold	Silver	Lead
	feet	feet	ounces per ton	ounces per ton	percent
Lahay	102	2.87	0.084	3.65	7.29
No. 1, south, *A*	74	4.20	0.040	2.08	6.35
No. 1, south, *B*	21	3.92	0.007	1.65	12.17
No. 4, south	184	4.52	0.262	2.76	8.69
Total	381	.....	.....	.....	.....

PETROGRAPHY OF THE DIABASE

A number of thin sections made from specimens of diabase taken along the main showing were examined. Petrographic study shows them to be altered quartz diabase (quartz metadiabase) similar in most respects to sill diabase exposed to the southwest. The samples differ from average sill diabase in being more highly altered. It is probable that this latter feature resulted from shearing and vein deposition in the diabase along the main showing. A sample of Nipissing diabase from the main showing area has the following average composition (percentages are estimated): hornblende, 40–60 percent; epidote and saussurite, 20–30 percent; sodic plagioclase, 5–15 percent; quartz, 2–5 percent; micrographic intergrowth of quartz and sodic plagioclase, 0–5 percent; chlorite, 5–30 percent; carbonate, 0–45 percent; sericite, 1–10 percent; leucoxene, 1–3 percent; plus minor amounts of apatite, magnetite, and pyrite. Pale-green, faintly pleochroic, uralitic hornblende is the most abundant constituent; it may be partly altered to chlorite. Epidote intermixed with hornblende and as veinlets is also abundant. Much of the feldspar including that micrographically intergrown with quartz is largely replaced by epidote, sericite, and some carbonate.

STRUCTURE OF THE DIABASE

The only apparently significant departure of the quartz diabase from an essential sill-like or flat-lying attitude was observed on claims T.R.4090 and T.R.4091. In tracing the sill northward from the southwest corner of Delhi township, a number of contacts with underlying Gowganda greywacke were observed. All showed the diabase to be roughly conformable with the bedding planes of the nearly flat-lying sediments. This feature is well shown within the New Delhi

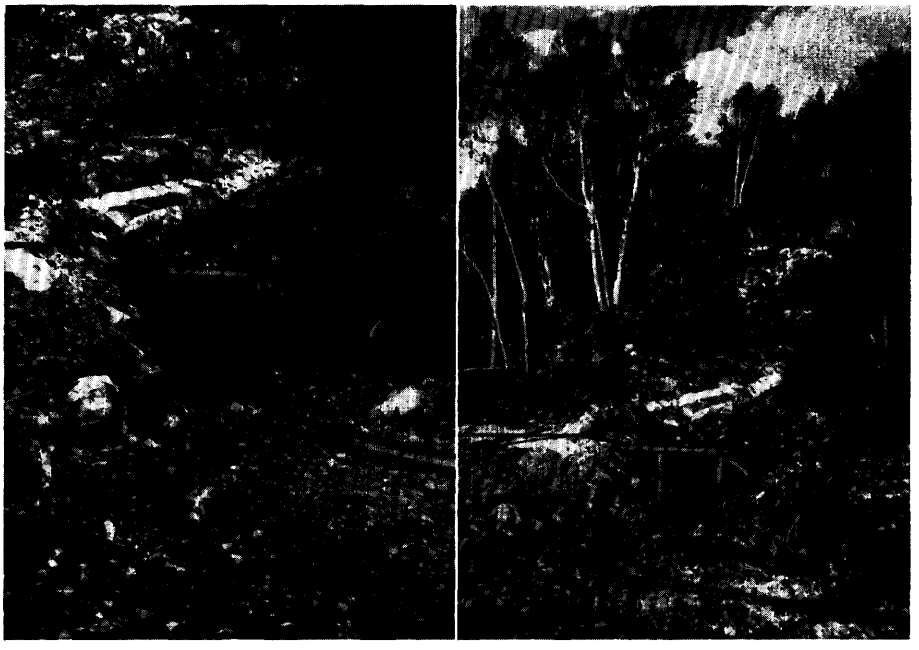
[1]The recovery value was calculated on the following basis:

	Recovery	Price
	percent	
Lead	95	$ 0.11 per pound
Silver	85	0.90 per ounce
Gold	50	35.00 per ounce

MAIN SHOWING

The property has been developed by surface-trenching and test-pitting, diamond-drilling, and underground work on an adit level. Prior to 1949, development work consisted of trenching and some diamond-drilling. In addition, two adits of about 200 and 50 feet in length, respectively, were driven on claim T.R.4090. A small shaft about 30 feet deep was sunk on a vein in the centre of claim T.R.4090.

The surface plan (in pocket at back of report) of the geology along the main showing of New Delhi Mines, Limited, shows most of the exposed veins, test pits, and trenches opened up in this part of the property.



Two views of the entrance to the main adit, claim T.R.4090, New Delhi Mines, Limited. The Lahay vein can be seen just above the entrance to the adit.

During July and August, 1949, a program of geological mapping in the vicinity of the main lead-silver showings, and 1,500 feet of diamond-drilling (7 holes), was carried out. The diamond-drill holes, numbered 1 to 7, are plotted on the surface plan.

DIMENSIONS AND GRADE OF DEPOSIT

Some 21,692 pounds of vein material were taken from the Lahay vein during the period March 14–April 7, 1950, as part of a bulk-sampling program recommended for the property. The material was taken from seven cuts across the surface of the vein spaced at 10-foot intervals, to cover a total length of 80 feet of vein. The section of the Lahay vein represented by the bulk sample lies immediately east of the main adit entrance on the side of the hill. The 21,692 pounds of vein material, analysed by the Temiskaming Testing Laboratory, Cobalt, gave the following assay:

Lead	percent	7.13
Silver	ounces per ton	5.58
Gold	ounces per ton	0.25

most valuable for their lead (galena) content. Native silver has not been observed, and silver at the New Delhi property is associated with galena. Small amounts of native gold are also scattered irregularly throughout the quartz-carbonate veins on this property, but gold and galena appear to occur independently of one another. Nickel and copper have also been reported in Delhi township but only in very small quantities.

DESCRIPTION OF PROPERTIES

New Delhi Mines, Limited

New Delhi Mines, Limited, successor to Delhi (Temagami) Gold Mines, Limited, is a lead-silver-gold property. In 1952, this company owned 15 surveyed claims and 18 unsurveyed claims in the northern part of Delhi township on the southwest side of Wakimika Lake. The 18 unsurveyed claims, known as the Shannon group, adjoin the block of surveyed claims along the south boundary of the latter. The original company, Delhi (Temagami) Gold Mines, Limited, was incorporated in September 1934 with L. J. Lahay as president. Mr. Lahay, who was prominent in early development work on this property, is believed to have been the original staker.

ACCESS

Personnel and small, light cargoes may be transported most easily to the property by aeroplane, either from Timagami or Sudbury. A small dock and cabin are located on the southwest side of Wakimika Lake at the landing site. A tractor road about 1¼ miles in length and a good trail about ¾ mile long, lead from the dock on Wakimika Lake up to the property. Heavy equipment, including the mining plant used to drive the adit in 1951, must be drawn over a tractor road. The road, built with government assistance, leads from the north end of Obabika Lake across the Wakimika River up to the property, a distance of a little more than 3 miles.

GENERAL GEOLOGY

The New Delhi group of claims encloses the north end of a Nipissing diabase sill and adjacent country rock composed of thin-bedded Gowganda greywacke. The diabase is part of the main sill that trends northerly across the western part of the township from the southwest corner. A dike of olivine diabase about 250 feet wide is projected across the property with a general strike of about S.75°E. It follows approximately a line joining a point 250 feet north of the No. 4 post of claim T.R.S.8824 with the No. 2 post of claim T.R.S.8828. No contacts were observed between this olivine diabase dike and the Nipissing diabase of the sill. However, from analogy with other areas the olivine diabase is believed to be the younger of the two. A band of breccia trends northwesterly across claim T.R.S.8742. This feature is described in the section of this report dealing with breccia.

The ore occurs in a system of somewhat vuggy, quartz-carbonate veins containing inclusions of the wall rock, mostly quartz diabase. The veins are mineralized with argentiferous galena and a little pyrite and chalcopyrite; native gold is erratically distributed throughout the veins. The host rock is largely Nipissing diabase. Some of the veins are also known to occur in the adjoining thinly bedded greywacke. The vein system lies within and next to a sheared and faulted zone striking about N.60°W. The veins fill fractures in the diabase. They strike northeasterly to easterly and dip at 30–55 degrees to the northwest and north. The veins are irregular in width, strike, dip, and distribution of galena mineralization.

River, which winds southwestward through this part of the township. In addition, glacial lake deposits are found south of Wakimika Lake along the Wakimika River, and in the extreme southwest corner of Delhi township where no bedrock is exposed.

STRUCTURAL GEOLOGY

The Cobalt sediments, which constitute the bulk of the bedrock in the township, are not greatly deformed except locally along the sill of Nipissing diabase, along dikes and breccia bands, and in the vicinity of faults. The lowest formations stratigraphically occur, for the most part, in those sections of the township that are lowest topographically. Thus, thin-bedded greywacke and conglomerate are found in the centre and southern sections of the township and along the shore of parts of Obabika and Wakimika lakes, all of which are topographically low areas. Lorrain quartzite, stratigraphically overlying the greywacke, is, on the other hand, found in higher parts of the township. Thus, erosion has produced the present configuration of sedimentary rock types in the township.

Aside from a few small shears traversing the diabase sill, the heaviest shearing is to be found in a zone crossing the New Delhi property N. 60°W. Individual shears within this zone dip from 40°N. to vertical, with some of the shearing also dipping steeply south. The zone is made up of a series of parallel shears, all of which are narrow. Shearing is found both in the Nipissing diabase and greywacke. The age of the shearing with respect to the olivine diabase is not known.

No prominent folds were observed in the greywacke and quartzite anywhere in the township. The generally flat or nearly flat attitude indicates little or no deformation of these rocks.

A few small faults occur in the shear zone on the New Delhi property. A more prominent fault has been traced for about ¾ mile along the southwest side of Wakimika Lake. The sedimentary rocks are upturned and somewhat sheared and highly fractured along a zone that trends across the bottom of the large peninsula in the lake, through the lake between a small island and the west shore, and then southeastward into the drift-covered area south of Wakimika Lake. The general strike of the fault in this area is N.37°W. with a nearly vertical attitude. F. C. Knight carried out a geophysical survey on the Shannon group of claims of New Delhi Mines, Limited, and found what may be an extension of this fault. In tracing a dike of olivine diabase across these claims, the geophysical map shows the contours of magnetic intensity over the dike to be extremely contorted in one place. The contorted area appears to represent a fault zone passing through the dike which lines up quite well with a projected extension of the fault trending southeastward from Wakimika Lake. The horizontal displacement of opposite sides of the dike, as determined by Knight's geophysical data, is about 750 feet, with the east side having moved north relative to the west side.

ECONOMIC GEOLOGY

The association in Delhi township of sedimentary rocks of the Cobalt series with sills and dikes of Nipissing diabase is typical of the entire area between the Cobalt, Gowganda, and Sudbury mining camps. At Cobalt and Gowganda, quartz-calcite fissure veins are associated with the sills, and these contain silver and cobalt mineralization. On the basis of this association, the diabase sill traversing the western part of Delhi township and the adjacent sedimentary rocks are recommended as the most promising prospecting ground for mineralization of economic value. It may be pointed out, however, that veins so far discovered have proved

been observed. However, boulders of a basic rock resembling the sill diabase both lithologically and petrographically are not uncommon as constituents of the breccia. The age relation between the breccia and the olivine diabase dikes is unknown; no breccia was seen cutting the diabase or vice versa, nor were any boulders of this diabase noted as inclusions in the breccia.

The foregoing facts have lead the author to conclude that the rock here described is a structural breccia similar to that reported from the Sudbury area. In post-Huronian time, after intrusion of the Nipissing diabase, the area underwent deformation. Fractures developed in the rocks with little relative displacement between opposite walls. Subsequent movement brecciated the rocks along the fractures, with fragments large and small being torn loose and partially crushed. Finally a breccia "mud" composed of uncrushed fragments set in a matrix of comminuted rock materials developed. This "mud" became sufficiently mobile to flow along fractures in the confining rocks. Partial recrystallization and final consolidation of the matrix with its load of transported uncrushed fragments, resulted in the breccia rock now outcropping in Delhi township. Fairbairn and Robson in their discussion of the Sudbury breccia believe that brecciation took place in the presence of magmatic fluids, principally steam. These fluids assisted in rendering the mass mobile as brecciation progressed.

Olivine Diabase

A number of dikes of olivine diabase occur in Delhi township. Most of these are narrow and cannot be traced over any great distance. An exception is a large dike that enters the township a little east of the northwest corner post, just east of Dorothy Lake. Scattered exposures permit it to be traced in an easterly direction to the New Delhi property. A little west of the New Delhi claims the dike changes in strike to a more southeasterly direction. It is believed to cross claims T.R.S. 8824, T.R.4092, T.R.4090, T.R.4094, T.R.4093, and T.R.S.8828, to join up with a dike of about the same width, attitude, and composition, known to cross the north end of Obabika Lake. F. C. Knight, by means of a magnetic survey, has traced this latter dike from Obabika Lake northwestward beneath the area of overburden south of Wakimika Lake to the No. 2 post of claim T.R.S.8828 of the New Delhi group. Lithologically it is a massive, coarse-grained rock, dark grey in colour. The dike rock has about the same texture and colour as the diabase of the sill. In mapping the New Delhi claims on a scale of 1 inch to 300 feet, no contacts between the olivine diabase and sill diabase were apparent. As a result, the olivine diabase dike was mapped as Nipissing diabase and was so represented on a preliminary map. However, thin-section study has shown a definite compositional difference between the sill diabase and the dike rock. Thus, although not observed in contact with Nipissing quartz diabase, the olivine diabase dike is believed, from analogy with other areas, to be younger. The olivine diabase has the following composition (percentages estimated): calcic andesine, 65 percent; olivine, 15 percent; augite, 15 percent; saussurite, 2 percent; biotite, 1 percent; apatite, 1 percent; magnetite, 1 percent.

Pleistocene and Recent

The geological map of Delhi township shows the main drift-covered and swamp-covered areas. Most of the flat, somewhat swampy ground in the centre of the township is probably underlain by glacial lake deposits of Pleistocene derivation. Sections of varved silt and clay are exposed along the banks of the Obabika

bedding somewhat obscured. On this outcrop also, further evidence is to be seen pointing to a local origin for at least some of the breccia boulders. Pink-weathering quartzite fragments occur in the breccia. These are lithologically similar to quartzite beds up to 12 inches thick found interbedded with greywacke in the immediately adjacent country rock.

A breccia-greywacke relation seen in a large outcrop about ½ mile southwest of the No. 3 post of T.R.S.8824 of the New Delhi group is worthy of brief comment. The outcrop forms a hill with a steep eastern face. The top and part of the side of the hill is composed of breccia. However, along the base of the hill, underlying the breccia, is a block of thin-bedded greywacke at least 75 feet long and 30 feet high. The block is apparently undisturbed with bedding striking north and

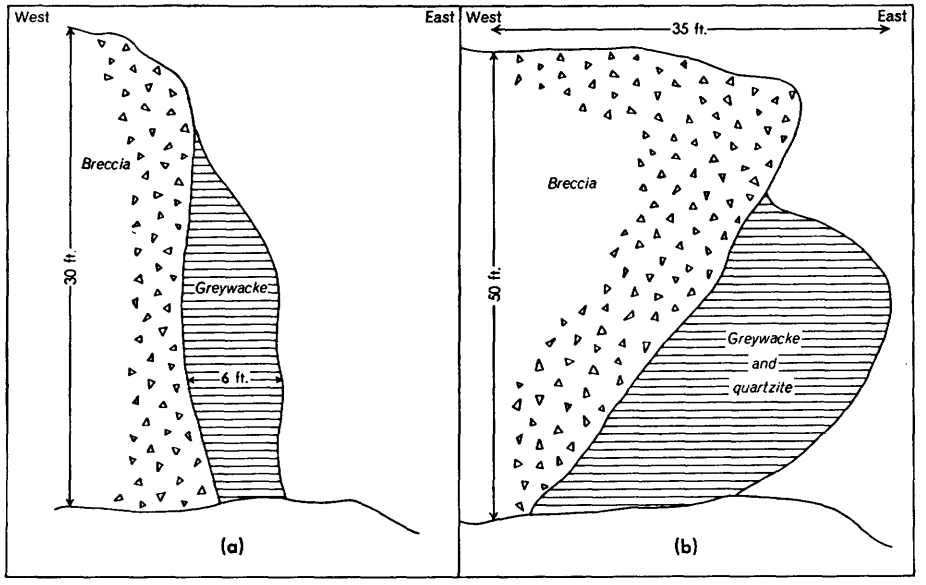


Figure 2 — Diagrammatic sketches showing the contacts between:

(a) Breccia and undisturbed, thinly bedded, Cobalt greywacke about 350 feet west of the southwest corner of Lahay Lake.

(b) Breccia and thinly bedded greywacke and quartzite. The contact dips 50 degrees west. Beds near the contact are down-dragged and fractured. The exposure is about 100 feet west of centre of the west shore of Lahay Lake.

dipping gently west. The contact between breccia and underlying greywacke can be traced and shows the breccia to be cutting across bedding planes of the sediment, though not steeply. Flow banding parallel to the contact could be seen in that part of the breccia adjacent to it. This relation may simply represent a contact between breccia and country rock, or the block of greywacke may be a giant inclusion.

In concluding a discussion of contacts, it may be pointed out that little or no shearing was observed either along contacts of breccia and country rock or within the breccia itself. Formations in which the breccia occurs may be disturbed and shattered in the vicinity of a contact, but a general lack of shearing and absence of evident displacement of country rock on either side of the breccia band indicate that it is not simply a fault breccia.

The numerous examples noted of breccia cutting the Cobalt sediments prove it to be post-Huronian in age. Breccia bands in the Nipissing diabase have not

strong. A section of such matrix from the large outcrop on the west side of Lahay Lake had the following composition: small fragments of quartz, about 2 mm. or less in diameter, are set in a fine-grained paste, composed of a mass of discontinuous and highly irregular, narrow, sericite veinlets, smaller quartz grains, chlorite, epidote, and an unidentified mineral of low relief and very low though not anomalous bi-refringence. In many cases this latter mineral has a faintly fibrous radiating habit with many tiny rounded particles as inclusions. The particles are believed to be opaque. Thin sections of matrix close to fragments exhibit banding which may be well-developed and very intricate in pattern. Banding, for the most part, is due to alternation of dark layers richer in chlorite and epidote, with lighter-coloured layers richer in sericite and quartz. In many cases, the matrix is so fine-grained that identification of all the mineral constituents and an estimation of their relative proportions is impossible. Thin-section study shows the matrix of breccia in the greywacke to be considerably richer in chlorite and epidote than that occurring in the Lorrain quartzite. The latter is richer in sericite and quartz. Brecciation was accompanied by a certain amount of recrystallization of the comminuted rock materials, mostly to sericite, chlorite, and epidote.

Breccia bands in the Lorrain quartzite are exposed in a number of places in the western part of the township. Lithologically, they are all similar, and the following description is typical. Being in Lorrain quartzite, boulders and pebbles are almost exclusively derived from that formation. Fragments are angular to rounded in outline and range up to several feet in diameter. The boulders are shades of pale grey, green, or pink in colour. The matrix material is a lighter grey or green and is much finer-grained, resembling a chert. Flow layering in the matrix is common. Under the microscope, the matrix is seen to be composed of an extremely fine-grained, intimate mixture of sericite, quartz, feldspar, and a little chlorite. The relative proportions of the different minerals are difficult to estimate, but sericite and quartz appear to be most abundant. It is probable that, during comminution, original feldspar of the feldspathic quartzite was altered, largely to sericite. Rounded to subangular quartz grains are scattered through the matrix. Many of these grains have been fractured. Flow banding observed on weathered surfaces may also be seen in thin sections. It is produced by bands of matrix material alternately richer in sericite and in quartz. A good exposure of breccia in the Lorrain quartzite is to be seen on a large outcrop located about ¾ mile southwest of the mile-post V on the north boundary of Delhi township.

Contacts may be seen between the breccia and undisturbed country rock in a number of places. The Cobalt sediments throughout the township are in most cases flat-lying and undisturbed. In every case the breccia cuts across the bedding of these rocks with no evidence of conformity displayed. Steeply dipping contacts are common, though in some cases breccia truncates bedding in the country rock very gently. Sharp contacts between undisturbed country rock and breccia do not always occur. Instead, there may be a gradation from undisturbed rock, through a heavily fractured and partly brecciated zone, into actual breccia. Crevices up to 2 or 3 inches wide in this bordering, fractured zone may be filled with fine-grained matrix material, squeezed in from the breccia.

Figure 2 illustrates two breccia–country rock contacts just west of Lahay Lake. A marked variability in the attitude of the contact occurs in this vicinity. At other places, along the same contact as that illustrated in (a), a nearly vertical contact changes to a nearly horizontal one, that is, the breccia only gently truncates the flat-lying, thinly bedded greywacke. (b) illustrates another contact. Here, country rock near the breccia has been down-dragged and fractured, with

generally dark grey, fine-grained, and in places, rather flinty; in other places it resembles massive greywacke. On weathered surfaces, concentric flowage lines may be seen wrapped around boulders and pebbles. In some places, the matrix is more massive, and flow banding is not so evident. Generally this occurs in matrix remote from the edges of inclusions.

Another outcrop of probably the same breccia band is exposed in the bed and along the west side of Nasmith Creek in a section of rapids about ½ mile southeast of mile-post II, on the west boundary of Delhi township. It is a water-washed, nearly flat outcrop. The breccia seen here is much the same as that described above, with the following additional features. Large inclusions of boulder conglomerate occur with fragments of thin-bedded greywacke. A distinctly foreign fragment is present in the form of a boulder of coarse-grained pink granite, 18 inches in diameter. The boulders themselves are somewhat fractured, and tiny veinlets of the matrix, generally a fraction of an inch wide, penetrate the boulders along these fractures. The matrix, in this outcrop, amounts to about 15 percent of the volume of the rock and shows excellent development of flow banding including swirls, contortions, and concentric flow lines around fragments.

Another band of breccia may be traced northwestward from the northeast corner of claim T.R.4091 of the New Delhi group. It trends across claims T.R.S. 8742 and S.40453 into Shelburne township. A good exposure of this breccia may be seen on an outcrop which crosses the north boundary of Delhi township at a point about 300 feet west of the No. 4 post of claim T.R.S.8742. A feature noted in this band points to a fairly local origin for at least some of the fragments in the breccia. Boulders of pink-weathering quartzite about one foot in diameter are common in the breccia. They are similar in all respects to a pink-weathering quartzite interbedded with thin-bedded, flat-lying greywacke on the New Delhi claims. The only other feature of importance related to this breccia band is to be seen in the undisturbed rock bordering it. About 550 feet northeast of the No. 2 post of claim S.40453 a number of fractures were observed in the thin-bedded greywacke bordering the breccia. These crevices, up to 2 or 3 inches in width and of an undetermined length, are filled with fine-grained, dark-coloured material similar in all respects to the matrix of the breccia. There is flow layering parallel to the walls of the fractures and a few small pebbles in the matrix. This same feature was observed elsewhere in the country rock bordering the breccia, and indicates the fine-grained matrix material to have been highly mobile. It appears to have acted like a fluid under the forces causing brecciation.

A third breccia band, also trending northwestward, may be traced across the bottom of the large peninsula on the west side of Wakimika Lake.

A narrow but characteristic band of breccia, about 5 feet wide, occurs a few feet from the No. 4 post of claim T.R.S.8831 of the New Delhi group, on the south shore of Wakimika Lake. Boulders of thin-bedded greywacke, pink quartzite, and greenstone, up to 18 inches in diameter, are present in a fine-grained matrix having good flow structure.

A few breccia zones occur south of the Obabika River; one is located a little less than 1½ miles west of Obabika Lake and trends north. Several small bands outcrop about ½-¾ mile northeast of mile-post V on the south boundary of Delhi township. Another small band of breccia was mapped about ¾ mile northwest of the dam on claim J.L.306 on the Obabika River. All these exhibit features already described.

A number of thin sections of matrix material were studied from breccia in the Gowganda greywacke. In matrix remote from fragments, flow banding is not

fine-grained, dark-grey, flinty matrix with fragments of greywacke being the most abundant inclusions. A characteristic feature within the matrix is the presence of flow banding. This structure is best seen on weathered surfaces. The flow lines wrap around the borders of fragments in a concentric fashion and may exhibit intricate flowage patterns in the areas between fragments.

The breccia has a general distribution throughout the township. The most extensive band may be traced by discontinuous outcropping from a point on the north boundary of Delhi township just north of the No. 1 post of T.R.S.8823 of the New Delhi group, southwestward across Nasmith Creek to the west side of Lahay Lake. West of the south end of Lahay Lake it takes a sharp bend and



Breccia exposed on the east side of the large peninsula in Wakimika Lake.

continues southwestward along Nasmith Creek striking into the drift-covered area at the southwest corner of the township; it has an average width of about 400 feet. An excellent exposure of the breccia composing this band may be seen on the west shore of Lahay Lake opposite the centre of the lake. It is composed of subangular to rounded boulders and pebbles of greywacke, pink-weathering quartzite, and a basic rock similar lithologically to the Nipissing diabase of the sill. The inclusions, amounting to about 75 percent of the total volume of the rock, range in size from tiny pebbles to large boulders over 7 feet long. One large boulder of basic intrusive, having a diameter of about 15 feet, was noted. It is rounded in outline and is completely surrounded by matrix. No sorting of the boulders as to size or distribution throughout the outcrop was noted. The boulders of greywacke may be quite highly fractured and are among the largest boulders found. Quartzite boulders appear to be smaller, averaging about 1 foot in diameter. The matrix composing the remaining 25 percent of the rock is

instead of being light grey in colour like that of the diabase, is dull red. This feature imparts to the rock its distinctive colour and common name of "red rock." Thin sections of the "red rock" show it to be a granophyre, that is, composed largely of micrographically intergrown quartz and sodic plagioclase, or a hornblende granite composed of distinct quartz and plagioclase crystals not intergrown to any extent. Its mineralogical composition is generally as follows (percentages are estimated): quartz, 30–50 percent; albite, 25–50 percent; microcline, 0–5 percent; hornblende, 2–15 percent; chlorite, 5 percent; epidote and saussurite, 5 percent; plus sericite and minor amounts of carbonate, magnetite, apatite, and sphene. Much of the albite is sericitized.

Field and petrographic evidence indicate the "red rock" to be a phase of the diabase since it apparently grades imperceptibly into it. Intrusive contacts between the two were not observed. It should be pointed out that on the geological map, that part of the sill represented as "red rock" is outlined only approximately. Because of a lack of detailed study and the apparent gradation from "red rock" into quartz diabase, the "red rock" area could not be defined with greater accuracy.

Granite

Aside from the granitic phase of the quartz diabase, a few small masses and narrow dikes of granite were observed cutting the diabase and associated "red rock." The dikes are too narrow to be represented on the map. Some of the "red rock" phase may actually be intrusive granite.

Breccia

A breccia is exposed in various parts of the township having features similar to the so-called "Sudbury structural breccias" that occur partly in Precambrian sedimentary rocks of the Sudbury area. Commenting on the breccia in that area, H. C. Cooke[1] stated: " . . . there is a most unusual breccia in the Sudbury district. It has such peculiar characteristics, and is present in such volume, that the writer believes it should be given a special name, and will, therefore, refer to it as the Sudbury breccia." The breccia here referred to has been studied by H. W. Fairbairn and G. M. Robson[2, 3] and H. C. Cooke.[4]

A few unpublished reports also exist.[5]

The unusual feature of this breccia is that it apparently flowed along fractures in the confining rocks. The breccia is composed of subangular to rounded fragments set in a fine-grained matrix, with the volume of the matrix generally subordinate to that of the fragments. The fragments range in size from a fraction of an inch to more than 6 feet in diameter, with no sorting of any kind evident. The majority of the inclusions are apparently derived from the surrounding formation or formations in which the particular breccia band occurs. Some foreign fragments are also present—mostly granite and a little greenstone. In a general way, the composition of the matrix and the dominant type of fragment vary with the type of rock brecciated. A breccia band in the Lorrain quartzite, for example, is composed almost entirely of quartzite fragments, and the matrix is a pale greenish-grey cherty material. In greywacke, bands of breccia have a

[1]H. C. Cooke, *Problems of Sudbury Geology, Ontario*, Geol. Surv. Can., Bull. 3, 1946, p. 64.

[2]H. W. Fairbairn and G. M. Robson, *Breccia at Sudbury*, Jour. Geol., Vol. 50, 1942, pp. 1–33.

[3]H. W. Fairbairn and G. M. Robson, *Breccia at Sudbury*, Ont. Dept. Mines, Vol. L, 1941, pt. 6.

[4]H. C. Cooke, *op. cit.*

[5]H. J. Fraser, *Petrology of Sudbury Norite and Footwall Rocks*, unpublished report to the International Nickel Company of Canada, Limited, 1937.

T. C. Phemister, unpublished report to the Ontario Department of Mines, 1937.

and a fairly continuous breccia band occurs composed of angular fragments ½-1 inch in diameter. The overlying diabase exhibits a 12-inch-wide chilled contact. However, the freshness of the diabase right down to the contact and the sharpness of the contact itself indicate little or no contamination of the diabase magma by the country rock. Thus, along lower contacts, the diabase is essentially conformable with the underlying thin-bedded greywacke. The diabase exhibits some chilling, and the sediments are locally contorted and brecciated, but contacts are sharp and metamorphic effects insignificant. Upper contacts between the Nipissing diabase and overlying country rock were not observed. Everywhere within the township the diabase presented an eroded upper surface. The only apparently significant departure of the diabase from an essential sill-like attitude was observed at the extreme north end of the sill as exposed on claims T.R.4090 and T.R.4091 of the New Delhi group. This feature is discussed in the section that deals with the geology of the New Delhi group.

Lithologically the Nipissing diabase is a massive dark-grey or dark-green basic rock. It shows a variation in texture, as is usual with this rock. The generally coarse-grained texture gives the rock a gabbroic rather than diabasic appearance. Over 20 thin sections selected from various parts of the sill were examined. They included samples of the diabase proper, of the "red rock," and of the sheared diabase on claims T.R.4090 and T.R.4091 of the New Delhi group. Thin-section study shows the sill rock to be a quartz metadiabase derived by alteration of quartz diabase or quartz gabbro. Alteration is apparently general and widespread throughout the sill. A sample taken about ½ mile southeast of Lahay Lake approaches closest in composition to a normal unaltered quartz diabase. It has the following mineralogical composition (percentages are estimated): calcic andesine, 40 percent; hornblende, 30 percent; epidote and saussurite, 10 percent; clinopyroxene, 5 percent; quartz, 5 percent; micrographic intergrowth of quartz and sodic plagioclase, 2 percent; chlorite, 2 percent; apatite, magnetite, and sericite, 1 percent. The andesine feldspar is generally quite fresh though some grains are largely altered to epidote or a mass of saussurite. A clinopyroxene, probably augite, is present in small amounts. The bulk of it has been replaced by masses of uralitic hornblende. Quartz, as independent grains and in micrographic intergrowth with sodic plagioclase, is present. Magnetite and apatite are accessory minerals.

In composition, a specimen examined from the centre of claim T.R.4094 of the New Delhi group is representative of the whole sill, exclusive of the "red rock" and sheared diabase on claims T.R.4090 and T.R.4091. It has the following mineralogical composition (percentages are estimated): uralitic hornblende, 55 percent; epidote and clinozoisite, 30 percent; chlorite, 5 percent; micrographic intergrowth of quartz and sodic plagioclase, 8 percent; pyrite, leucoxene and magnetite, 2 percent. An original diabase texture has been obscured through alteration of the original plagioclase and pyroxene to a mass of pale-green, uralitic hornblende, epidote, clinozoisite, and chlorite. The sodic plagioclase, micrographically intergrown with quartz, has been altered largely to epidote and clinozoisite.

"Red Rock"

In mapping the sill, a granitic "red rock" phase of the Nipissing diabase was sufficiently distinctive to permit its delineation on the geological map. The principal area of "red rock" is found northeast of Lahay Lake. In the field it is a dull-red rock of granitic or syenitic appearance. It is as coarse-grained as the average sill diabase. It may be richer in feldspar and quartz, and the feldspar,

group itself by contacts exposed in the south parts of claims T.R.4090 and T.R.4093 and the northwest corner of claim T.R.4094. However, in tracing diabase-sedimentary contacts on surface southeastward across the centre of claim T.R.4090 and the southwest part of claim T.R.4091, by plotting diamond-drill hole results, and from information shown on the geological plan (page 17), a different attitude is indicated for the Nipissing diabase in these parts of the two claims. It appears to be a dike, essentially vertical in attitude, having steep to vertical contacts with the adjacent country rocks. The dips of contacts, where observed, are plotted on the surface plan (back pocket) along the main showing. A diagrammatic cross-section, A-B, is drawn to illustrate the apparent dike-like (vertical) attitude of the mass of Nipissing diabase in the centre of claim T.R.4090 and its change to that of a sill-like intrusion when traced southwestward in claim T.R.4090. It should be pointed out, however, that the Nipissing diabase intrusive does not itself change, only its attitude. The main vein system so far explored (up to June 1951) has occurred in this part of the Nipissing diabase.

ADDITIONAL SHOWINGS

In mapping the New Delhi group of surveyed claims the following additional veins were noted: About 35 feet northwest of the No. 2 post of claims T.R.S.8465 a small quartz-carbonate stockwork is exposed over an area of about one square yard on a small diabase outcrop. A little galena mineralization was noted. About 725 feet northwest of the No. 2 post of claim T.R.S.8465, just south of the centre of the claim, a small test pit and trench occur. The test pit is sunk in diabase a little north of its contact with sheared greywacke. The shear appears to be part of an extension of the main shear crossing the centre of claim T.R.4090 in a direction N.60°W.

In the extreme southeast corner of the New Delhi group of surveyed claims a few small veins were noted. A steeply dipping, easterly trending quartz vein, 11 inches wide, was noted about 265 feet north of the No. 2 post of claim T.R.S. 8830 along the east line of that claim. This vein lines up with another quartz vein of the same width and attitude located about 210 feet west of it along the north edge of a diabase outcrop. No mineralization was noted.

On claim T.R.S.8829 a few small, barren quartz veins were mapped along the east side of the large greywacke outcrop where it has been intruded by small masses of diabase. In addition, a few small quartz veins were noted on the diabase outcrop lying immediately southwest of the large greywacke outcrop on claim T.R.S.8829. A few quartz veins up to 12 inches wide were mapped along the south line of claim T.R.S.8829 between 150 and 420 feet east of the No. 3 post of that claim.

New Norzone Mines, Limited

In 1952, this company owned a block of 17 unsurveyed claims in the northern part of Delhi township. The claims, consisting of some 720 acres, extend from Grassy Bay on Wakimika Lake southeastward to the peninsula at the north end of Obabika Lake. About 150 acres of the block underlie Obabika and Wakimika lakes. Most of the bedrock on the claims is buried beneath a mantle of thick overburden. Much of the ground is swampy. Flat-lying, thin-bedded greywacke with Lorrain quartzite is exposed on the property. These have been intruded by an olivine diabase dike about 250 feet wide that trends in a general east-west direction across the northern part of Delhi township. Exposures of any of these rock types are not abundant but F. C. Knight has traced the olivine diabase

across the property by means of a magnetic survey. Mr. Knight, on this geological and geophysical information, reports evidence of the olivine diabase dike having been offset by north-south trending, post-intrusive faults.

Lahay Claims

Members of the L. J. Lahay family hold claims in the western part of the township adjacent to Lahay Lake and in the area between the New Delhi group and Lahay Lake. About 350 feet north of the Lahay camp on the east side of Lahay Lake and about 50 feet from the shore of the lake there is a quartz-carbonate vein averaging about 30 inches in width. It strikes approximately N.50°W. with a generally flat dip of 30°-35°N. It has been traced by a series of test pits and trenches for about 500 feet eastward from the lake. The vein occurs along a narrow sheared and fractured zone in coarse-grained quartz diabase. Its mineralization consists of chalcopyrite and pyrite scattered sparingly along the vein.

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PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*
M. E. HURST, *Provincial Geologist*

SIXTY-THIRD ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXIII, PART 5, 1954

Geology of the Emo Area

By
G. L. Fletcher and T. N. Irvine

PRINTED BY ORDER OF
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COLOURED GEOLOGICAL MAP
(In Pocket at Back of Report)

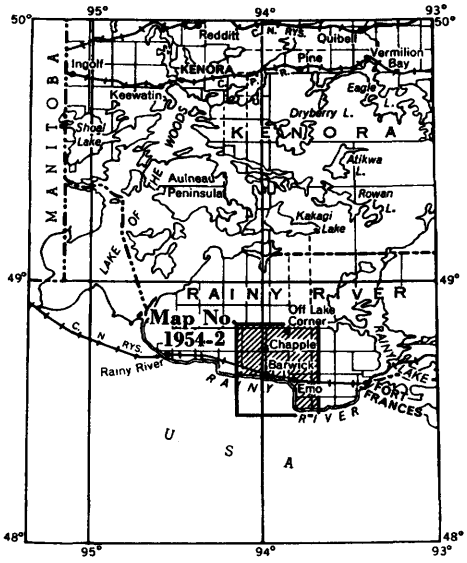
Map No. 1954-2—Emo Area, District of Rainy River, Ontario.
Scale, 1 inch to 1 mile.

Geology of the Emo Area

By G. L. Fletcher and T. N. Irvine

INTRODUCTION

Emo is situated in the district of Rainy River, 20 miles west of Fort Frances, on the Canadian National railway between Fort Frances and Winnipeg. The Emo area, as described in this report, covers about 320 square miles and includes the townships of Tait, Mather, Kingsford, Shenston, Dobie, Carpenter, Roseberry, Barwick, Lash, and Aylsworth, plus parts of the adjoining townships. The south boundary of the map-sheet is marked by the Rainy River.



Key map showing the location of the Emo area, district of Rainy River. Scale, 1 inch to 50 miles.

Previous to 1952, interest in this section as a mining area was only casual. Many parts had been staked or optioned from time to time, and scattered test pits remain as evidence of early prospecting, but there is no record of any significant occurrence of valuable minerals.

In 1952 the report of a base-metal deposit in the southern part of Dobie township started a period of intensive exploration during which the area was thoroughly prospected. Aeromagnetic and ground geophysical surveys were made in the southern part of the area. Deposits of nickel-copper and iron were found, but because these were too small and of too low a grade to be of economic value at the present time, work in the area declined in the autumn of 1953.

A geological survey, on which this report is based, was conducted during the summer of 1953 by the authors. A base map on the scale of 1 inch to ¼ mile was supplied by the Surveys Branch, Ontario Department of Lands and Forests.

Vertical air photographs on the same scale, in conjunction with pace-and-compass traverses, provided close control for the location of outcrops. It has been necessary to enlarge and generalize many of the outcrops to show them on the final map, which is published on the scale of 1 inch to 1 mile. The geological boundaries are indicated on the map as defined, approximate, assumed, or based on geophysical data. The map also shows all roads, trails, and buildings.

Acknowledgments

The authors are indebted to H. D. B. Wilson of the University of Manitoba and H. D. Carlson, resident geologist of the Ontario Department of Mines at Kenora, for their suggestions and advice during the field season. Special thanks is extended to Professor Wilson for his constructive criticism during the writing of this report.

During the field season, capable assistance was received from D. McMorland and D. W. Rawlyk, both of the University of Manitoba.

Field mapping was greatly facilitated by the co-operation of the following exploration companies: Falconbridge Nickel Mines, Limited; Noranda Mines, Limited; Conwest Exploration Company, Limited; Prospectors Airways Company, Limited; and Sudbury North Rim Exploration Company, Limited.

Many persons in the area extended hospitality and aided the work of the party in various ways, and to all of them the authors express their sincere appreciation.

Assays were made by the staff of the Provincial Assay Office, Toronto.

Means of Access

The main freight line of the Canadian National Railways crosses the south part of the map-sheet, and daily train service is provided from Winnipeg and Fort William. Stations are located at Emo and Barwick, the two main centres of population in the map-area.

Highways Nos. 70 and 71 cross the area from north to south and from east to west, respectively, and provide access from Kenora, Rainy River, and Fort Frances.

Good gravel roads make all parts of the area accessible by automobile. In addition to these, numerous logging trails and survey lines have greatly facilitated field traversing.

Previous Geological Work

A brief reconnaissance survey along the Rainy River was carried out in 1885 by A. C. Lawson and maps with his interpretative geology of the area accompany his report published in 1887. This geology is also shown on the Kenora sheet compiled by T. L. Tanton of the Geological Survey of Canada.

The area is part of a larger one in which W. A. Johnston made a study of the surficial geology in 1913–14.

A list of works bearing on the geology of the area follows:

Bibliography

W. A. Johnston, *Rainy River District, Ontario. Surficial Geology and Soils*, Geol. Surv. Can., Mem. 82, 1915.

A. C. Lawson, *Report on the Geology of the Lake of the Woods Region*, Geol. Surv. Can., Vol. I, 1885, pt. CC.

A. C. Lawson, *Report on the Geology of the Rainy Lake Region*, Geol. Surv. Can., Vol. III, 1887–88, pt. F.

A. C. Lawson, *The Archean Geology of Rainy Lake Re-studied*, Geol. Surv. Can., Mem. 40, 1913.

T. L. Tanton, Map No. 266A (Kenora sheet), Geol. Surv. Can., 1933.

Topography

Relief in the area is low, seldom exceeding 75 feet. The southern parts have a thick blanket of overburden, and outcrops are small and scattered. The northern parts are more rugged in appearance with low ridges of outcrop and heavily wooded valleys.

Drainage is provided by the Rainy River and its tributaries. The southern part of the area drains directly into the Rainy River, and the northern part drains southward into the Rainy River by way of the Pinewood and Sturgeon rivers. The general drainage is characterized by small meandering streams that, although incised in the surficial deposits, are partially controlled by the structure of the bedrock. Unlike most Precambrian areas, lakes of appreciable size are absent, and muskegs are comparatively small and few in number.

Natural Resources

AGRICULTURE

Farming is well established, a large part of the area having been cleared and cultivated. Limited markets and heavy, gravelly clay-loam soil with numerous boulders hinder extensive grain farming. Hay crops of alfalfa, clover, and grasses are the main produce. Other crops grown are flax, oats, barley, potatoes, and to a lesser extent, buckwheat and rye. In previous years peas and beans have been important field crops.

Large herds of cattle are common, the most popular breeds being Shorthorn, Hereford, and Holstein.

TIMBER

The trees common to the area are poplar, spruce, balsam, jack pine, white pine, and cedar. Dense undergrowths of alder and willow occur on low-lying ground.

Pulpwood is the main natural resource of the district. Much of the best timber has been cut, and in the southern parts, second-growth poplar is well advanced. The mills of the Minnesota-Ontario Pulp and Paper Company at Fort Frances and International Falls provide a convenient market.

GAME

Game is not abundant in the area. During the field season, deer, bear, moose, foxes, and rabbits were seen, as well as evidence of beaver and muskrat. Grouse, partridge, and prairie chickens are occasionally seen.

A small amount of trapping is done during the winter by the inhabitants.

GENERAL GEOLOGY

The bedrock of the area is entirely Precambrian in age. The sedimentary and volcanic rocks have been assigned to the Coutchiching and the Keewatin. The intrusives are all post-Keewatin.

A small isolated body of sediments, previously assigned to the Coutchiching, occurs in the southern part of the area.

The Keewatin consists of a thick section of sediments and volcanics. These have been divided into the following four divisions: (1) hornblendic sediments (possibly Coutchiching), (2) intermediate and acid volcanics, (3) basic volcanics, and (4) greywacke and iron formation.

Intrusive into the rocks grouped as Keewatin are two basic stocks and numerous smaller basic dikes and sills.

Various masses of granitic rocks cut the preceding groups, with the exception of one basic intrusive. These form batholiths, stocks, dikes, and sills of all sizes. No definite evidence of more than one age of granite was found.

Quartz diabase dikes represent the youngest igneous rocks in the area, and are believed to be Keweenawan in age.

Deposits of clay, sand, gravel, and boulders laid down by continental glaciers overlie the Precambrian rocks. Bedded clays indicate deposition in post-glacial lakes. These deposite are all Pleistocene in age.

Recent deposits consist of peat deposited in swamps and small amounts of alluvial sand, silt, and clay loam deposited along streams.

The geological succession is summarized in the accompanying table.

Table of Formations

CENOZOIC	
RECENT:	Peat, alluvial sands, silt and clay-loams.
PLEISTOCENE:	Bedded clay-loams, glacial clay, silt, sand, gravel, boulders.
	Great Unconformity
PRECAMBRIAN	
KEWEENAWAN:	Quartz diabase dikes.
	Intrusive Contact
GRANITIC INTRUSIVES:	Pegmatite dikes, granitic and aplite dikes, quartz monzonite, monzonite, hornblende granodiorite, granodiorite.
BASIC INTRUSIVES:	Norite, hypersthene gabbro, diabasic gabbro, hornblende diorite.
	Intrusive Contact
KEEWATIN:	Carpenter volcanics, Mather sediments, Dobie volcanics and Tait volcanics, Carpenter sediments.
COUTCHICHING OR KEEWATIN:	Siliceous tuff, biotite and hornblende schist.
VOLCANIC DIVISIONS OF THE KEEWATIN	
BASIC VOLCANICS:	Basalt, basalt porphyry, amygdaloidal basalt, vesicular basalt, basic sediments, tuff, agglomerate.
INTERMEDIATE AND ACID VOLCANICS:	Dacite, dacite porphyry, rhyolite, agglomerate, tuff.
SEDIMENTARY DIVISIONS OF THE KEEWATIN	
UPPER:	Greywacke, iron formation, conglomerate.
LOWER:	Hornblende schist, garnetiferous hornblende schist.

Coutchiching or Keewatin

Part of a body of sediments and tuffs that outcrops in the southern part of Aylsworth township has been proposed by Lawson[1] as a probable extension of the Coutchiching rocks in the Bear's Passage area of the Rainy Lake region. He stated, with reference to the Coutchiching,

> . . . the belt of mica schists . . . extends from the neighborhood of the Bear's Passage across Rainy Lake in a W.S.W. direction to Coutchiching and thence down Rainy River. In the direction of its strike, the belt is traceable continuously for twenty-four miles, and it probably continues to the westward, under the post-glacial formations of the Rainy River, for a distance of at least sixteen miles.

This westward extension is shown on Lawson's Rainy Lake sheet and on the Kenora sheet compiled by Tanton.[2]

[1] A. C. Lawson, *Report on the Geology of Rainy Lake Region*, Geol. Surv. Can., Vol. III, 1887–88, pt. 1, rept. F, p. 102.

[2] T. L. Tanton, Map No. 266A (Kenora sheet), Geol. Surv. Can., 1933.

Within the area studied by the authors, this belt has very limited exposure. It is isolated from the other sedimentary and volcanic rocks to the north by large granitic intrusives. Thus, neither its own structure nor its stratigraphic relationship to the rest of the map-area is known, and hence on the basis of Lawson's work, it has been grouped separately as "Coutchiching or Keewatin."

The belt consists of two distinct rock types: one, a mafic-rich sedimentary schist; the other, a well-bedded, siliceous material of probable tuffaceous origin. These types were not found in contact with each other, but the distribution of outcrops indicates that they may be interbedded.

The mafic-rich sediments are thin-bedded and dark grey in colour. In the northwest quarter of section 22, Aylsworth township, they are highly injected by granitic material, and large patches of dark red garnet are present. Microscopic examination shows them to be composed of plagioclase, quartz, hornblende, and biotite, a composition conceivably similar to Lawson's Coutchiching mica schist.[1]

The well-bedded siliceous rock is greenish grey in colour and weathers to light buff. Thin sections show it to be composed of a microcrystalline intergrowth of about equal parts of quartz and plagioclase with minor amounts of green biotite and hornblende. The rock is called a siliceous tuff.

Keewatin

The rocks assigned to the Keewatin have been divided into four lithologic divisions of which two consist of volcanics and two of sediments. Of the volcanic divisions one is composed of intermediate and acid lavas and fragmentals, and the other chiefly of basic lavas. The sediments have been separated into lower and upper divisions, the former being composed of hornblende schists, and the latter of greywacke, iron formation, and minor amounts of conglomerate.

In the following discussions, an attempt has been made to outline the distribution, lithology, and metamorphism of each of the divisions. Age relationships are based mainly on structural considerations, and these will be discussed later under "Stratigraphy of the Keewatin."

INTERMEDIATE AND ACID VOLCANICS

Intermediate and acid volcanics occur in south and north belts. The south belt outcrops mainly in southern Dobie township. The north belt underlies parts of Tait, Mather, Richardson, and Potts townships.

The same rock types occur in both belts, but the relative proportions differ. The south body is mainly agglomerate, whereas the north consists of dacite with some agglomerate and tuff.

Intermediate to Acid Lavas

The intermediate lavas are dacitic in composition. Their fresh surface is light greenish-grey, and they weather to a light colour, typically creamy-white to buff. They are massive, and their texture ranges from aphanitic to porphyritic. The porphyritic material has "quartz eyes" and feldspar phenocrysts, seldom exceeding ¼ inch in size, making up from 10 to 40 percent of the rock. Microscopic examination shows a microgranular intergrowth of equal amounts of quartz and plagioclase with an average of 10 percent of muscovite, biotite, chlorite, and hornblende. The feldspar phenocrysts were found to be oligoclase in composition.

[1]A. C. Lawson, *The Archean Geology of Rainy Lake Re-studied*, Geol. Surv. Can. Mem. 40, 1933, pp. 28–33.

Rhyolite occurs in minor flows interbedded with tuffs in southwestern Dobie township. It closely resembles the dacite in appearance, but stained thin sections of the rock show abundant potash feldspar.

Intermediate Agglomerate

Intermediate agglomerate is well exposed in southern Dobie and Shenston townships and in the vicinity of Pinewood Lake. It is light weathering, like the lavas, and is often interbedded with dacite.

The fragments in the agglomerate range from 1 to 8 inches in length and are occasionally as large as 1 foot. They are subangular to subrounded in outline and make up from 10 to 40 percent of the total rock. In appearance, they are remarkably uniform, consisting of very fine-grained, massive igneous material that weathers cream to buff. Thin sections of the fragments show them to be



Intermediate agglomerate with dacite fragments, Shenston township.

dacite composed of plagioclase and quartz, with minor amounts of biotite, hornblende, and epidote.

The matrix surrounding the fragments is poorly bedded and is composed of fine rock fragments and recrystallized tuffaceous material. It has the same mineral assemblage as the fragments, but the mafic constituents are more prevalent, and calcite is occasionally present.

Tuff

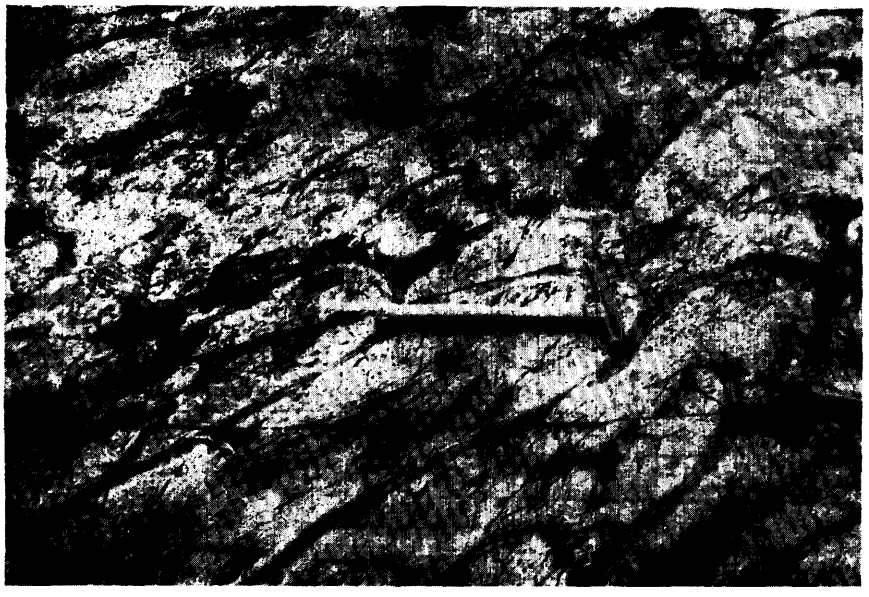
Tuff occurs in thin beds between dacite flows as well as in the matrix of most of the agglomerate. The beds associated with the dacite seldom exceed three feet in thickness and are thinly stratified, resembling varved clays. They are composed of small angular grains and rock fragments distributed through a very fine-grained matrix. Because of the fine-grain size the exact composition could not be determined, but stained thin sections of the rock indicate that it is rhyolitic.

Metamorphism

In the intermediate and acid volcanics, changes in mineralogy resulting from metamorphism have not been extensive because these rocks are composed mainly of quartz and plagioclase. In the south belt, hornblende and epidote are the principal metamorphic minerals and indicate a medium grade of regional metamorphism. In the dacites in the north belt, muscovite is abundant and is probably due to the breakdown of potash feldspar. The minerals are partially or completely recrystallized and a low to medium grade of regional metamorphism is indicated.

BASIC VOLCANICS

Basic volcanics occur in three areas. The largest is in Tait and Richardson townships; the second extends from southwestern Shenston township into central Dobie township; and the third is in the eastern part of Carpenter township.



Pillowed basalt showing abundance of vesicles, Richardson township.

Basic Lavas

Dark greenish-grey basic lavas make up the major part of the basic volcanic group. These lavas are predominantly fine-grained and massive, with schistose material developed only locally. Other variations are present, but because the lavas generally occur in areas of poor exposure, it has been found impossible to map individual flows.

Medium- to coarse-grained varieties occur most extensively in the northern area. They are massive, and the average grain size is about ¼ inch. This material probably represents the slowly cooled interiors of thick flows and sills.

Porphyritic lavas are infrequent. They contain feldspar phenocrysts ¼–1 inch long aligned in a dark, fine-grained basaltic matrix, giving the rock a typical trachytic texture.

Vesicular and amygdaloidal lavas are present only in minor amounts. These are most commonly associated with pillow lavas and have been used in determina-

tion of tops of flows. Amygdules consist of quartz and white-to-pinkish calcite.

In the field the composition of the lavas appeared to be uniform throughout, and specific gravity determinations indicate that it is probably basaltic. Microscopic study showed the rocks to be either too fine-grained or too highly recrystallized for accurate determinations of plagioclase composition to be made. However, some unrecrystallized plagioclase in the phenocrysts of the porphyritic material proved to be bytownite, and this variety of lava, at least, is basalt.

Pillow structures occur in all three areas of basic lavas. They are best developed in fine-grained material in the north belt, and notable exposures are in sections 6 and 7, Tait township, and lot 8, concession I, Richardson township. The pillows range in length from a few inches to 4 feet and are usually only slightly deformed. They have served as the principal evidence for the determination of tops of beds.

Basic Sediment, Tuff, and Agglomerate

Associated and interbedded with the basic lavas are small amounts of mafic-rich sedimentary material, in part tuffaceous, and basic agglomerate. This material is most extensive in the body of basic volcanics in eastern Carpenter township, and the best exposure is in lot 3, concession III, Carpenter township.

The sediments are fine-grained, clastic in appearance, and are irregularly bedded. They are moderately schistose and locally garnetiferous. Microscopic examination shows them to be composed mainly of hornblende, diopside, plagioclase, and quartz.

The agglomerate consists of fragments of porphyritic basalt and fine-grained lava in a matrix of the basic tuffaceous material. The fragments are subangular, 1–6 inches long, and make up 10–40 percent of the total rock.

Metamorphism

Microscopic study reveals that the lavas from the three main areas have, as a result of different grades of metamorphism, different textural features and mineral assemblages.

The basic lavas in Richardson and Tait townships are composed of a felty mass of fibrous hornblende in a matrix of plagioclase and epidote. Recrystallization is very slight, and evidence of effects of appreciable stress is lacking. The metamorphism is low- to medium-grade regional and thermal.

The Shenston-Dobie group of basic volcanics has been almost completely recrystallized, and the characteristic minerals are hornblende and plagioclase. The mineral grains are usually aligned, and red garnet, a stress mineral, is present in small amounts indicating that stress has been an important factor in the metamorphism of this group. The metamorphism is medium- to high-grade regional. Slight hydrothermal alteration has occurred, producing small amounts of shreddy chlorite.

The volcanics in Carpenter township have been highly metamorphosed. Recrystallization has been very complete, and a granular texture is well developed. The lavas along the east margin of the Carpenter basic intrusive have, as a characteristic mineral assemblage, hornblende, augite, hypersthene, and plagioclase. They are believed to have attained the highest grade of thermal metamorphism. Farther north, in the mafic-rich sedimentary material, garnet, hornblende, and diopside are found, and the stress effects of regional metamorphism are more in evidence. Local epidotization and feldspathization also occur in this volcanic group.



Pillowed basalt, Pattullo township.



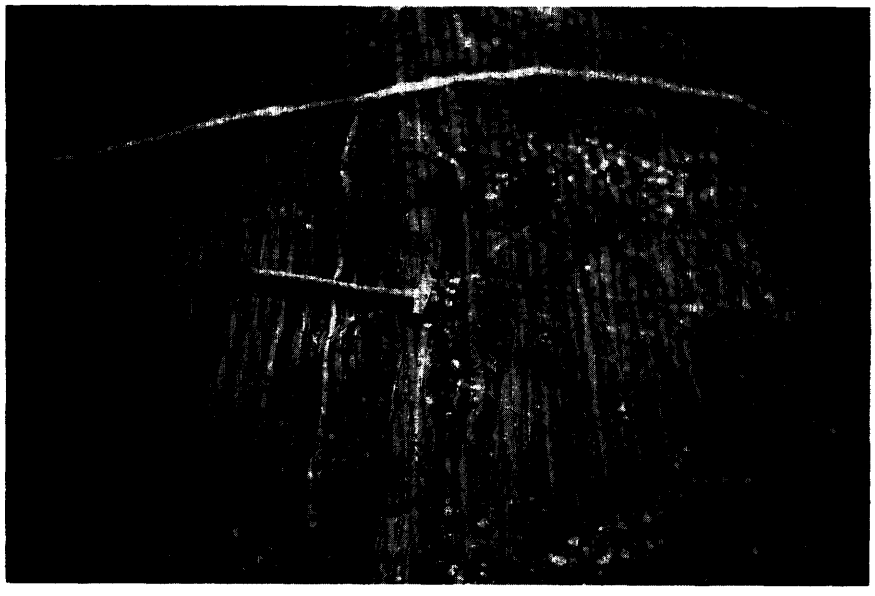
Garnetiferous basic sediments found associated with the basaltic lavas, Carpenter township.

LOWER SEDIMENTARY DIVISION

Hornblende Schists

Two bands of hornblende-rich schists of sedimentary origin occur within the map-area, one in the general area of Carpenter township, the other at the southeast corner of Potts township. These have similar lithologies and structural relationships, and they are believed to be of the same age. They are believed to represent the oldest unit of the Keewatin rocks.

The main band of hornblende schists occurs in the Carpenter area. It extends south and east in an arc from the northeast corner of Dobie township into the central part of Carpenter township. From here, it continues eastward about N.70°E. North of this band, several outcrops of the same schists occur within large granitic masses, and these have been interpreted as tongues and remnants of the main band.



Thin-bedded hornblende sedimentary schist showing lenses composed of garnet and hornblende along the bedding planes, Carpenter township.

The band at the southeast corner of Potts township outcrops in an arc extending from the east side of Pinewood Lake into Mather and Kingsford townships. Its limits are not known because it is located at the boundary of the map-area.

These bands consist of fine-grained, well-bedded, dark-grey clastic sediments, with minor amounts of light-brownish sandy material. The fresh surface characteristically shows lustrous black hornblende and frequently has a banded effect owing to fine laminations of feldspathic material. Red garnets are common, and lenses of garnet and hornblende are developed along the bedding planes in many places. Schistosity is not extreme, the rock having a flaggy nature.

Microscopic examination shows an approximate composition of 40 percent hornblende, 25 percent quartz, 20 percent plagioclase, and 15 percent diopside. Garnet and biotite are present in minor amounts. Hornblende occurs throughout as aligned prisms. Diopside is concentrated in bands 1–2 millimetres wide. Plagioclase is frequently highly saussuritized.

Metamorphism

The rock is completely recrystallized, and the above mineral assemblage implies a high-grade regional metamorphism of a mafic-rich sediment. The diopside results from recrystallization of layers originally rich in lime.

UPPER SEDIMENTARY DIVISION

Greywacke

Greywacke, forming the major part of the upper sedimentary division, occurs in two parallel, steeply dipping bands and extends completely across the map-area at about N.70°E. The two bands are believed to represent the opposite limbs of a synclinal fold and are divided by a narrow granitic intrusive. They are broken up by the granitic rocks, particularly in the eastern parts, and *lit par lit* zones are common along the borders of the intrusive. The maximum width indicated is in the north band and is approximately 16,000 feet; but structural complications may well exist.



Lit par lit **composed of well-bedded greywacke injected with quartz monzonite, Kingsford township.**

Bedding varies, individual beds ranging from thin laminations to several feet, and many outcrops are massive. Successive beds differ only slightly in composition, but the effects of differential weathering are frequently in evidence, and concordant stringers of quartz commonly add to the bedded appearance.

The sediments weather brown to greyish-brown with a distinct sandy appearance. On the fresh surface, the rock is a massive, fine-grained, clastic and is grey to dark greenish-grey in color. This appearance persists throughout the whole body although some hand specimens show slight schistosity and are occasionally spotty owing to the development of poikilitic biotite.

The composition does not vary appreciably from outcrop to outcrop; a typical specimen contains 25 percent quartz, 45 percent oligoclase, and 30 percent biotite. Minor amounts of hornblende, garnet, and sericite occur in various parts of the body. Chlorite is present but is partially altered to biotite. Potash

feldspar is almost entirely absent. Accessory minerals are apatite, zircon, magnetite, and hematite.

Metamorphism

Three assemblages of metamorphic minerals are present. Hornblende occurs in the sediments in Mather township in a narrow zone along the north side of the granitic intrusives. Garnet and biotite characterize the rest of the north band in Mather township and occur in the south band and along the western part of the intrusive where it thins and interfingers with the sediments. Biotite, chlorite, and sericite are the main metamorphic minerals in the sediments underlying Tait township.

The above assemblages and their distribution indicate that the metamorphism of the sediments is medium- to high-grade regional near the contacts with the granitic rocks and decreases to a low-grade regional in the northwestern part of the body. Thus it appears that the regional stress and heat are due to the intrusives. The grade of metamorphism in the hornblende and garnet-bearing zones is probably the same, a greater content of lime having resulted in the formation of the hornblende.

Textural features are also indicative of the grade of metamorphism. Near the intrusive borders, the sediments are completely recrystallized and granular. However, in the northwest portions, the rock is only slightly recrystallized and has a fine-grained, clastic, typically greywacke texture.

Granitization effects are locally evident along the intrusive contacts and in the *lit par lit* zones. Metacrysts of feldspar developed in the sediments are the most striking effect.

Conglomerate

Conglomerate occurs in very minor amounts in the greywacke, near its contact with the volcanics, and a good exposure is in lot 8, concession V, Dobie township. It consists of well-rounded pebbles and cobbles, ranging in size from 1 to 10 inches, enclosed in a matrix of typical greywacke. The pebbles and cobbles make up 10–35 percent of the rock and consist of quartzite, fine-grained granitic material, and dacite.

Iron Formation

On the map, iron formation is shown in the northern part of Dobie township, and in Lash and Carpenter townships. It does not outcrop in the map-area, but it is strongly magnetic, and its extent has been outlined from geophysical data.

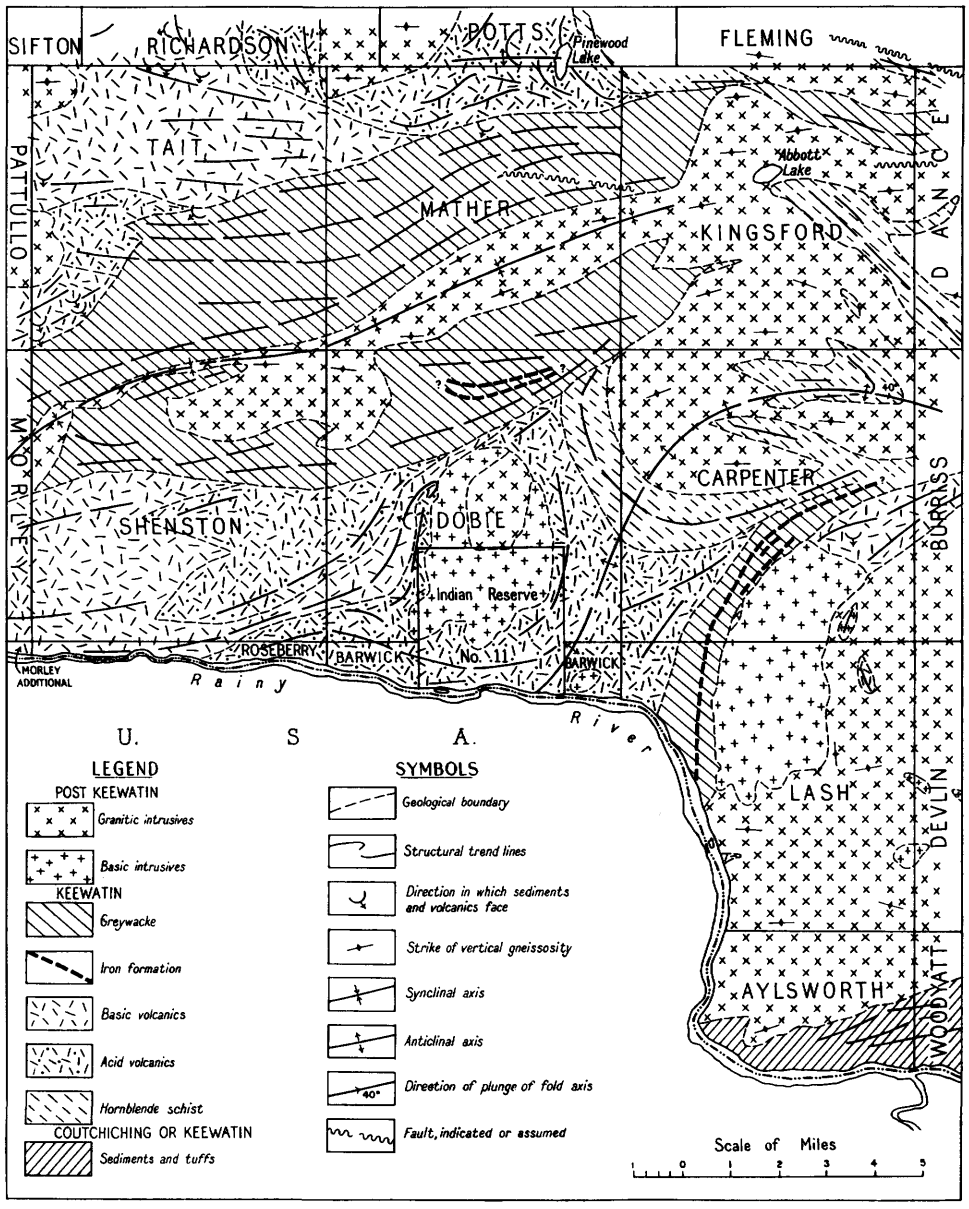
The iron formation in Dobie township, as seen in specimens of diamond-drill core, consists of garnetiferous mica and hornblende sedimentary schists with disseminations and tiny bands of finely granular magnetite. Pyrite and hematite are rare. The magnetite has apparently resulted from recrystallization of hematite.

No definite information is available on the iron formation in Lash and Carpenter townships, but it is believed to be of a type similar to that in Dobie township. It is reported to have a greater concentration of magnetite.

STRUCTURE OF THE KEEWATIN

Interpretation of both the structure and the stratigraphy of the area has been limited by the sparseness of outcrops. Wherever possible, contacts and structural trends have been outlined on the basis of geophysical and drill-hole data, but in many places, their location has been assumed.

Tops of beds have been determined primarily from pillow structures in the basic lavas. The attitude of the schistosity and bedding has proved useful.



Sketch map showing the structural geology of the Emo area.

but determinations based on grain gradations and cross-bedding in the sediments could rarely be made because of the obscuring effects of metamorphism and coverings of lichen.

As a large part of the area is underlain by rocks of Keewatin age, any discussion of the structure of these rocks is, in effect, a discussion of the structure of the area. Stratigraphic relationships of the divisions of the Keewatin are largely based on the structural interpretations.

Folding

Three major folds, two anticlines, and a complementary syncline, are indicated within the map-area (see sketch map). The limbs of these folds are vertical to steeply dipping, and the axes of all three trend in an easterly to northeasterly direction.

The most southerly fold is an anticline and is exposed with drag-folding in outcrops in lots 3 and 4, concession VI, Carpenter township. From this location, the axis apparently extends west and south, under areas covered by overburden, to a point on the Rainy River about two miles west of Emo. In the exposures in Carpenter township, the axis plunges about 40°E. At the boundary of Dobie and Carpenter townships, an arc of vertical sediments opening to the northeast suggests that the axis is plunging steeply to the southwest. Thus, the eastern part of the anticline is believed to be domed. On the limbs of the fold, only two reliable determinations of directions of tops of beds were made, but these indicate an anticline. On the south limb, in lot 3, concession III, Carpenter township, pillow lavas indicate tops to the south, and correspondingly, on the north limb, pillow lavas in lot 9, concession III, Dobie township, indicate tops to the north.

The other fold interpreted as an anticline occurs on the north boundary of the map-area. Its axis trends approximately east-west from Pinewood Lake towards the southwest corner of Potts township. Because of its proximity to the boundary of the map-area, its location farther west is not known. However, the schistosity and flow structures of the volcanic rocks in this region swing from an east-west direction in Mather and Tait townships to a north-south direction in Richardson township indicating that the fold does persist to the west. The pattern of Burditt Lake and other lakes to the north, as seen on topographic maps, suggests that this fold may form the south extremity of a much larger fold. Evidence of the anticlinal nature of the fold is not available in the vicinity where the position of the axis is best defined; however, pillow lavas in Tait and Richardson townships are apparently in the south limb of the fold, and these indicate the direction of tops of flows to be south.

A syncline has been suggested between the two previously described anticlines. Its axis is believed to strike approximately N.70°E. along the band of granitic rocks crossing Shenston and Mather townships. In the sediments bordering the intrusive in Shenston township, vertically plunging drag folds are prevalent, indicating that the assumed position of the axis may well be the correct one.

STRATIGRAPHY OF THE KEEWATIN

Although no definite evidence of unconformable contacts has been found, the Keewatin may be divided stratigraphically on the basis of structural data and interpretations into four divisions. For descriptive purposes these divisions have

been named after the townships in which they are best exposed. In sequence, from the oldest at the bottom to the youngest at the top, they are as follows:

Carpenter volcanics
Mather sediments
Dobie volcanics and Tait volcanics
Carpenter sediments (possibly Coutchiching in age)

Carpenter Sediments

The Carpenter sediments consist of the hornblende schists of the lower sedimentary division. As has been described, these hornblende schists occur in two separate bands, the main one in Carpenter township, the other in the southeast corner of Potts township. The structural positions of these bands on the anticlinal folds indicate that they both stratigraphically underlie intermediate volcanics and form the basal units of Keewatin rocks in the sections exposed by the folding. For these reasons, the two bands are believed to be stratigraphically equivalent and to represent the oldest unit of Keewatin rocks in the map-area.

This division may possibly be equivalent to the Coutchiching mapped by Lawson in the Rainy Lake area, because it consists of sediments representing the oldest rocks in the map-area and underlying Keewatin-type volcanic rocks. However, it has been assigned to the Keewatin because the hornblende schists are not lithologically similar to the Coutchiching mica schists and because direct correlation with the rocks in Lawson's map-area is impossible at this time.

Dobie Volcanics and Tait Volcanics

The Dobie volcanics are the belt of volcanic rocks extending across the southern parts of Shenston and Dobie townships and into the western part of Carpenter township. Tait volcanics refers to the northern body of basic and intermediate-to-acid volcanic rocks. The former occurs in the north limb of the syncline and the latter in the south limb. Stratigraphically, they both appear to directly underlie the greywacke of the upper sedimentary division and, therefore, are probably equivalent in age. They appear to overlie the hornblende schists in the limbs of the adjoining anticlines and thus occupy a stratigraphic position between the Carpenter sediments and the upper sedimentary division.

Mather Sediments

The upper sedimentary division is best exposed in Mather township. As was stated previously, it consists of a synclinally folded formation composed mainly of greywacke, and it is stratigraphically underlain by the Dobie and Tait volcanics.

Conglomerate occurs in minor amounts near the base of the greywacke in both limbs of the syncline. The contact of the volcanics and sediments is not exposed but appears to be conformable, and it is believed that the conglomerate is merely a gradational stage from agglomerate to greywacke.

Iron formation is interbedded with greywacke in the northern part of Dobie township and is in the north limb of the main anticlinal fold. In the south limb of this anticline, iron formation trends north and east across Carpenter township. These two are presumably equivalent in age.

Carpenter Volcanics

The group of basic volcanic rocks in eastern Carpenter township is called the "Carpenter volcanics." It appears to stratigraphically overlie the iron formation both by its position in the anticline and by top determinations in pillow lavas. Thus it is believed to be the youngest group of Keewatin rocks in the map-area.

Post-Keewatin Intrusives

BASIC INTRUSIVES

The principal basic intrusives are two stocks, one in the central part of Dobie township, the other in Lash and Carpenter townships. Besides these, numerous smaller bodies of hornblende diorite and gabbro cut the sediments and volcanics and are included in the granite.

Dobie Basic Intrusive

The Dobie basic intrusive is an apparently U-shaped body with arms extending to the northeast. Its approximate dimensions are 22,000 by 15,000 feet. It intrudes volcanic rocks, but contacts are only exposed in two places. In the west-central part of Indian reserve No. 11, it is found in sharp intrusive contact with intermediate agglomerate, and in lot 8, concession IV, Dobie township, it intrudes basic sedimentary material and associated basic lavas. The contact was observed in the core from a diamond-drill hole in the northwestern part of the reserve. In several outcrops, presumably close to the contact, angular inclusions of dacite and other materials are common. The location of the remainder of the contact has been either assumed or outlined with the aid of an aeromagnetic map owned by Falconbridge Nickel Mines, Limited. The east arm and the southern part of the intrusive were well defined by aeromagnetics, but the indicated west arm has no pronounced anomalies, and outcrops are found only in its northern parts. Thus a gap of about a mile exists between the northwest tip and the main intrusive mass, and it is possible that the intrusive is actually two separate bodies.

The intrusive is divided, through differentiation, into three main phases, coarse-grained diabasic gabbro, medium-grained hypersthene gabbro, and norite. Coarse-grained pyroxenite and anorthosite occur in minor amounts, but their distribution is too erratic to be mapped on the scale used. In the border zones, where inclusions occur, the intrusive becomes slightly more feldspathic, and some of the inclusions consist of a fine-grained basic material, which may possibly represent an early chilled phase of the intrusive.

The three main phases were distinguished in the field on the basis of textural features and mafic content. Later detailed microscopic study has revealed that the plagioclase becomes progressively more calcic in going through the sequence from diabasic gabbro to norite. The phases are gradational into each other over distances of 50–100 feet.

The diabasic gabbro occurs in the central zone of the thickened southern part of the intrusive. It is characterized by a coarse-grained diabasic texture, which is well shown on both the fresh and weathered surfaces. Randomly oriented, white to greenish feldspar laths, ¼–½ inch long, form a marked contrast with the interstitial mafic minerals. The composition is about 70 percent sodic labradorite, 20 percent augite, and 10 percent hypersthene and uralite.

The hypersthene gabbro is the most extensive phase and appears to partly enclose the diabasic gabbro. It occurs in a narrow band along the southeast side of the intrusive and makes up nearly all the arms. It weathers dark grey, and the fresh surface is uniform grey to black owing to the dark colour of both feldspar and the mafic minerals. The texture is medium-grained equigranular, and the average composition is 50 percent labradorite, 30 percent augite, and 20 percent hypersthene and uralite.

The third major phase, fine- to medium-grained norite, occurs in two lobes of the intrusive along its southern contact. It is dark grey on both the fresh and weathered surfaces and is distinguished by its mafic content. The main

mineral constituents are calcic labradorite, hypersthene, and enstatite plus small amounts of olivine. Hypersthene predominates, making up about 75 percent of the rock. This phase is significant because associated with it are massive and disseminated pyrrhotite and pentlandite.

The age of the intrusive is well established as post-Keewatin by its intrusive contacts with the volcanic rocks. It is cut by quartz diabase dikes and is thus pre-Keweenawan. Its age relative to the granitic intrusives is not known since it is not found in contact with them. The fresh, unaltered appearance of the minerals in the basic rock and the absence of secondary gneissosity indicate that it has not suffered the metamorphism and stress associated with the granitic intrusives in the area, and it is thus probably later in age.

Carpenter-Lash Basic Intrusive

The second basic stock underlies the south-central part of Carpenter township and the north-central part of Lash township. It has a maximum size of 30,000 by 12,000 feet and is elongated in a north-south direction. Exposure is poor, particularly in Lash township, and the location of the intrusive boundaries, although outlined to a large extent with the aid of an aeromagnetic map, is much in doubt.

The rock is fine- to medium-grained and is equigranular. It is essentially massive, except in a few border outcrops where weak primary gneissosity is developed. The fresh surface is dark greenish-grey, and the weathered surface is grey. Unlike the Dobie basic intrusive, no definite zoning is evident. The composition throughout is about 50–60 percent labradorite with the remainder being augite and hypersthene. The pyroxenes are partially uralitized, and small amounts of sericite, magnetite, sulphides, and zoisite are present. The rock is a hypersthene gabbro.

Field evidence for the relative age of the intrusive is as follows. In lot 3, concession II, Carpenter township, the intrusive truncates the basic volcanics. In lot 3, concession II, Carpenter township, it is cut by dikes and tongues of the monzonite, which outcrops more extensively to the east. In a rock-cut along highway No. 71 in the southwest quarter of section 33, Lash township, fragments of hypersthene gabbro are included in quartz monzonite. Thus, this basic intrusive is post-Keewatin and is older than at least some of the granitic rocks.

Hornblende Diorite and Gabbro

Small bodies of basic rock are common throughout the area. The main occurrences are in section 17, Devlin township, and section 12, Lash township, where three bodies, one about 3,500 feet in diameter, are surrounded by quartz monzonite. An apparent sill of hornblende diorite, with an exposed width of 600 feet, intrudes the intermediate volcanics in the southern part of Indian reserve No. 11. Irregular dikes and sills of this material, seldom exceeding 20 feet in width, are common in the volcanics and sediments, and small inclusions are prevalent in the granitic intrusives. A notable example of the latter is in the southwest quarter of section 3, Lash township, where sharp angular fragments of hornblende diorite are enclosed in quartz monzonite (see photograph).

The basic rock is dark-grey to greenish-black, and its texture is fine- to medium-grained equigranular. It is massive for the most part, but gneissic material occurs in some of the smaller dikes. The composition ranges from hornblende diorite to hornblende gabbro and is occasionally as acid as quartz diorite. The hornblende diorite is the most abundant type and is composed of

hornblende and andesine in about equal portions with small amounts of biotite and epidote. The accessory minerals are apatite and magnetite.

GRANITIC INTRUSIVES

Granitic intrusives in the area range in composition from quartz monzonite to granodiorite and are rarely as basic as quartz diorite. True granites were found only in small dikes. The intrusives have been, for convenience, described under five divisions, but boundaries are, for the most part, poorly defined, and age relationships are indefinite. No evidence was found of any great interval of time between any of the divisions, so the description is not necessarily in order of age.

Granodiorite

The main body of granodiorite underlies the north third of Carpenter township and the south third of Kingsford township. It intrudes the domal



Angular inclusions of hornblende diorite in coarse-grained quartz monzonite, Lash township.

structure of hornblende schists and is bordered on the south and west by these schists. It is truncated on the north by pink quartz monzonite and extends beyond the east border of the map-area.

In age, this intrusive is apparently among the oldest of the granitic intrusives studied. In lots 5 and 6, concession III, Kingsford township, it is cut by dikes of the pink quartz monzonite. The gneissosity of the granodiorite and the attitude of the invaded sedimentary schists conform for the most part, suggesting that the major folding of the area and the intrusion of the granodiorite were contemporaneous.

The rock is fine- to medium-grained and light-grey to pinkish-grey in colour. It has moderate gneissosity resulting from alignment of layers and flakes of biotite. Its appearance is uniform in part, but where in contact with the sediments or where inclusion of sediments occur, streakiness has developed because of contamination. Contortion of the gneissosity adds to this streaky effect as do numerous injections of feldspathic and quartzose material.

Microscopic study shows the uniform material to have an average composi-

tion of 30 percent quartz, 48 percent oligoclase, 7 percent microcline, and 15 percent biotite. Accessories are extremely rare.

A second body of granodiorite occurs in the northeastern part of Kingsford township. It is similar in appearance and composition to the intrusive to the south but contains more accessories, principally apatite and magnetite. Gneissosity is not pronounced except near its contacts with the sediments.

A third body of granodiorite occurs at the west boundary of the map-area in Tait and Pattullo townships. It intrudes basaltic lavas and intermediate tuffs and is cut by a large diabase dike.

This intrusive, as exposed in the map-area, appears to be zoned. Near the borders it has a coarse-grained diabasic texture and is mottled green and black in colour on the fresh surface, weathering dark-grey. Towards the central parts, the texture becomes medium-grained granular with local porphyritic patches, and the colour changes to light-grey and pink on both the fresh and weathered surfaces. Microscopic examination of these sections reveals that the only mineralogical change throughout the body is in the type of mafic mineral. In the border zone, augite was found, whereas biotite and hornblende predominate in the centre. The average composition is 15 percent quartz, 10 percent microcline, 55 percent andesine and 20 percent mafic minerals. The accessory minerals are magnetite, apatite, and zircon. The minerals are generally fresh in appearance, but there is some uralitization and sericitization along the diabase dike.

Hornblende Granodiorite and Quartz Monzonite

A band of granitic rocks, ranging in composition from hornblende granodiorite to quartz monzonite, extends across Shenston, Mather, and Kingsford townships. The average width of the band is approximately 7,000 feet, but its outline is irregular.

Contacts with adjacent rocks are seldom exposed, and then only for short distances. In the northeast quarter of section 34, Shenston township, a sharp contact between sediments and igneous material is exposed in two adjacent outcrops for a total distance of 1,500 feet. In Mather township, the south border of the band is marked by a zone of *lit par lit* injection about 1,500 feet wide. On the corresponding north border, the *lit par lit* zone is absent, and the limit of outcrops of granite material forms a sharp lineament suggesting a possible fault contact. In Kingsford township, the granitic material surrounds and highly injects a body of hornblende sedimentary schists. Here, the regional gneissosity of the granitic rocks does not conform with the strike of the sediments indicating that this body was intruded after the major folding of the area.

The body varies considerably in composition and texture, but two phases, hornblende granodiorite and quartz monzonite, predominate.

The hornblende granodiorite outcrops most extensively in the western part of the band and occupies a bulge in the south boundary of the band in the vicinity of Dobie and Shenston townships. The texture ranges from medium-grained equigranular to porphyritic. The rock is grey in colour, composed of white to pinkish feldspar in a dark mafic-rich matrix. Gneissosity is commonly well developed, and in the porphyritic varieties, alignment of crushed phenocrysts of feldspar gives an augen-gneiss appearance. A study of thin sections of the rock shows an average composition of 10 percent quartz, 50 percent oligoclase, 17 percent microcline, 13 percent hornblende, and 10 percent biotite. Accessories are epidote, sericite, chlorite, apatite, and sulphides. Oligoclase is moderately saussuritized, and, in the porphyritic material, forms phenocrysts ½–1 inch long. Hornblende occurs as pleochroic, green crystals with distinctive poikilitic habit

resulting from abundant inclusions of quartz. Microcline, brown biotite, and strained quartz make up most of the matrix.

Quartz monzonite occurs in the eastern part of the band and along its margins in Mather. It is also the material in the *lit par lit* injections. In Kingsford, its colour is reddish-pink; in Mather, it is pinkish grey; and in the *lit par lit* injections, where assimilation of sedimentary material is probable, it is light grey. The rock is fine- to medium-grained, with well developed gneissosity. Its average composition is approximately 25 percent quartz, 39 percent oligoclase, 30 percent microcline, and 6 percent biotite. Epidote granules are the only common accessory.

The phases described above are intimately associated, and all gradations were found between them. Dikes of quartz monzonite cut the hornblende granodiorite, and pegmatite dikes cut both. It would appear that the phases have been derived, by differentiation, from the same magma and have been intruded as an non-homogeneous mass. The quartz monzonite is regarded as the slightly later phase, which has been intruded into and around the hornblende granodiorite. Squeezing in the late stages of crystallization has resulted in the strong gneissosity and in the further mixing of the types by redistribution of residual magma.

Monzonite

The monzonite is exposed in sections 25 and 36, Lash township, and lots 1 and 2, concession I, Carpenter township, and extends eastward into Burriss and Devlin townships an undetermined distance. It is bounded on the west by a basic intrusive and basic lavas, on the north by basic lavas and sediments, and on the south by quartz monzonite.

The relative age of the monzonite has been established as younger than the basic intrusive, basic lavas, and sediments. In a large rock-cut, four miles east of Emo on highway No. 71, the monzonite occurs as dikes and apophyses in the basic lavas, and in the border zone of the monzonite, xenoliths of basic lavas are present. In lot 3, concession I, Carpenter township, it cuts the hypersthene gabbro. The age relationships of the monzonite and quartz monzonite cannot be definitely established because their contact is not exposed. However, sericitization and uralitization in the monzonite near the contact as compared with the fresh, unaltered appearance of the quartz monzonite suggests that the monzonite is older. From its association with hypersthene gabbro and quartz monzonite, the monzonite may possibly be interpreted as an intermediate phase in a series of intrusions along an orogenic zone.

The monzonite is massive with the exception of a slight lineation of mafic minerals in apophyses and dikes. In outcrop the surface is a uniform brown to dark grey, and the fresh surface is a distinctive purplish-grey owing to the dark colour of the feldspar.

The rock has been found by Rosiwal analysis to be composed of about 2 percent quartz, 50 percent andesine, 20 percent microcline, 13 percent biotite, and 15 percent augite. The accessory minerals are apatite, magnetite, sphene, and zircon, apatite being the most abundant.

Quartz Monzonite

Two major bodies composed mainly of quartz monzonite occur in the area. The larger and better defined underlies most of Lash and Aylsworth townships, the other is a small lobe of a larger intrusive projecting into the map area in Potts and Mather townships.

The body of quartz monzonite in Lash and Aylsworth townships is bounded

on the south by sediments and volcanics of possible Coutchiching age and on the north by basic lavas and hypersthene gabbro. It extends both east and west beyond the limits of the map-area. This intrusive is believed to be younger than all the adjacent rocks, and its age relationships have been discussed previously.

The rock is grey to pink on the fresh surface and weathers predominantly grey, only the finer-grained phases have a pink colour in outcrop. A streaky appearance is commonly developed where xenoliths are present, probably as a result of assimilation.

The composition of the rock is uniform throughout, but the texture varies, ranging from medium-grained equigranular to coarse-grained porphyritic with phenocrysts ¼-½ inch long. No systematic occurrence of the porphyritic material could be determined.

Microscopic examination shows that the rocks of this intrusive are characterized by coarse-grained replacement perthites and vermicular intergrowths of quartz and plagioclase. The average composition is 25 percent quartz, 30 percent microcline, 37 percent andesine, and 8 percent biotite. Small amounts of secondary epidote and hornblende are present. The accessory mineral content is very low, consisting of only a few grains of apatite and magnetite.

The second body of quartz monzonite occurs on the north boundary of the map area in Mather and Potts townships. The quartz monzonite intrudes intermediate volcanics, and a sharp intrusive contact with xenoliths of dacite is exposed in lot 12, concession VI, Mather township.

The intrusive rocks are pink to grey, fine-grained, and massive, becoming gneissic near the contact. The major part of the intrusive is quartz monzonite although a minor monzonite phase occurs near the south edge of the body. These two phases differ considerably in mineral content. The quartz monzonite contains quartz, sodic andesine, microcline, biotite, and hornblende; and the monzonite is composed of sodic andesine, microcline with partially uralitized augite, and hornblende. In both phases apatite is the main accessory mineral, and lesser amounts of zircon, magnetite, and sphene are present.

Pegmatite, Aplite, and Granitic Dikes

Dikes of granitic composition occur in all parts of the area but are not abundant. The greatest concentration is in the band of hornblende granodiorite and quartz monzonite extending across Shenston and Mather townships. Pegmatite dikes are small and irregular, seldom more than 1 foot wide. Rare mineral pegmatites were not found.

Keweenawan

Dikes of quartz diabase cut all other rock formations in the Emo area and are presumably Keweenawan in age.

The dikes, as indicated by the distribution of outcrops, have remarkable continuity at a bearing of N.45°W. Two are apparently continuous for distances of over 20 miles, and several others have been traced for about five miles. The major dikes range from 100 to 200 feet wide, but smaller dikes ranging from a few inches to 6 feet wide are also common.

A hummocky appearance along strike is characteristic of the dikes, and in the larger ones, this is often clearly visible on air photographs. It results from the removal, by glacial action, of slabs or columns of the diabase freed by cooling joints developed normal to the dike walls.

The dike rock is fine-grained along the margins of the intrusive, becoming medium- to coarse-grained in the central parts. It is dark greenish-grey in

colour and weathers a distinctive brown. Microscopic examination shows it to be composed of labradorite, augite, interstitial quartz, and accessory magnetite and sulphides. The augite is partially uralitized. Diabasic or intergranular texture is well developed.

Minor magnetic anomalies, as observed on an aeromagnetic map, occur along the dikes. These apparently result from disseminations of magnetite in the quartz diabase.

Cenozoic

The soils and other Cenozoic deposits in the area have been mapped and adequately described by W. A. Johnston,[1] of the Geological Survey of Canada.



Two-foot Keweenawan diabase dike cutting granodiorite, Carpenter township.

The region has undergone continental glaciation, and in the map-area, the glacial striae strike about N.40°E. Johnston has suggested three glacial advances. The succession is: (1) a probable advance of Keewatin glaciers from the northwest, (2) a Labradorean glacier from the northeast, and (3) another advance of Keewatin glaciers from the northwest. The Labradorean glaciers have apparently produced most of the glacial striae, but the till in the area is believed by Johnston to have been deposited by a lobe of the last Keewatin glaciers. Ponding in front of this lobe produced Early Lake Agassiz in which laminated clays containing pebbles and boulders were deposited. Later, fluviolacustrine and lacustrine sand, silt, and clay were deposited in pro-glacial Lake Agassiz, formed after Early Lake Agassiz disappeared.

Recent deposits are mainly peat and other organic material accumulated in swamps. Very minor deposits of alluvium occur along the streams.

[1]W. A. Johnston, *Rainy River District, Ontario. Surficial Geology and Soils*, Geol. Surv. Can. Mem. 82, 1915.

STRUCTURAL GEOLOGY

The folding in the area and structural evidences thereof have been discussed previously under Structure of the Keewatin. Faulting is not confined to the Keewatin rocks and will be discussed here.

Faulting

Three faults shown on the map have been inferred from lineaments on the air photographs. The most pronounced lineation is a prominent north-facing scarp, striking N.70°W., near the northeast corner of Kingsford township. This scarp is 25–30 feet high and is visible on air photographs for about 4 miles. In the sediments in northeastern Mather township, a gully trending approximately N.80°W. has been taken as a possible fault. The third possible fault occurs along another pronounced gully, striking east-west, in the quartz monzonite on the east boundary of Kingsford township. Displacement, if any, on these faults, is not known.

Several faults have been shown where there are offsets of diabase dikes. Actual fault planes were not seen in outcrop, but one of these faults, in the central part of Indian reserve No. 11, was outlined by an electro-magnetic anomaly, and the shear zone was observed in the core from a diamond-drill hole. These faults are probably post-Keweenawan in age, although a second period of movement along an earlier fault is a possibility. The displacement need not have exceeded the width of the dike.

ECONOMIC GEOLOGY

Nickel-Copper Sulphides

Deposits of nickel- and copper-bearing sulphides were found in Dobie township in 1952. The first discoveries were in outcrops in lot 9, concession I, Dobie township, and along highway No. 70, in the southern part of Indian reserve No. 11. Test pits were opened up, and early assays gave encouraging values of nickel and copper. Following these early results, large portions of the district were staked or optioned, and a detailed exploration program was initiated. An aeromagnetic survey showed pronounced magnetic anomalies in the vicinity of the first two discoveries plus numerous smaller anomalies in the surrounding area. Ground magnetometer and electromagnetic work were carried out, and a detailed diamond-drilling program was set up.

Nickeliferous sulphides were found only in the Dobie basic intrusive and mainly within the norite phase. They occur in local disseminations and minor pockets without evident structural control. They are believed to have been concentrated, probably by magmatic segregation, during the differentiation of the magma. In some places, the sulphides appear massive in hand specimens, but microscopic examination shows only thin skins of pyrrhotite and pentlandite around the grains of the silicate minerals. These sulphides may have been produced by reaction of magmatic hydrogen sulphide gas with iron- and nickel-bearing pyroxenes.

The principal ore minerals are pyrrhotite, pyrite, pentlandite, and chalcopyrite, with small amounts of violarite, sphalerite, and magnetite. Pyrrhotite predominates. The nickel-bearing sulphide minerals are pentlandite and violarite. Pentlandite occurs as exsolution blades and grains in the pyrrhotite, and violarite as a supergene alteration product of the pentlandite. Chalcopyrite is interstitial between pyrrhotite and pyrite.

The most significant deposit of nickel-copper sulphides was the original discovery located in lot 9, concession I, Dobie township. It occurs in a body of norite that forms a bulge extending outward from the southwestern part of the gabbro-norite intrusive. A grab sample of massive sulphides from the test pit on this deposit yielded on analysis 2.52 percent nickel and a trace of copper. Two grab samples of disseminated sulphides were submitted for analysis. One yielded 0.30 percent copper and 0.31 percent nickel, and the other 0.40 percent copper and 0.41 percent nickel.

Options on ground including the original discovery and on other holdings in Dobie township and on Indian reserve No. 11 were acquired by Falconbridge Nickel Mines, Limited, from D. R. Young and associates of Emo. An airborne magnetometer survey of the area extending from Woodyatt and Devlin townships on the east to Shenston township on the west was made for the company by Aeromagnetic Surveys, Limited, and a program of exploration by diamond-drilling was carried out between March and September, 1953. The results of this exploration and a map showing the locations of the drill holes have been made available to the writers through the courtesy of Falconbridge Nickel Mines, Limited. The information with respect to the drilling has been condensed and is presented in the appendix on pages 27–34.

Other Sulphide Deposits

A number of sulphide deposits consisting mainly of pyrite and pyrrhotite were found throughout the area. Some of these were investigated in the early days for gold, others have been investigated more recently as base metal prospects.

In lots 4 and 5, concession III, Kingsford township, several rusty zones of "burnt rock" occur in outcrops composed of fragments of hornblendic sediments in granitic material. The largest of these zones was traced discontinuously for 800 feet and has a maximum width of 20 feet. It strikes N.80°W., parallel to the *lit par lit* injection, and is bordered on the south by a Keweenawan diabase dike, 60 feet wide, striking N.70°W. In this vicinity, five test pits have been opened up, two of them in the main zone. The fresh surface reveals the rock to be highly silicified with disseminations and small bands of pyrite and pyrrhotite. An assay of a grab sample of the better-looking material yielded no gold and only a trace of nickel.

In lot 11, concession IV, Burriss township, a rusty silicified zone, with an exposed width of about 300 feet, occurs in an outcrop of thick-bedded basic sediments. One small test pit has been blasted out, and small amounts of disseminated sulphides are visible on the fresh surface.

Minor showings of sulphides were found along the contact of the dacite and monzonite in the southeast quarter of section 1, Richardson township, and small rusty patches are common throughout the dacites in section 2, Richardson township. Assays of sulphides from the contact zone show traces of gold, copper, and nickel.

In the southeast quarter of section 11, Pattullo township, rusty streaks with pyrite and pyrrhotite are present in the basic lavas.

In lot 9, concession IV, Dobie township, small bands of pyrite and pyrrhotite are exposed in basic tuffs and lavas. These are within several hundred feet of the contact with the Dobie basic intrusive, and Falconbridge Nickel Mines, Limited, has drilled two diamond-drill holes in the tuffs on the basis of a geophysical anomaly. The core, however, showed only bands of sulphides similar to those found in outcrop. A grab sample from the outcrop assayed a trace of nickel but no gold.

In the western part of Dobie township and in the eastern part of Shenston

township, several geophysical anomalies have been investigated by diamond-drilling by Noranda Mines, Limited. These were found to have been caused by small massive bands and disseminations, mainly of pyrite and pyrrhotite.

The contact of the Coutchiching (?) with the granitic intrusives in Aylsworth township is marked by a strong linear magnetic anomaly. Two diamond-drill holes, designated *A*1 and *A*2, were put down in 1953 by Falconbridge Nickel Mines, Limited, on magnetic highs close to the contact. Hole No. *A*1, in the southwest quarter of section 28, was directed S.30°E. at an angle of 45 degrees. It was drilled for a total length of 404 feet, the first 79 feet being through overburden, and the balance in schistose tuffs containing magnetite, pyrite, pyrrhotite, and a little chalcopyrite. Hole No. *A*2, in the northwest quarter of section 25, was directed due south at an angle of 45 degrees. It was drilled for a total length of 364 feet, the section from surface to 27 feet consisting of clay and small boulders, and the rest of granitized sediments with seams of pyrite and pyrrhotite. No copper or nickel values of significance were encountered in either hole.

A drill hole was put down by Falconbridge Nickel Mines, Limited, in June, 1953, on the Dunvegan property in the northern part of section 24, Shenston township. This hole was drilled due south at an angle of 58 degrees for a total length of 293 feet. The casing was driven through muskeg, clay, sand, and boulders for 150 feet, and from this point to the end of the hole, the core consisted chiefly of greywacke containing narrow veinlets of quartz and carbonate and a little pyrite.

Iron Formation

The most significant mineral occurrence in the area is the iron formation extending north and east from near the town of Emo. It does not outcrop, but it has been traced by air and ground magnetometer work from the international boundary northeast into Carpenter township, a distance of about 7 miles. Aeromagnetic maps of Minnesota show that it extends about 28 miles to the southwest. The formation has been investigated by diamond-drilling, but the results have not been released. It is reported to consist of a band of magnetite, about 40 feet wide, interbedded with steeply dipping sediments. Despite its length and reportedly good grade, the band is too narrow and under too great a depth of overburden to be of economic value at the present time. It may, however, be of importance in the future.

Information with regard to a hole drilled jointly by Noranda Mines, Limited, and Prospectors Airways Company, Limited, in Carpenter township has been supplied by Prospectors Airways Company, Limited. This hole was put down near the centre of the south half of lot 9, concession 2, and in proximity to the linear magnetic anomaly referred to above. The hole was directed S.60°E. at an angle of 55 degrees and, on completion at 600 feet, the dip had flattened to 42 degrees. A partial log of the hole is as follows: 0 to 175 feet, casing; 175 to 381 feet, siliceous gneissic sediment; 381 to 429 feet, garnet-mica-magnetite zone; 429 to 600 feet, garnetiferous biotite gneiss and chloritized gneissic sediment. The magnetite band encountered in this hole had a true width of about 35 feet. A representative sample ran 34.8 percent iron and 49.0 percent solubles (mostly silica). On grinding to 100 mesh, 89.1 percent of the iron content was recovered as a magnetic concentrate containing 65.6 percent iron.

Exploration by diamond-drilling was carried out in April, 1953, by Prospectors Airways Company, Limited, on the Young-Corrigan property in concession 6, Dobie township. Four holes were put down to intersect two zones of magnetic attraction indicated by a magnetometer survey. Information with respect to this work, summarized from data supplied by the company, is given in the following table.

RESULTS OF DIAMOND-DRILLING, YOUNG-CORRIGAN GROUP, CONCESSION VI, DOBIE TOWNSHIP

Hole No.	Location	Dip (surface to end of hole)	Overburden	Total length	Description
			feet	feet	
1	NW. corner, S. ½ lot 6	48°–16½°	80	633	Grey gneiss with bands of magnetite.
2	SW. corner, S. ½ lot 7	42°–30°	102	604	Grey biotite-garnet gneiss with bands of magnetite.
3	S. ½ lot 8	45°–24°	81	772	Biotite-garnet gneiss with bands of magnetite.
4	N. ½ lot 4	45°–33°	23	335	Biotite-garnet gneiss with magnetite-quartz bands.

The deposit is thought to represent Keewatin-type iron formation. According to the company, the best 100-foot section of iron-bearing material, taken between 400 and 500 feet in hole No. 3, yielded, on analysis, 24.44 percent iron and 55.75 percent silica. A high recovery was made by magnetic concentration, and an excellent concentrate, low in phosphorus, was obtained by grinding to 200 mesh. The over-all grade of the section drilled would appear to be considerably lower than 25 percent iron.

In lot 12, concession IV, Dobie township, a strong, but local, magnetic anomaly has been found. This anomaly has not been investigated, but its location suggests that it is probably due to magnetite-bearing sediments.

Gold

The principal gold prospects in the area, other than the sulphide deposits previously described, are quartz veins in the northern parts of Tait and Mather townships. Two test pits were found in these quartz veins, one in the southeast quarter of section 26, Tait township, the other in lot 6, concession VI, Mather township.

The veins are mostly small and discontinuous, a few occurring along small shear zones. They are usually composed of barren white quartz, but several contain thin streaks of black tourmaline. An assay of a grab sample from one of the latter veins showed no gold and only traces of silver and copper.

Gravel and Peat

Gravel deposits are numerous in the area, and pits have been opened up in most of these. The most extensively developed pits are in Mather township and in the southeast quarter of section 4, Shenston township. The gravel is used principally in road construction.

Some peat has been removed from the large muskeg in lots 6, 7, and 8, concession IV, Carpenter township, but operations were not going on during the field season. The peat is reported to have been used mainly for insulation purposes.

Future of the Area

In view of the detailed exploration that has been carried out, it seems unlikely that the Emo area will be important as a mining district in the near future. To date, nickel and copper sulphides have only been found in minor deposits, although larger deposits might possibly exist at depth in the norite. The other sulphide deposits in the area do not appear to have an appreciable base-metal content and are too small to be of value as sources of sulphur or iron. The area has been thoroughly prospected for gold, and no significant deposits have been recorded. The only important mineral deposit in the area at present is the iron formation in Carpenter township, but this awaits an increased demand for iron before development would be practical.

APPENDIX—RESULTS OF DIAMOND-DRILLING BY FALCONBRIDGE NICKEL MINES, LIMITED

YOUNG OPTION, SOUTH HALF OF LOT 9, CONCESSION I, DOBIE TOWNSHIP

Hole No.	Dip	Over-burden	Total length	Description	Samples			Assays	
					From	To	Length	Copper	Nickel
		feet	feet		feet	feet	feet	percent	percent
D.1	40°	25.0	439.0	Gabbro with disseminated chalcopyrite, pyrite, and pyrrhotite	25.0	40.0	15.0	0.02	0.05
					40.0	50.0	10.0	0.07	0.03
					175.0	187.0	12.0	0.33	0.14
					50.0	60.0	10.0	0.13	0.10
					187.0	192.5	5.5	0.57	0.67
					60.0	65.0	5.0	0.35	0.24
					192.5	196.8	4.3	0.35	0.59
					196.8	200.5	3.7	0.18	2.23
					200.5	204.6	4.1	0.45	1.71
					204.6	210.0	5.4	0.49	0.67
					65.0	75.0	10.0	0.26	0.11
					210.0	220.3	10.3	0.87	0.33
					220.3	225.0	4.7	0.39	0.15
					225.0	230.0	5.0	0.25	0.14
					230.0	240.0	10.0	0.17	0.06
					240.0	245.0	5.0	0.17	0.05
D.2	45°	26.0	372.0	Gabbro with disseminated chalcopyrite, pyrite, and pyrrhotite	74.8	88.3	13.5	0.29	0.10
					88.3	98.3	10.0	0.20	0.09
					98.3	110.5	12.2	0.36	0.10
					110.5	123.0	12.5	0.37	0.10
					123.0	127.4	4.4	0.33	0.14
					127.4	128.4	1.0	0.23	1.87
					128.4	141.5	13.1	0.35	0.20
					141.5	150.1	8.6	0.30	0.23
					150.1	154.6	4.5	0.32	0.95
					154.6	165.2	10.6	0.38	0.18
					165.2	173.6	8.3	0.18	0.11

APPENDIX—RESULTS OF DIAMOND-DRILLING BY FALCONBRIDGE NICKEL MINES, LIMITED—*Continued*

YOUNG OPTION, SOUTH HALF OF LOT 9, CONCESSION I, DOBIE TOWNSHIP—*Continued*

Hole No.	Dip	Over-burden	Total length	Description	Samples			Assays	
					From	To	Length	Copper	Nickel
		feet	feet		feet	feet	feet	percent	percent
D.3	50°	25.0	228.0	Gabbro with disseminated chalcopyrite, pyrite, and pyrrhotite	90.5	102.5	12.0	0.24	0.16
					102.5	113.5	11.0	0.35	0.19
					113.5	123.0	9.5	0.37	0.28
					123.0	130.7	7.7	0.49	0.43
					130.7	136.6	6.1	0.65	0.56
					136.6	147.8	11.2	0.26	0.29
					147.8	157.5	9.7	0.25	0.20
					157.5	167.5	10.0	0.28	0.15
					167.5	172.5	5.0	0.32	0.09
					172.5	181.5	9.0	0.29	0.11
					181.5	191.5	10.0	0.33	0.14
					191.5	201.5	9.5	0.23	0.11
					201.0	210.5	9.5	0.24	0.07
					210.5	221.0	10.5	0.23	0.07
					221.0	226.0	5.0	0.25	0.10
D.4	40°	18.0	191.0	Gabbro with disseminated chalcopyrite, pyrite, and pyrrhotite	78.0	88.0	10.0	0.30	0.03
					88.0	97.5	9.5	0.26	0.07
					97.5	107.5	10.0	0.21	0.11
					107.5	114.5	7.0	0.52	0.67
					114.5	117.0	2.5	0.20	1.34
					117.0	119.8	2.8	0.19	0.13
					119.8	121.0	1.2	0.93	0.45
					121.0	126.0	5.0	0.32	0.16
					155.0	165.0	10.0	0.12	0.08
					165.0	174.5	9.5	0.20	0.05
D.5	45°	33.0	208.5	Gabbro; lamprophyre dikes, disseminated sulphides	99.0	106.5	7.5	0.10	0.08
					106.5	114.5	7.5	0.32	0.29
					114.5	124.0	10.0	0.26	0.18
					124.0	133.0	9.0	0.26	0.18
					133.0	143.0	10.0	0.41	0.15
					143.0	147.5	4.5	0.25	0.18
					147.5	156.5	9.0	0.29	0.19
					156.5	163.5	7.0	0.36	0.19
					167.5	177.0	9.5	0.35	0.17
					177.0	187.0	10.0	0.31	0.13
					187.0	197.0	10.0	0.21	0.18
					197.0	201.5	4.5	0.41	0.17

D.6	49°	25.0	205.0	Gabbro; some disseminated sulphides	127.0	132.0	5.0	0.58	0.22
					132.0	137.0	5.0	0.42	0.81
					137.0	146.5	9.5	0.46	0.12
D.7	45°	25.0	204.0	Gabbro, disseminated pyrrhotite, chalcopyrite pyrite, magnetite	90.2	99.2	9.0	0.35	0.14
					99.2	109.0	9.8	0.37	0.16
					109.0	119.0	10.0	0.30	0.17
					119.0	129.0	10.0	0.31	0.30
					129.0	133.7	4.7	0.38	0.51
					133.7	135.3	1.6	0.37	1.76
					135.3	146.0	10.7	0.21	0.30
					151.3	157.0	5.7	0.34	0.13
D.8	60°	22.0	446.0	Gabbro					
D.9	45°	21.0	291.0	Gabbro; spotty sulphides	65.0	68.7	3.7	0.15	0.13
					68.7	70.0	1.3	0.02	3.27
					168.0	171.0	3.0	0.13	0.24
					171.0	181.0	10.0	0.40	0.14
					181.0	190.6	9.6	0.26	0.12
D.10	45°	11.0	267.0	Gabbro; disseminated chalcopyrite, pyrite, pyrrhotite, magnetite	107.5	110.0	3.0	0.36	0.20
					110.0	117.5	7.5	0.53	0.45
					117.5	119.5	2.0	0.57	0.01
					119.5	125.0	5.5	1.18	0.71
					125.0	132.2	7.2	0.27	0.13
D.11	60°	8.0	518.0	Gabbro, dolerite dikes, quartz and carbonate stringers; disseminated chalcopyrite, pyrite, pyrrhotite	183.5	189.5	6.0	0.19	0.69
					189.5	194.5	5.0	0.51	0.16
					288.0	295.5	7.5	0.57	0.67
					295.5	299.0	3.5	0.35	1.36
					299.0	303.2	4.2	0.23	1.82
					303.2	306.7	3.5	0.34	0.89
					367.4	378.6	11.2	0.30	0.29
					385.1	390.8	5.7	0.42	0.28
					415.0	419.0	4.0	0.38	0.18
					419.9	421.0	1.1	0.34	1.63
					421.0	426.0	5.0	0.21	0.44
					430.5	432.8	2.3	0.17	0.54
					512.0	516.8	4.8	nil	nil

APPENDIX—RESULTS OF DIAMOND-DRILLING BY FALCONBRIDGE NICKEL MINES, LIMITED—*Continued*

YOUNG OPTION, SOUTH HALF OF LOT 9, CONCESSION I, DOBIE TOWNSHIP—*Continued*

Hole No.	Dip	Over-burden	Total length	Description	Samples			Assays	
					From	To	Length	Copper	Nickel
		feet	feet		feet	feet	feet	percent	percent
D.12	45°	21.0	336.0	Gabbro; dolerite dikes; quartz and carbonate stringers; sulphides disseminated and in bands	164.3	171.0	6.7	0.20	0.12
					171.0	177.9	6.9	0.32	0.19
					182.0	189.0	7.0	0.38	0.24
					182.0	189.0	7.0	0.29	0.15
					189.0	196.0	7.0	0.40	0.18
					196.0	203.0	7.0	0.22	0.14
					209.3	216.3	7.0	0.29	0.16
					216.3	221.0	4.7	0.68	0.19
					240.4	244.1	3.7	1.62	0.35
					244.1	247.0	2.9	1.36	0.26
					247.0	254.1	7.1	0.61	0.20
					254.1	256.4	2.3	0.80	0.91
					256.4	260.5	4.1	0.40	0.42
					260.5	265.0	4.5	0.32	0.15
					283.5	290.6	7.1	0.33	0.13
					290.6	297.9	7.3	0.33	0.11
					297.9	305.8	7.9	0.32	0.15
					313.2	322.0	8.8	0.34	0.12
					322.0	331.0	9.0	0.37	0.16
D.13	60°	17.4	418.0	Gabbro; quartz and carbonate stringers; dolerite dikes; disseminated sulphides.....	173.0	180.0	7.0	0.37	0.14
					180.0	187.0	7.0	0.55	0.18
					187.0	194.0	7.0	0.37	0.12
					237.2	242.2	5.0	0.30	0.10
					253.0	258.0	5.0	0.37	0.14

D.14	45°	19.0	345.0	Gabbro; replacement sulphides	146.4	150.4	4.0	0.18	0.86
					150.4	154.2	3.8	0.28	1.19
					154.2	157.7	3.5	0.14	0.43
					273.0	280.0	7.0	0.32	0.19
					280.0	287.0	7.0	0.30	0.20
D.15	45°	23.0	263.0	Gabbro; minor replacement sulphides	211.5	213.0	1.5	0.56	0.13
D.16	45°	16.0	467.0	Gabbro; dolerite dikes, disseminated and replacement sulphides	92.0	106.0	14.0	0.33	0.12
					106.0	119.0	13.0	0.25	0.12
					119.0	131.0	12.0	0.20	0.10
					131.0	140.0	9.0	0.34	0.14
					140.0	147.5	7.5	0.31	0.12
					147.5	152.0	4.5	0.92	0.28
					152.0	156.0	4.0	0.40	0.06
					156.0	163.0	7.0	0.50	0.20
					163.0	171.5	8.5	0.44	0.20
					171.5	176.5	5.0	0.56	0.79
					176.5	180.0	3.5	3.20	0.63
					180.0	188.0	8.0	0.76	0.53
					188.0	194.5	6.5	0.29	0.18
					197.5	206.0	8.5	0.24	0.15
					206.0	214.0	8.0	0.35	0.16
					225.0	227.0	2.0	0.38	0.89
					227.0	234.0	7.0	0.43	0.26
					234.0	240.0	6.0	0.43	0.61
					241.0	255.0	14.0	0.33	0.18
					255.0	270.9	15.9	0.33	0.14
					300.0	317.0	17.0	0.33	0.20
					404.5	411.5	7.0	0.19	0.09
					421.1	422.1	1.0	1.10	1.76
D.25	65°	20.0	1,108.5	Gabbro; basic dikes; felsite; spotty, disseminated sulphides	157.0	167.0	10.0	0.27	0.04
					562.0	563.8	1.8	0.30	0.38
					792.0	795.0	3.0	0.14	0.03

APPENDIX—RESULTS OF DIAMOND-DRILLING BY FALCONBRIDGE NICKEL MINES, LIMITED—*Continued*

YOUNG-CORRIGAN OPTION, INDIAN RESERVE No. 11

Claim No.	Hole No.	Dip	Overburden	Total length	Description	Samples			Assays	
						From	To	Length	Copper	Nickel
			feet	feet		feet	feet	feet	percent	percent
123	R.1	45°	14.0	218.2	Gabbro; quartz and carbonate stringers					
100	R.2	45°	5.0	313.0	Gabbro; minor disseminated pyrite, chalcopyrite, pyrrhotite					
96	R.3	45°	.....	496.0	Gabbro					
105	R.4	45°	41.5	409.5	Gabbro; minor disseminated chalcopyrite, pyrrhotite					
96	R.5	30°	.....	113.0	Gabbro; disseminated sulphides	34.9	38.9	4.0	0.31	0.34
						75.0	84.0	9.0	0.27	0.15
96	R.6	60°	.....	116.0	Gabbro; disseminated pyrrhotite, chalcopyrite, pyrite	21.0	29.0	8.0	0.25	0.14
82	R.7	45°	6.0	197.6	Gabbro; dolerite dikes					
105	R.8	45°	20.0	246.0	Gabbro; dolerite dikes; weak disseminated sulphides	50.0	55.0	5.0	0.04	trace
						173.0	179.0	6.0	0.03	trace
69	R.9	45°	181.0	181.0	Clay and sand					
69	R.10	60°	147.0	393.0	Cherty greywacke					
79	R.11	45°	59.0	391.0	Gabbro; lamprophyre dikes					
67	R.12	45°	153.0	153.0						
67	R.13	60°	175.0	175.0						
90	R.14	50°	158.0	211.0	Medium-grained microgabbro					
91	R.15	50°	156.0	213.0	Microgabbro; rhyolite (?)					

YOUNG OPTION, SOUTHERN PART OF SOUTH HALF OF LOT 10, CONCESSION II, DOBIE TOWNSHIP

Hole No.	Dip	Over-burden	Total length	Description
		feet	feet	
D.17A	45°	42.0	56.0	Andesite; felsite
D.17B	45°	37.0	255.0	Chiefly andesite
D.18	45°	90.0	90.0	Sand, gravel, boulders
D.20	45°	54.0	250.0	Andesite; dolerite dike; tuff

YOUNG OPTION, SOUTHERN PART OF SOUTH HALF OF LOT 9, CONCESSION III, DOBIE TOWNSHIP

Hole No.	Dip	Over-burden	Total length	Description
D.19	45°	47.0	64.0	Schist; dolerite dike; mud seams
D.21	45°	54.5	98.0	Greywacke; dolerite dikes
D.24	45°	66.0	268.0	Chiefly greywacke; some iron formation, dolerite, felsite

YOUNG OPTION, NORTHERN PART OF NORTH HALF OF LOT 9, CONCESSION III, DOBIE TOWNSHIP

Hole No.	Dip	Over-burden	Total length	Description	Samples			Assays	
					From	To	Length	Copper	Nickel
		feet	feet		feet	feet	feet	percent	percent
D.22	45°	42.0	253.0	Greywacke; bands of replacement sulphides, chiefly pyrite and pyrrhotite.....	47.0	52.0	5.0	0.07	nil
					70.0	73.5	3.5	0.08	nil
					82.5	87.0	4.5	nil	trace
					109.0	115.0	6.0	nil	trace
					168.0	172.5	4.5	nil	trace
					227.0	232.4	5.4	nil	trace

APPENDIX—RESULTS OF DIAMOND-DRILLING BY FALCONBRIDGE NICKEL MINES, LIMITED—*Continued*

YOUNG OPTION, SOUTHERN PART OF SOUTH HALF OF LOT 8, CONCESSION IV, DOBIE TOWNSHIP

Hole No.	Dip	Over-burden	Total length	Description	Samples			Assays	
					From	To	Length	Copper	Nickel
		feet	feet		feet	feet	feet	percent	percent
D.23	45°	14.0	171.0	Greywacke, tuff, andesite; pyrite and pyrrhotite in bands.....	100.7	105.7	5.0	0.05	trace
					153.1	156.6	3.5	0.02	trace

SCHALLER OPTION, INDIAN RESERVE NO. 11

Claim No.	Hole No.	Dip	Over-burden	Total length	Description
			feet	feet	
125	RS.1	45°	172.0	172.0	Clay, sand, gravel
	RS.2	60°	134.0	146.0	Greywacke
	RS.3	60°	150.0	150.0	
	RS.4	45°	169.0	169.0	
	RS.5	45°	102.0	398.0	Diorite (102–270 ft.); tuffs (270–398 ft.)

CONWEST EXPLORATION, INDIAN RESERVE NO. 11

Claim No.	Hole No.	Dip	Over-burden	Total length	Description
155	CR.1	50°	34.0	356.0	Diorite

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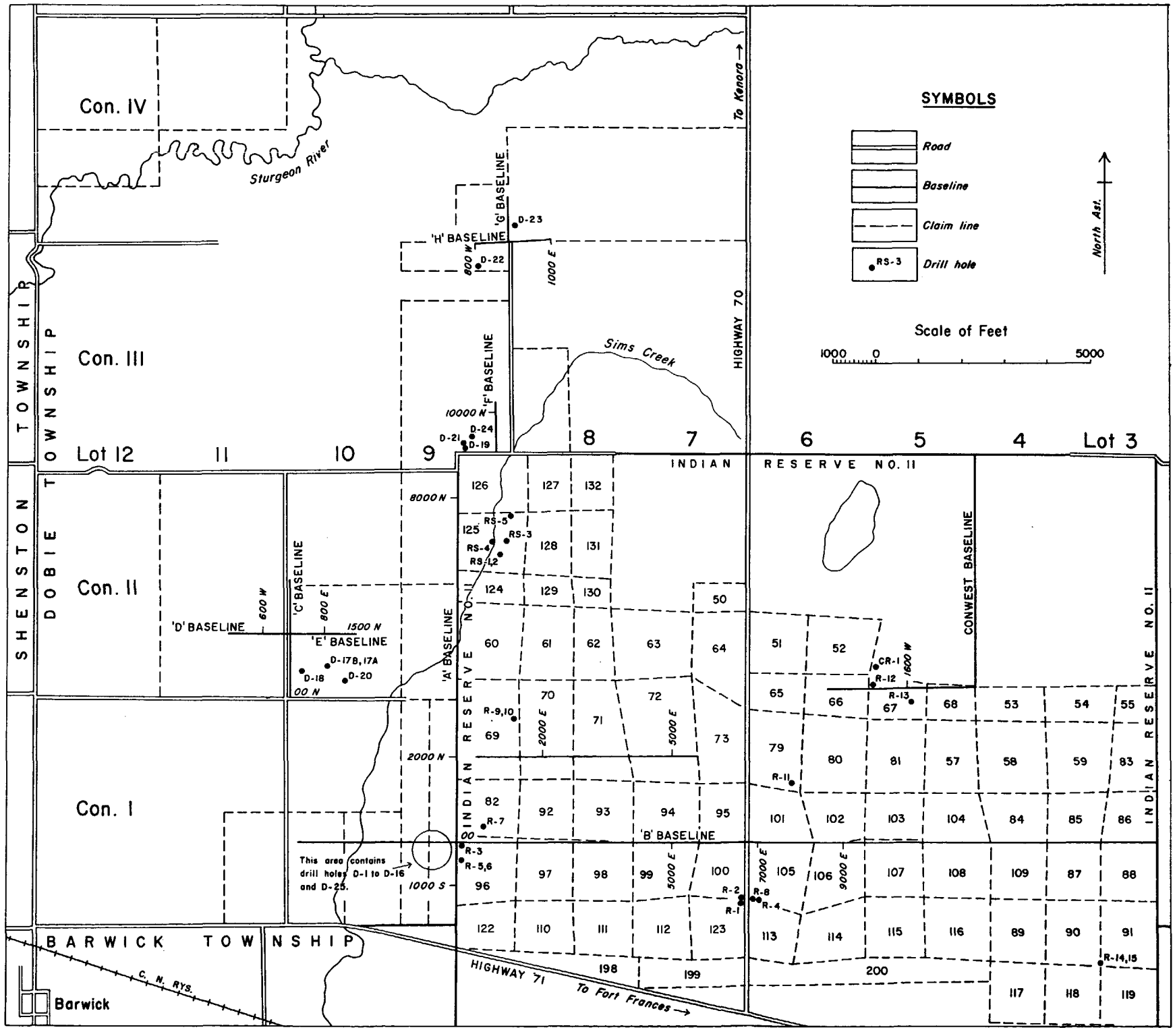
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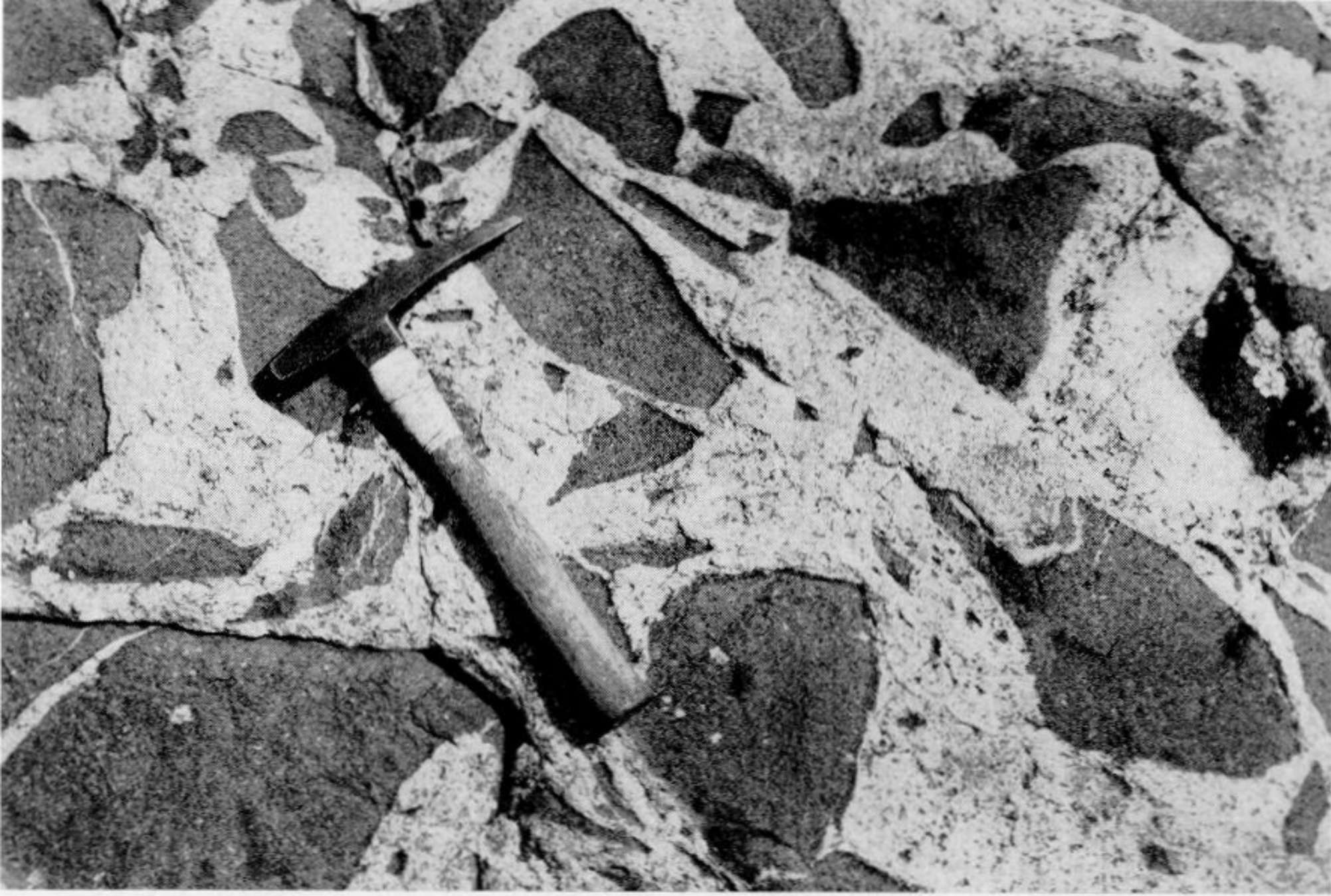
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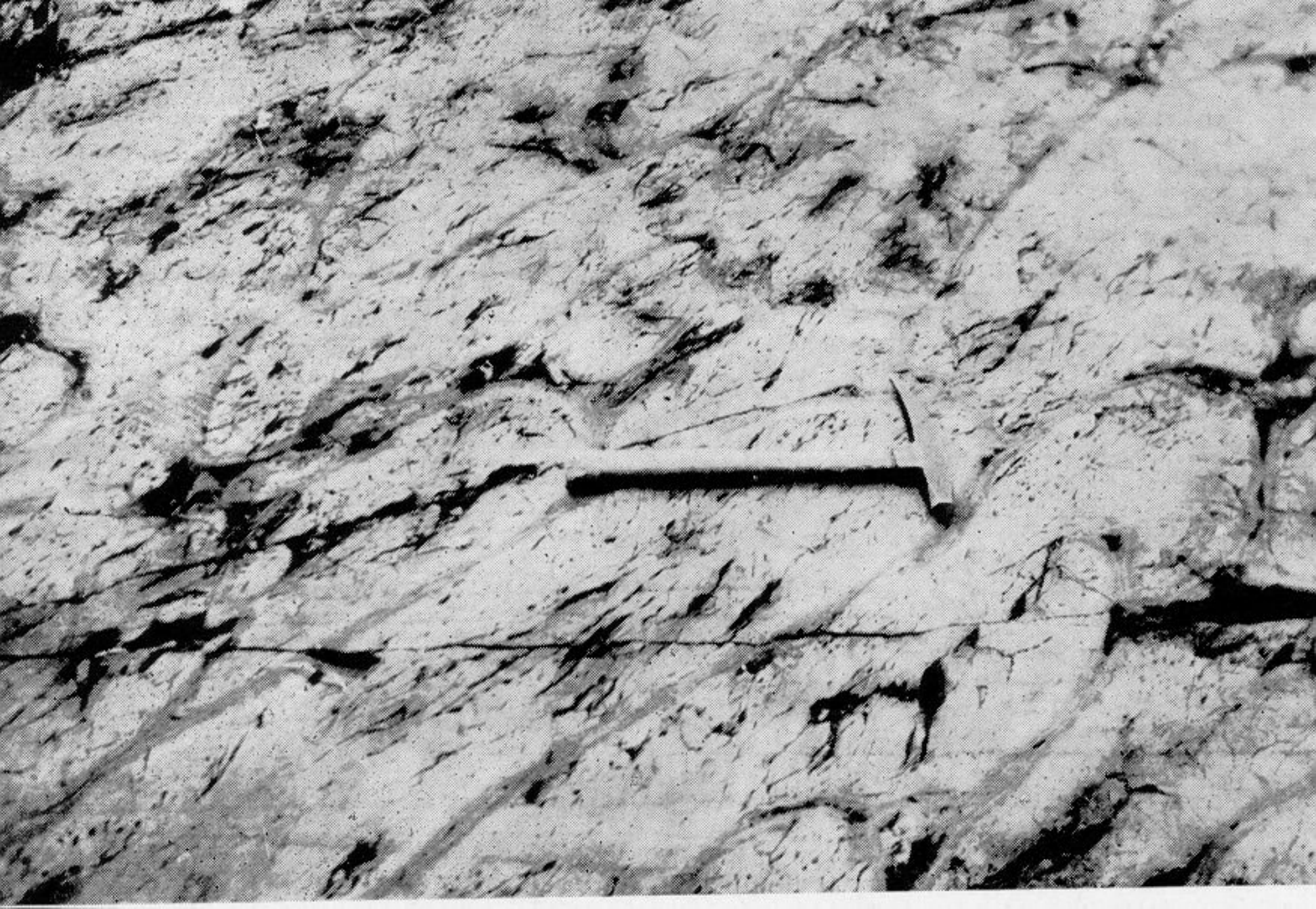














PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*
M. E. HURST, *Provincial Geologist*

SIXTY-THIRD ANNUAL REPORT

OF THE

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BEING

VOL. LXIII, PART 6, 1954

Geology of Monteagle and Carlow Townships

By
D. F. HEWITT

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COLOURED GEOLOGICAL MAPS
(In pocket at back of report)

Map No. 1954-3—Monteagle and Carlow townships, Ontario.
Scale, 1 inch to ½ mile.

Geology of Monteagle and Carlow Townships

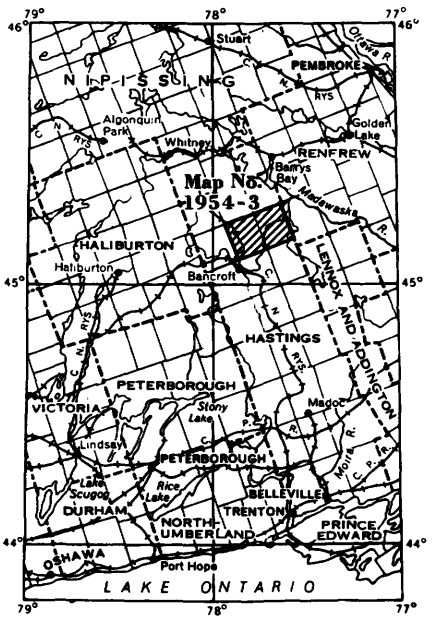
By D. F. Hewitt

CHAPTER I

INTRODUCTION

The townships of Monteagle and Carlow make up an area of about 155 square miles lying in the northern part of Hastings county, eastern Ontario, northeast of the town of Bancroft. The area is covered by the Barrys Bay and Bancroft map sheets of the National Topographic Series.[1]

There is good access by road and rail. Highway No. 62 runs northward up



Key map showing the location of Monteagle and Carlow townships. Scale, 1 inch to 50 miles.

the west side of the map area to the town of Maynooth and then turns eastward along the north boundary of the area through the village of Maple Leaf. County and township roads serve most of the area. A branch line of the Canadian National Railways from Bancroft to Princes Lake runs through Monteagle township; and Hybla, Graphite, and Maynooth stations are within the map area.

The villages and post offices of Maynooth, Fort Stewart, Boulter, New Carlow, Graphite, Hybla, Musclow, Monteagle Valley, and Greenview lie within the area.

[1] Published on the scale of 1 inch to 1 mile by the Canadian Department of National Defence; available from the Canadian Department of Mines and Technical Surveys, Ottawa.

Prospecting and Mining Activity

Prospecting and mining activity have been carried on in the area for over 50 years, principally for corundum, feldspar, graphite, nepheline syenite, iron, and radioactive minerals.

In 1902 the mining of corundum began in Carlow township on the site of Burgess Mines. A mill was erected, and mining continued until 1916.

Between 1911 and 1916 graphite was mined from two properties just east of Graphite station in Monteagle township. In 1952 and 1953 these workings were dewatered, and some exploratory diamond-drilling was carried on.

In the 1920's the Hybla area became the centre of a flourishing feldspar-mining industry, with 14 small mines opened within a 2-mile radius of the MacDonald mine. The MacDonald mine was the largest producer, with a production of 35,048 tons of feldspar from 1919 to 1935. Feldspar mining continued intermittently in the area until 1950, but at present there are no mines active. Some of the granite pegmatite carries radioactive minerals, and Monteagle township has been re-examined recently for uranium deposits.

In 1947 and 1948 the nepheline and corundum deposits in the area were restudied by Louis Moyd. This work led to exploration, surface-trenching, and diamond-drilling on the Monteagle nepheline property on the York River in southeastern Monteagle township during 1951–53. Mill tests on separation of nepheline-albite, mica, and corundum from this rock were carried out in 1952 and 1953.

A large magnetic anomaly at Boulter was diamond-drilled by Ventures, Limited, in 1950. Some magnetite was found in diamond-drill core and in two small prospect pits, but the quantity found was too small to be of commercial interest.

Present Geological Survey

The present geological survey of the two townships was carried out from June to September, 1952, and in May and June, 1953. In 1952 the field party consisted of three senior geologists, who examined outcrops, and two junior geologists, who ran pace-and-compass traverse lines; and in 1953 of two senior geologists and two junior geologists. Plotting of geological data was done on Perfatrace fitted over air photographs on the scale of 1 inch to 1,320 feet. Pace-and-compass traverses were run between easily recognizable points on the air photographs. Owing to the abundance of ground-control features such as roads, clearings, lakes and creeks, it was not necessary to run picketed base lines for traverse control. For the most part, the traverses were spaced at quarter-mile intervals, and the geology between traverses was generalized by stereoscopic examination of the air photographs. Some of the mining properties were mapped by plane table.

Geological data were transferred by sketchmaster from the air photos to a base map, on the scale of 1 inch to 1,320 feet, which had been prepared by the cartography section of the Ontario Department of Mines from maps of the National Topographic Series. The original geological outcrop map, compiled on the scale of 1 inch to 1,320 feet, was reduced to 1 inch to ½ mile and redrawn with the geology simplified and generalized. The final map has been reproduced on the scale of 1 inch to ½ mile.

On the final map, areas of numerous small outcrops appear as single outcrop areas. In these townships, as in other parts of the Grenville subprovince, the rocks show rapid variations over short distances, and within a small area several different rock types may be found. Consequently, on this scale of mapping the

colours and symbols pertaining to any outcrop area represent only the rocks most prominently exposed, and the map gives only a generalized picture of the areal geology.

ACKNOWLEDGMENTS

The writer was ably assisted in 1952 by H. D. Carlson, W. F. Take, D. Hill, and D. G. Brooks, and in 1953 by W. James, S. K. Das Gupta, and D. G. Brooks. A large part of the mapping was carried out independently by H. D. Carlson and W. F. Take in 1952, and by W. James in 1953. The writer acknowledges the competent assistance and wholehearted co-operation of these men.

The party received assistance from many residents of the area, and in particular from Louis Moyd of Bancroft, whose wide knowledge of many of the mining properties in the area was most helpful.

Means of Access

The York River, which flows northeastward through Carlow township to join the Madawaska River near Combermere, provided the earliest means of access into the area. In the late 1850's two colonization roads, the Hastings Road, which ran north from Belleville through Bancroft to Maynooth, and the Peterson Road, which ran westward from Brudenell, on the Opeongo Road, to Maynooth, provided access for early settlers of the area.

At present all parts of both townships are easily accessible by road. The Bancroft-Combermere section of highway No. 62 passes through Monteagle township. A good gravel road runs east from Bancroft, through Hermon and Fort Stewart, to Boulter in central Carlow township, thence north to Combermere on highway No. 62. The area is well settled, and other less-travelled township roads serve other parts of the area.

The Bancroft–Princes Lake branch of the Canadian National Railways passes through Hybla, Graphite, and Maynooth stations, where sidings are available.

Previous Geological Work

The earliest geological reconnaissance of the area was made by Alexander Murray of the Geological Survey of Canada in 1853.[1] His canoe route took him up the York River, from its junction with the Madawaska, to Baptiste Lake.

In 1897 A. E. Barlow of the Geological Survey of Canada examined Monteagle and Carlow townships as part of the geological survey of the Haliburton-Bancroft area undertaken by F. D. Adams and A. E. Barlow.[2] Monteagle and Carlow townships are shown on maps Nos. 708 and 770, which accompany the Adams and Barlow memoir.[3]

In 1897 Willet G. Miller examined and described the geology and occurrence of corundum deposits in the corundum belt of north Hastings and Renfrew counties.[4]

The mineral deposits of the area and the general geology are briefly described by J. E. Thomson.[5]

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[1]Alexander Murray, "Report for the Year 1953," *Report of Progress, 1953–54–55–56*, Geol. Surv. Can., pp. 59–190.

[2]*Annual Report*, Geol. Surv. Can., Vol. X, 1897, pt. A, pp. 44–56 [from a report by F. D. Adams and A. E. Barlow.]

[3]F. D. Adams and A. E. Barlow, *Geology of the Haliburton-Bancroft Areas*, Geol. Surv. Can., Mem. 6, 1910, with maps Nos. 708 (Haliburton sheet) and 770 (Bancroft sheet).

[4]Willet G. Miller, *Economic Geology of Eastern Ontario*, Ont. Bur. Mines, Vol. VII, 1898, pt. 3, pp. 207–38.

[5]Jas. E. Thomson, *Mineral Occurrences in the North Hastings Area*, Ont. Dept. Mines, Vol. LII, 1943, pt. 3.

Many of the mineral deposits are described in separate reports, the more important of which are listed below:

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E. LINDEMAN AND L. L. BOLTON, *Iron Ore Occurrences in Canada*, Mines Branch, Can. Dept. Mines, No. 217, 1917.

HUGH S. SPENCE, *Graphite*, Mines Branch, Can. Dept. Mines, No. 511, 1920.

HUGH S. SPENCE, *Mica*, Mines Branch, Can. Dept. Mines, No. 701, 1929.

HUGH S. SPENCE, *Feldspar*, Mines Branch, Can. Dept. Mines, No. 731, 1932.

In 1949 the Ontario Department of Mines, in co-operation with the Geological Survey of Canada, made an aeromagnetic survey of that part of the area that lies within the Bancroft topographic sheet, and in 1949 and 1950 E. M. Abraham examined magnetic anomalies in the area.[1]

Physiography

The area was peneplaned in Precambrian times and later covered by a thick section of early Paleozoic sediments. In post-Devonian, pre-Pleistocene times there was a period of normal faulting tentatively dated as early Tertiary in age.[2] Paleozoic sediments still covered parts of adjacent areas in Tertiary times, and outliers of these Paleozoic rocks are preserved in down-faulted blocks within the Ottawa-Bonnechere graben. The nearest such outlier is 25 miles east of the map area at Lake Clear, in Renfrew county.

Monteagle and Carlow townships form part of the Madawaska highlands, a major structural and topographic unit lying southwest of the Ottawa-Bonnechere graben. To the east of this map area the Madawaska highlands are bounded on the north by the Mount St. Patrick fault, and on the south by the Plevna fault.[3] The Plevna scarp is well marked in Frontenac, and Lennox and Addington counties, but its throw decreases to the west, and it fades out in Ashby township. The highland area, of which Monteagle and Carlow townships form a part, is bounded on the southeast by a northeast-trending fault, the McArthurs Mills fault, which runs through Dungannon, Mayo, and Raglan townships.

To the east, in Lennox and Addington, Renfrew, and Frontenac counties, the predominant direction of faulting is northwest by west, parallel to the Mount St. Patrick fault.[4] To the west, in north Hastings county, there is faulting trending northwest-by-west, but there is also a strongly developed northeasterly faulting; the structure and topography are no longer dominated by the series of north-facing scarps that occur to the north and east.

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[1]E. M. Abraham, *Preliminary Report on the Geology in the Vicinity of Aeromagnetic Anomalies on the Bancroft and Coe Hill Sheets*, Ont. Dept. Mines, P.R.1951-2, 1951.

[2]G. Marshall Kay, *Ottawa-Bonnechere Graben and Lake Ontario Homocline*, Bull. Geol. Soc. Amer., Vol. 53, No. 4, 1942, pp. 585–646.

[3]G. Marshall Kay, *op. cit.* pp. 585–646.

[4]D. F. Hewitt, *Geology of the Brudenell-Raglan Area*, Ont. Dept. Mines, Vol. LXII, 1953 pt. 5, p. 31

RELIEF

The maximum relief in the area is over 700 feet. Burgess Mountain, a resistant hill of granite and corundum syenite in northeastern Carlow township, is the highest point in the area, with an elevation of over 1,650 feet, and Conroy marsh to the southeast has an elevation of 930 feet. The granite gneiss south of Maynooth forms another highland with elevations up to 1,650 feet; the relief in this area rarely exceeds 400 feet. The Canadian National railway follows the valleys of Bentley and Cedar Creeks, entering the map area north of Bird Creek at an elevation of 1,123 feet and leaving the map area at Maynooth Station at an elevation of 1,298 feet. Most of Monteagle township is an upland peneplane with an average elevation of 1,300 to 1,400 feet. The upland peneplane around Fraser Lake in Carlow township averages 1,200–1,300 feet in elevation. Between these two highland uplands lies the York River valley with an elevation, at river level, of about 940 feet.

DRAINAGE

These townships contain over 20 lakes and ponds, of which Salmon Trout Lake and Fraser Lake are the largest. The York River and its tributaries, the chief of which are the Little Mississippi River, Papineau Creek, and Bird Creek, drain the area. The York River appears to be subsequent, flowing northward and then northeastward along the strike of softer paragneiss and limestone bands that lie between the predominantly granitic uplands of Monteagle and southern Carlow. It is navigable except for short stretches at Foster Rapids at the York River crossing, north of Boulter, and at Conroy Rapids near the east boundary of the area. Most of the tributaries of the York River appear to be consequent.

Natural Resources and Development

The area was first opened for settlement during the 1840's, when lumbering began on the Madawaska River and its tributaries. In 1852 the Hastings colonization road was run north from Madoc up the west boundary of Monteagle township. In 1859 and 1860 the Peterson road was run from Maynooth through Combermere to Brudenell to connect with the Opeongo colonization road from the Ottawa Valley.

Monteagle township was originally surveyed by J. S. Peterson in 1857 and subdivided by J. J. Haslett in 1861 and 1863. The area of this township is about 80 square miles of which 11 percent is Crown land. Carlow township was surveyed by C. F. Aylsworth in 1865, at which time 270 acres were cleared by settlers. The total area of the township is about 75 square miles, of which 37 percent is Crown land.

AGRICULTURE

The rocky, hilly topography and the sandy, stony nature of the soil are not well-suited for agriculture. Farms range in size from 200 to 1,000 acres and often consist mainly of pasture and woodlot. Hay and oats are the chief cultivated crops. Sheep, cattle, and pigs are raised.

FORESTS

Lumbering is an important industry in the area, and most of the settlers depend to a large extent on revenue from their woodlots. Most of the white pine has long since gone, and the lumber cut consists mainly of spruce, balsam, cedar, hemlock, poplar, maple, and yellow birch. Some black spruce and poplar are cut for pulp. In 1952 and 1953 three small lumber mills were operating in the area.

CHAPTER II

GENERAL GEOLOGY

The bedrock formations are all of Precambrian age and consist of Grenville-type metasediments (crystalline limestone, paragneiss, and amphibolite) and metavolcanics, cut by basic and acid plutonic rocks (diorite, gabbro, granite, syenite, nepheline syenite, and their gneissic equivalents). The area has been affected by folding, faulting, intrusion, and granitization; the rocks are highly metamorphosed, and original textures and structures, both in sedimentary and plutonic rocks, have been modified or completely obliterated. The standard criteria for the determination of tops of beds, such as grain gradation and cross-bedding, cannot be applied, since these features were destroyed by metamorphism. Consequently the stratigraphic succession in the metasediments is largely unknown.

The oldest rocks in the area are the metamorphosed Grenville-type sediments, consisting of crystalline limestone and dolomite, amphibolite, paragneiss, quartzo-feldspathic gneiss and schist, and quartzite. These sediments were probably laid down as limestone, sandstone, and shale, with possibly some greywacke. It is difficult to estimate the original thickness of the sedimentary series; the original basement on which they were laid down is unknown, and the sediments themselves are intruded, injected, and replaced by large volumes of igneous material.

A small outcrop area of metamorphosed basic volcanic rocks occurs between the Mallard Lake fault and the Mallard Lake metagabbro, just east of Mallard Lake on the south boundary of Carlow township. These basic lavas are part of the Rowland basic volcanics belt that forms a prominent band in Mayo township to the south. The volcanics face south in Mayo township, but no pillow tops are available in Carlow township. Their age relation to the Grenville metasediments is uncertain, but they appear to be interbanded with the Grenville sediments, and are provisionally assigned to this age.

The earliest intrusives in the area are a series of plugs and stocks of diorite and gabbro, the largest of which is the Boulter gabbro in Carlow township. Some of these intrusives have been highly metamorphosed and converted to metadiorite, metagabbro, and amphibolite, as for example, the Mallard Lake metagabbro in southern Carlow township. Intruding the gabbro, and possibly of about the same age, is a large mass of grey biotite albite granite. This large granite mass, called the Boulter granite, occupies the southeast quarter of Carlow township.

After this early period of intrusion came a second period during which nepheline rocks, syenites, and granites were implaced. These three groups of later plutonic rocks appear to have been implaced by injection and replacement as well as by intrusion of molten magma. With regard to relative age, the nepheline rocks are the oldest; they are intruded and replaced by grey and pink syenites, which are in turn cut and replaced by granite. *Lit par lit* injection and granitization played an important part during this period of intrusion. Folding and metamorphism at this time produced a strong gneissic structure in all these rocks. Later fissure-filling granite pegmatite dikes cut all the rocks in the area.

After the last period of Precambrian mountain-building the area was eroded to a peneplane of low relief. In Tertiary times there was a period of normal faulting; the most prevalent directions were northwest by west, and northeast. Ranges of fault-block mountains were thrown up across this part of eastern Ontario at that time. Subsequent erosion again reduced the area to its present level.

During Pleistocene times the area was glaciated, and glacial till and glacio-

fluvial gravel and sand cover much of the bedrock. The exposed rock in these townships amounts to less than 20 percent.

The rock classification used in this report is based primarily on lithology with secondary emphasis on age and genesis. The table of formations present in the area is as follows:

Table of Formations

PLEISTOCENE	Boulder clay, sand, silt, gravel.
	Great unconformity
PRECAMBRIAN	
PLUTONIC ROCKS:	Granite Group: Pink and grey leuco-granite, granite gneiss. Hornblende granite, hornblende granite gneiss. Biotite granite, biotite granite gneiss. Hybrid granite gneiss, banded gneiss, migmatite. Granite pegmatite, pegmatitic granite. Syenite Group: Pink and grey leuco-syenite, syenite gneiss, albitite. Hornblende syenite, hornblende syenite gneiss. Biotite syenite, biotite syenite gneiss. Hybrid syenite gneiss, banded gneiss, migmatite. Syenite pegmatite. Corundum syenite, corundum syenite gneiss. Corundum syenite pegmatite. Nepheline Gneiss Group: Nepheline-plagioclase gneiss. Nepheline-hornblende gneiss, nepheline-hornblende-garnet gneiss. Nepheline-biotite gneiss. Nepheline-poor grey alkaline gneiss, oligoclase-andesine gneiss. Nepheline scapolite gneiss, scapolite gneiss. Nepheline-corundum gneiss. Nepheline pegmatite. *Intrusive contact* Boulter biotite-albite granite (tonalite). *Intrusive contact* Older Basic Intrusive and Meta-intrusive Group: Diorite, gabbro, hornblendite, lamprophyre, pyroxenite, meta-gabbro, amphibolite.
	Intrusive contact
METASEDIMENTARY ROCKS (GRENVILLE TYPE):	Crystalline Limestone Group: Crystalline limestone and dolomite, interbedded limestone and paragneiss, or amphibolite. Silicated limestone. Lime silicate rock, metapyroxenite, skarn. Paragneiss-amphibolite Group: Amphibolite, biotite amphibolite, hornblende schist, garnet amphibolite. Paragneiss: biotite-quartz-feldspar gneiss, biotite schist, garnet paragneiss, garnet-sillimanite paragneiss. Quartzite, feldspathic quartzite, diopside quartzite. Quartzo-feldspathic paragneiss and schist, feldspathic paragneiss.
METAVOLCANIC ROCKS:	Amphibolite and hornblende schist.

Metavolcanic Rocks

Only one small area of metamorphosed basic volcanic rocks occurs in the area. These consist of black, well-banded amphibolite and hornblende schist. These rocks occur just east of Mallard Lake, on the south boundary of Carlow

township between the Mallard Lake metagabbro and the Mallard Lake fault which cuts off the volcanic band to the north. To the south the band of basic volcanics widens in Mayo township where they are well exposed on Rowland Hill. On Rowland Hill, pillow lava and thin beds of rusty sediments, which may be tuffs, were noted. These features confirmed the interpretation of a volcanic origin for the amphibolites in Carlow township.

To the south, along the Rowland volcanic belt, the pillow lavas face south, and these volcanics appear to be interbanded with Grenville-type metasediments. The metavolcanics are therefore tentatively assigned to the Grenville series.

Metasediments

The metasediments are the oldest rocks in the area. They are of the Grenville type and belong to the amphibolite metamorphic facies. For mapping purposes they are divided into two lithologic divisions, the paragneiss-amphibolite group and the crystalline limestone group. Paragneiss, amphibolite, and crystalline limestone occur interbedded with one another.

The accompanying table shows the development of Grenville metasediments by the progressive metamorphism of an initial sedimentary sequence consisting of limestone, shale, and sandstone. The amphibolites are believed to be developed largely from calcareous shales, whereas the paragneisses developed from sandy shales. In general, the metasediments are weaker and softer than the granitic, syenitic, and basic intrusives and are therefore not so well exposed as these latter rocks.

PROGRESSIVE METAMORPHISM OF GRENVILLE SEDIMENTS

Initial Sediment	Incipient Metamorphism	Amphibolite Metamorphic Facies
Sandy limestone	Sandy marble	Diopsidic marble
LIMESTONE	MARBLE (crystalline limestone)	MARBLE (crystalline limestone)
Shaly limestone	Shaly marble	Micaceous (silicated) marble
Limy shale	Limy argillite	AMPHIBOLITE = Hornblende-plagioclase gneiss
SHALE	ARGILLITE	PARAGNEISS = Biotite-quartz-feldspar gneiss
Sandy shale	Sandy argillite	
Shaly sandstone	Shaly quartzite	Biotitic or hornblendic quartzite
SANDSTONE	QUARTZITE	QUARTZITE
Limy sandstone	Limy quartzite	Diopsidic quartzite
GREYWACKE		AMPHIBOLITE or PARAGNEISS

PARAGNEISS-AMPHIBOLITE GROUP

This group includes all the metasediments except the limestones and associated calcareous rocks; it is divided into four subdivisions: amphibolite, paragneiss, quartzite, and quartzo-feldspathic gneiss. The amphibolite and paragneiss are generally dark-coloured gneisses with over 30 percent mafic minerals, whereas the quartzite and quartzo-feldspathic gneiss are light-coloured, with from 0 to 30 percent mafic minerals. Hornblende is the predominant mafic in the amphibolite, whereas biotite predominates in the paragneiss.

These rocks are generally medium-grained, equigranular, and well-banded or bedded with a marked continuity of banding or bedding. The leucocratic types

are often difficult to distinguish from orthogneisses, and the dark gneisses may be confused with metadiorite or metagabbro. The occurrence of frequent bands of calcareous gneiss or limestone with the sedimentary gneisses is one useful criterion of sedimentary origin.

Amphibolite

The amphibolites are medium-grained, equigranular rocks composed predominantly of hornblende and plagioclase, usually andesine or oligoclase. Biotite, pyroxene, scapolite, garnet, carbonates, pyrite, titanite, apatite, magnetite, and



Hybrid syenite gneiss and amphibolite, showing dragging and recrystallization of the amphibolite near a vertical fault, Monteagle township.

quartz are often present. Texturally these rocks are even-grained and granoblastic, consisting of a mosaic of hornblende and plagioclase.

Amphibolite is the predominant rock of the paragneiss-amphibolite group and occurs widely distributed throughout the map area. The hybrid granite gneiss usually consists of interbanded amphibolite and granite gneiss produced by the *lit par lit* injection of granitic material into amphibolite. Hybrid granite and syenite gneisses are also produced by granitization of amphibolite, a process of introduction of material by permeation and replacement of the country rocks. Bands of amphibolite up to 2,000 feet thick occur in Monteagle and northern Carlow townships interbanded with granite and hybrid granite gneiss.

The amphibolites are usually strongly banded, with alternating light and dark bands. This banding may be due to differences in composition in the original sediments, to differences in permeability during metasomatic alteration, or to a segregation of mafics produced by metamorphic differentiation.

Occasionally the percentage of mafics in the amphibolite increases to 90 percent or over. These rocks are designated as hornblende amphibolite or hornblende schist. Well-banded, fine-grained hornblende amphibolites occur along the north margin of the Mallard Lake metagabbro mass and are difficult to distinguish from the fine-grained marginal facies of the metagabbro itself.

Orthoclase and microcline are rarely present except in amphibolite that has been granitized. Potash metasomatism is manifested by the development of abundant microcline and microcline microperthite in the rocks, and these minerals are usually confined to those amphibolites that are granitized.



Limestone tectonic breccia filling a fault zone in syenitized amphibolite, Monteagle township.

Paragneiss

Paragneiss, consisting predominantly of biotite, feldspar, and quartz, is the second common member of the metasedimentary group. It is a medium-grained, equigranular rock with a prominent banding or bedding. Both orthoclase and plagioclase (usually oligoclase) are frequently present. Scapolite, pyroxene, tourmaline, titanite, apatite, pyrite, carbonates, and magnetite may be present as accessories. In zones of higher-grade metamorphism, garnet and sillimanite are common. Where the paragneiss has been granitized, microcline and microcline perthite are prominent constituents.

The main band of paragneiss exposed in the map area is the Carlow paragneiss, a wide band 4,000 feet thick, which enters the township from the south just east of the York River. The paragneiss dips steeply eastward and strikes in a northerly direction as far as McWhirter Lake where it is partly cut off by the Boulter gabbro. Here the strike of the band swings northeastward. The paragneiss is offset to the south on the Boulter fault and continues in an easterly direction to the Raglan boundary. Throughout its length the Carlow paragneiss

roughly parallels the course of the York River. To the east and south it is in contact with the Mallard Lake metagabbro, the Boulter granite, and the Boulter gabbro, which intrude and partly cut it off.

The Carlow paragneiss consists of a biotite-quartz-feldspar gneiss, often containing garnet and sillimanite. Near the contact with the Mallard Lake metagabbro the upper 500 feet of the band consist of a fine-grained, greenish quartz–biotite-diopside rock. Scapolite and tourmaline are developed in the paragneiss band, the former being due to contact metamorphism by the gabbro. Near the limestone footwall some interbanded amphibolite occurs. Graphitic and rusty-weathering pyritic paragneiss is found near McWhirter Lake.

A small band of garnet-sillimanite paragneiss runs across lots 21–25, concession XII, Carlow township. Minor amounts of paragneiss occur elsewhere in the area.



Pods of mobilized crystalline limestone in amphibolite and lime metapyroxenite, MacDonald mine, Monteagle township.

Quartzite and Quartzo-Feldspathic Gneiss

Quartzite and quartzo-feldspathic gneiss form a minor part of the metasedimentary group. The biotite-quartz-diopside rock, referred to above in the description of the Carlow paragneiss, was probably a limy, argillaceous sandstone. Quartzo-feldspathic gneiss is a light-coloured, medium-grained, granoblastic gneiss consisting predominantly of quartz and feldspar. This rock type is most common in the northern part of Monteagle township. There is one narrow band associated with limestone in the railway cut west of Selby Lake, another band runs north-south a mile to the east of Selby Lake, there is a third occurrence north of Salmon Trout Lake.

CRYSTALLINE LIMESTONE GROUP

The crystalline limestone group includes pure-white to grey crystalline limestone and dolomite, often interbanded with limy amphibolite; silicated limestone containing diopside, phlogopite, tremolite, and other silicates; lime silicate rocks; metapyroxenite; skarn; and limestone tectonic breccia. Bands of crystalline lime-

stone up to 500 feet wide are of common occurrence throughout the whole map area and occur with other metasediments in bands within the hybrid granite gneiss complex. Occasional bands of crystalline limestone up to 1,200 feet wide are found. Being softer than the other rocks the limestones are not generally well exposed.

The main bands of limestone occur in a belt about 4 miles wide following the York River across the township; the York River appears to be subsequent along this belt of weaker metasediments.

The crystalline limestone and dolomite consist of medium-grained aggregates of calcite and dolomite up to ¼ inch in grain size. In the silicated or impure varieties of limestone the following minerals are common: graphite, phlogopite, pyrite, pyrrhotite, diopside, tremolite, garnet, spinel, apatite, quartz, feldspar, scapolite, and vesuvianite. At the Tonkin-Dupont and National Graphite properties, flake graphite in places makes up 10–15 percent of the crystalline limestone.

"Lime silicate rock" is a general term used to designate all those rocks formed from Grenville limestones by contact metamorphism, metasomatism, hydrothermal metamorphism, or assimilation and digestion of limestone by intrusives. This group includes lime metapyroxenite and skarn as special types. Metapyroxenite is a medium to coarse-grained rock consisting of lime silicates, chiefly diopside. It is white, grey, or more commonly, pale-green to dark-green or black in colour, and consists of an aggregate of interlocking diopside grains. Mica, tremolite, augite, feldspar, scapolite, and carbonates often occur in these rocks.

Lime silicate rocks, consisting of a fine-grained, porcelain-like aggregate of white diopside, were also noted. Some rocks of this group consisted of an aggregate of white to pale-green tremolite.

Skarn is a contact metamorphic rock produced from limestone, consisting essentially of diopside, augite or hornblende with garnet, sulphides, or magnetite. Phlogopite, scapolite, tremolite, vesuvianite, tourmaline, spinel, wollastonite, forsterite, feldspar, and calcite are often found in the skarn zones.

Lime silicate rocks are common throughout Monteagle township, particularly along the railway and northeast of Salmon Trout Lake.

Plutonic Rocks

OLDER BASIC INTRUSIVE AND META-INTRUSIVE GROUP

A series of basic intrusives, consisting of quartz diorite, diorite, gabbro, olivine gabbro, and pyroxenite, are the oldest intrusive rocks in the area. The Boulter gabbro in central Carlow township is the largest gabbro intrusive in the map area. In places the gabbro bodies have been highly metamorphosed and now consist of metadiorite, metagabbro, amphibolite, and hornblende schist. The Mallard Lake metagabbro is of this type and consists largely of medium- to coarse-grained hornblende-plagioclase gneiss with a strong granoblastic texture. The metagabbro grades from a light-coloured scapolite-plagioclase gneiss with clotted aggregates of black hornblende, ⅛–⅜ inch in size, making up 30 percent of the rock, to a black, coarse-grained hornblendite with only accessory plagioclase. Scapolite is very common in the metagabbro and may completely replace plagioclase. The plagioclase ranges from oligoclase to bytownite with andesine being most common. Magnetite is a common accessory in the gabbro but is uncommon in metagabbro.

Boulter Gabbro

The Boulter gabbro is an oblong stock, about 4 miles long and 1½ miles wide, extending in a northwesterly direction across the south-central part of Carlow township. According to aeromagnetic data and scattered outcrops, a long finger

extends southeast from the main mass to Norway Bay on the Little Mississipp River in Mayo township. This finger crosses the Carlow-Mayo boundary about 1½ miles southeast of Fort Stewart. The Boulter gabbro is flanked on the northeast and southwest by the Boulter granite, and the gabbro body forms a marked aeromagnetic high. To the northeast the Boulter gabbro appears to be cut off by the Boulter fault.

Gabbro is the most common rock type in the intrusive mass and consists of a medium- to coarse-grained, hypidiomorphic, equigranular rock made up of augite and plagioclase (ranging from andesine to bytownite). Hornblende, biotite,



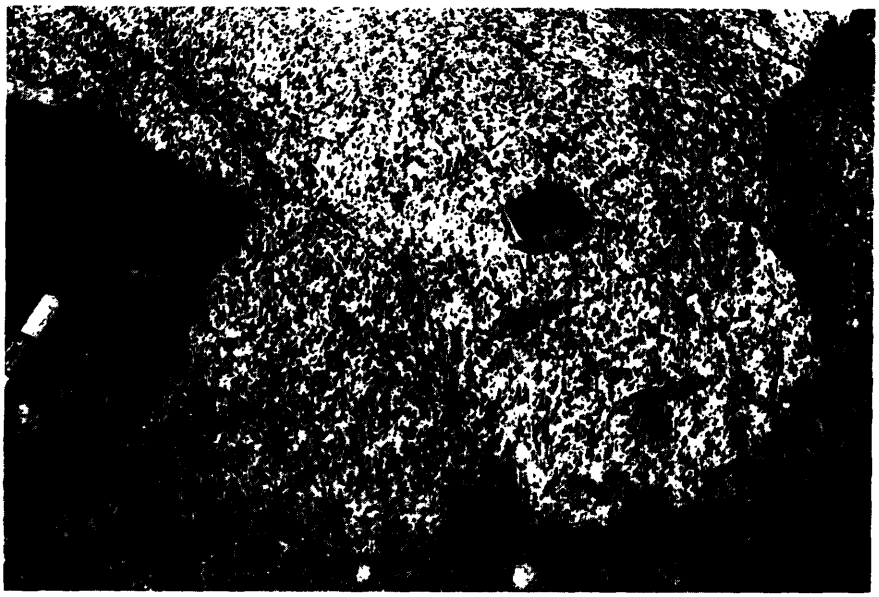
Mallard Lake metagabbro, showing hornblende clots in hornblende-plagioclase gneiss.

magnetite, and pyrite are quite common in places. Titanite and apatite are accessories. In places the gabbro is cut by fine- to medium-grained diorite. Occasionally the plagioclase content decreases to less than 10 percent, and the rock becomes a pyroxenite. A small amount of olivine was noted in one thin section. In places the gabbro is strongly gneissic and approaches a metagabbro. Metagabbro is typically a recrystallized granoblastic gneiss with clotted mafic aggregates. Some of the gneissocity is due to shearing, and several narrow sheared zones were noted on lot 17, concession VII, Carlow township. Serpentine, skarn, and lime-

stone were picked up by diamond-drilling in 1950.[1] Scapolite and carbonate in the gabbro and metagabbro may indicate assimilation of limestone.

Several small magnetic anomalies occur within and marginal to the Boulter gabbro. Surface examination and diamond-drilling indicated two small granular magnetite deposits of the contact metamorphic type and some disseminated magnetite within the gabbro.

Closely associated in age with the Boulter gabbro is a coarse-grained pink soda syenite. This rock occurs with the gabbro just north of Fraser Lake. In places it is cut by gabbro and appears to be either the same age or slightly older than the gabbro. Some thin sections of this rock show a strongly developed mylonitic texture with pronounced granulation of the feldspar along intergrain boundaries. The Boulter granite, a medium-grained, grey biotite-albite-granite, cuts the Boulter gabbro.



Mallard Lake metagabbro. Coarse hornblende-plagioclase gneiss facies.

Mallard Lake Metagabbro

The north end of a large body of metagabbro extends into Carlow township in the vicinity of Mallard Lake. This meta-intrusive occupies an area of about 28 square miles chiefly in northwestern Mayo and eastern Dungannon townships, extending to the southwest as far as Egan Chute on the York River. In Carlow township the metagabbro is flanked on the northwest by a wide band of Carlow paragneiss, which has been tourmalinized by the metagabbro. On the northeast the metagabbro is cut off against the Mallard Creek fault and the Boulter granite.

The metagabbro is a medium- to coarse-grained granoblastic gneiss consisting predominantly of aggregates of hornblende and plagioclase, generally andesine. Scapolite often replaces the plagioclase. Titanite, biotite, apatite, carbonate, and quartz are accessories. A fine-grained, fresh-looking black quartz diorite cuts the metagabbro near Mallard Lake.

[1]Louis Moyd, personal communication.

Other Basic Intrusive Bodies

On lots 3, 4, and 5, concessions V and VI, Carlow township, there is a knob, locally known as Bald Mountain, rising 350 feet above the York River. This knob consists predominantly of diopside and augite pyroxenite, and lime silicate skarn.

A small body of metagabbro about ½ mile in diameter forms a prominent hill on lots 8 and 9, concessions VII and VIII, Carlow township. Amphibolite and pink leuco-granite gneiss occur interbanded with the metagabbro.

Several small intrusives of gabbro, diorite, and hornblendite occur on both sides of the York River on lots 20 to 22, concessions X and XI, Carlow township. On the south side of the river, ¼ mile east of the Boulter bridge, the gabbro is cut by stringers of nepheline pegmatite.

One small body of diorite and amphibolite outcrops on the east shore of Salmon Trout Lake in Monteagle township.

BOULTER GRANITE

The Boulter granite is an older, medium- to fine-grained, grey biotite-albite granite, which can be readily distinguished lithologically from the other granites of the area. It occupies an area of about 16 square miles in southeastern Carlow township. The Boulter granite forms a large stock divided into two parts by the Boulter gabbro. The western part of the stock lies southwest of Fraser Lake, and its general foliation dips west and south at 25–50 degrees. It is bounded on the west by crystalline limestone and Carlow paragneiss, on the southwest by the Mallard Creek fault, and on the northeast by the Boulter gabbro and some marginal sediments, mainly paragneiss and crystalline limestone. Offshoots from this body cut the Mallard Lake metagabbro and Boulter gabbro.

The eastern part of the stock forms a prominent range of hills along the eastern boundary of Carlow township from concession VIII to the Mayo boundary. This part of the stock extends into Raglan and Mayo townships. The northwest-trending Boulter fault cuts this intrusive into two parts. The south part forms an open syncline whose axis strikes northwest. The arms dip about 50 degrees, and the fold plunges northwest. The north part dips 40–60 degrees southwest. For the most part the foliation in the Boulter granite is not well marked. The predominant mafic constituent, which in places makes up 10 percent of the rock, is biotite, and the foliation or lineation is due to alignment of this mineral. In contrast to the other granites in the area, the Boulter granites contain very few inclusions of amphibolite, and there is little suggestion of a hybrid origin for this granite body.

On microscopic examination the rock consists of a medium-grained, hypidiomorphic interlocking aggregate of quartz and albite or oligoclase. Biotite, hornblende, zircon, apatite, and occasional microcline, are accessories.

The Boulter granite is intruded by a pink leucocratic microcline granite and granite pegmatite. In the areas adjacent to these later microcline granite intrusives, there is often introduction of microcline into the Boulter granite. The microcline replaces plagioclase in typical patch-replacement textures.

NEPHELINE GNEISS GROUP

The nepheline gneisses are confined to the York River valley and the northern Carlow corundum range. The belt of nepheline gneisses extending down the York River valley is a continuation of the Bancroft nepheline belt. These nepheline rocks are of commercial interest as a source of raw material for glass and ceramics, and as the host rock for corundum deposits. The alkaline syenites,

which are also an important corundum-bearing series, are associated spatially and genetically with the nepheline gneisses. The nepheline rocks are high in alumina and are a potential ore of aluminium.

Nepheline-bearing rocks are easily recognized by their characteristic grey, pitted, weathered surface caused by differential weathering of nepheline and feldspar. Feldspar, corundum, and ferromagnesian minerals stand up in relief above nepheline and scapolite, which have weathered out. Nepheline and scapolite occur together in many of the nepheline gneisses and are sometimes very difficult to distinguish. Scapolite can frequently be distinguished from nepheline by its cleavage. A good estimate of the percentage of nepheline in the rock can usually be made by careful examination of the weathered surface.

Occurrence

South of the Mallard Creek fault there are two main bands of nepheline gneiss in the York River valley. The west band crosses the Dungannon-Monteagle boundary on lot 14, swings in a northeasterly direction to Bresnahan Lake, thence runs northeastward through Goddard Lake to the Mallard Creek fault. The east band runs north up the York River in lots 4, 3, 2, and 1, Monteagle township, and pinches out to the north in concession III, south of the Mallard Creek fault. This east band forms a prominent ridge on the east bank of the York River on lots 2 and 3, concession II, Monteagle township. Considerable surface work and diamond-drilling was done by Louis Moyd and associates in 1947–53 on the east band.

Two small lenses of nepheline gneiss interbanded with pink syenite gneiss are exposed on the west side of the York River on lot 2, concession V, Carlow township, opposite Bald Mountain. On lot 4, concession VI, Carlow township, immediately north of Bald Mountain, another narrow band of nepheline gneiss is exposed. This band extends northward along the east shore of the York River as far as Branch Bay, where it pinches out.

On lot 12, concession X, Carlow township, there is a small outcrop of nepheline gneiss on the north side of the York River, ¾ mile below Reber's Landing. On the south side of the York River another narrow band of nepheline gneiss extends from lot 11 to lot 14, concession X, Carlow township.

Two other small occurrences of nepheline rock were observed on the north side of the York River on lots 23 and 26, concession X, Carlow township. As previously noted, there is a small nepheline pegmatite cutting gabbro on the south side of the York River, ¼ mile east of the Boulter bridge, on lot 21, concession X, Carlow township. This locality is of geologic interest since, in addition to the cutting relations mentioned above, blocks of nepheline pegmatite are found as inclusions in a crystalline limestone tectonic breccia exposed along the river's edge.

Nepheline gneisses are found interbanded with pink and grey corundum-bearing syenite gneiss at three locations on the north Carlow corundum range, which forms a wide band in concessions XIV, XV, and XVI and extends from lot 5 to the Raglan boundary. Corundum-bearing nepheline plagioclase gneiss is exposed on outcrops just north of the Hoover Lake corundum pit. Nepheline-corundum-plagioclase gneiss is also exposed in the walls of the Logan corundum pits in lot 18, concession XIV, Carlow township. The third occurrence of nepheline gneiss is on the east shore of a small pond on lot 28, concession XVI, Carlow township.

Age, Lithology, and Structure

The nepheline rocks are gneissic in structure and vary in mineralogy both across and along strike. Structurally the nepheline gneisses are interbanded conformably with the metasediments and syenite gneisses. The nepheline gneisses are not found cutting other rocks in the area, but in part replace metasediments. Nepheline pegmatites cut gabbro and nepheline gneiss and replace the latter rock. The nepheline gneisses are intruded and replaced by white alkaline syenite (oligoclase-andesine gneiss), yellow-brown hornblende syenite and granite, pink syenite and granite, and syenite and granite pegmatites. In age these early alkaline intrusives are probably post-Boulter granite, but pre-granitization.

With the older sediments and basic intrusives, the nepheline rocks have suffered strong regional dynamo-thermal metamorphism. The original characteristics of these rocks have been destroyed by metamorphism, and they are now metamorphic gneisses, with metamorphic structure, texture, and mineralogy. The strongly banded structure developed in the nepheline rocks, the metagabbros, and many of the granite and syenite gneisses, is largely developed by metamorphic differentiation. Some of the banding may be primary and due to original compositional differences before metamorphism. Some geologists have interpreted the banding of these rocks as evidence of sedimentary origin and ascribed it to the preservation of original bedding.

Textures range from hypidiomorphic granitoid to equigranular granoblastic and poikiloblastic. The most common minerals in the nepheline rocks are nepheline, plagioclase (usually oligoclase), scapolite, muscovite, biotite, hornblende, and magnetite. Garnet, carbonate, titanite, zircon, tourmaline, vesuvianite, fluorite, corundum, pyroxene, microcline, and perthite are common accessories.

For the purposes of field mapping the nepheline rocks have been divided into seven lithologic subdivisions:

6a) Nepheline-plagioclase gneiss.
6b) Nepheline-hornblende gneiss.
6c) Nepheline-hornblende-garnet gneiss.
6d) Nepheline-biotite gneiss.
6e) Nepheline-poor alkaline gneiss, oligoclase-andesine gneiss.
6f) Nepheline-scapolite gneiss, scapolite gneiss.
6k) Nepheline-corundum gneiss.

These subdivisions are arbitrary, and the rock types grade into one another. The light-coloured nepheline gneisses consist predominantly of nepheline and plagioclase, which ranges from albite to andesine. Nepheline-plagioclase gneiss is the most common rock type, and with a decrease in nepheline content, it grades into nepheline-poor plagioclase gneiss and oligoclase-andesine gneiss. These rocks are often interbanded with pink and buff leuco-syenite gneiss, particularly in the Bresnahan Lake–Goddard Lake band and in the north Carlow corundum range. Biotite, muscovite, and magnetite are common accessories in the leucocratic nepheline gneisses.

Corundum, in crystals from microscopic size to 1 inch or in fine-grained granular aggregates, is found in the north Carlow occurrences and on the Monteagle nepheline property, lots 2 and 3, concession II, Monteagle township. The corundum is frequently mantled by muscovite and occurs most frequently in the nepheline-plagioclase or nepheline-biotite-plagioclase gneiss. Corundum does not occur in those facies carrying hornblende.

When scapolite is present in the nepheline gneiss, the plagioclase tends to be more calcic, usually andesine. In many of the nepheline-rock occurrences scapo-

lite is present as a minor accessory; in others, as for example the Monteagle nepheline property, scapolite makes up as much as 40 percent of the rock. On fresh surfaces the scapolite in this locality is greenish-grey to yellowish in colour, and greasy in lustre. After exposure to the sunlight the fresh surface turns a deep blue colour. The weathered surface of this scapolite is pale blue-grey, very similar in colour to weathered nepheline. Scapolite is usually most prevalent in the biotitic facies. Corundum frequently occurs in these scapolite-bearing alkaline rocks and can be easily distinguished in thin section by its very high relief, high birefringence, and prominent parting. In thin section the scapolite has medium birefringence usually first order yellow or red and marked cleavage. Scapolite often occurs with nepheline and plagioclase in an equigranular granoblastic mosaic texture, which is characteristic of many of these metamorphic gneisses.

In the dark-coloured nepheline gneisses, hornblende is the predominant mafic mineral. Some pyroxene is also occasionally found and sometimes occurs in poikilitic intergrowths with hornblende and garnet. Hornblende may also occur in the light-coloured gneisses as an accessory. Biotite, magnetite, garnet, scapolite, and carbonate are frequently seen in thin section. Occasionally plagioclase will be absent, and the mafic gneiss will be made up mainly of nepheline, hornblende or pyroxene or both. An example of this facies can be found on lot 23, concession X, Carlow township, just north of the York River. The nepheline content ranges from 30 to 40 percent, the remainder being ferromagnesian minerals. In this exposure the melanocratic gneiss has quite a uniform composition across the outcrop.

The garnet-rich facies of alkaline gneiss is uncommon in the Monteagle-Carlow map area, but to the south, in Dungannon township, this facies is a prominent member of the York River nepheline band.

Nepheline pegmatite consisting of irregular patches of coarsely crystalline nepheline and albite up to 2 feet in diameter are occasionally found replacing nepheline gneisses. The giant nepheline pegmatite bodies common in Dungannon township are not developed in this map area.

For description of the various individual areas of nepheline gneiss the reader is referred to the section on *Nepheline* in the chapter on *Economic Geology*.

SYENITE GROUP

The syenite group includes all those saturated feldspathic plutonic rocks that consist predominantly of one or both of potash or soda feldspar. Rocks of this group are characterized by the absence of nepheline and quartz. A few of the white and grey alkaline syenite gneisses that occur interbanded with the nepheline gneiss and that are genetic associates of the nepheline intrusive stem are included in the nepheline group as *6e*. Quartz syenites containing less than 10 percent quartz are grouped with the syenites.

Occurrence

Syenitic rocks are widespread throughout both Monteagle and Carlow townships. In north-central Monteagle township there is a large area of hornblende and biotite syenite gneiss northwest of Salmon Trout Lake. A second large area of syenitic gneiss extends northeast from Musclow in south-central Monteagle township. Between these two major areas of banded syenites there are scattered exposures of leuco-syenite gneiss and hornblende and biotite syenite gneiss, interbanded in the Monteagle hybrid granite gneiss series. Although some of these syenitic rocks are intrusive and show cutting relations, a considerable per-

centage of the syenitic gneiss is of hybrid origin, produced by a process of potash metasomatism, with pervasive replacement of the Grenville paragneiss and amphibolite.

In southeastern Monteagle township a band of leuco-syenite gneiss from 1,000 to 3,000 feet wide follows and encloses the Bresnahan Lake–Goddard Lake nepheline gneiss band.

Syenitic and granitic gneisses make up most of the north Carlow corundum range. Leuco-syenite gneiss, hybrid syenite gneiss, corundum syenite gneiss, and pegmatite are the chief rock types in a range of hills of syenitic gneiss, 3 miles long and 1 mile wide, between Hoover and O'Grady lakes in northern Carlow township. The Herb's, Hoover, Buck Lake, and O'Grady corundum mines occur within this syenite sequence. Smaller bands of leuco-syenite gneiss, biotite syenite gneiss, and corundum syenite gneiss and pegmatite are exposed in narrower bands at Jack's, Burgess, Mackie, Logan, and Ashland corundum mines, which occur in a second, stratigraphically-higher, syenite belt that forms the southern east-west trending range of hills of the north Carlow corundum range. In the extreme northeast corner of Carlow township there is a hill composed largely of hybrid syenite with some leuco-syenite and corundum syenite that forms part of the Carlow-Raglan corundum belt. It is a link between the Burgess and Craigmont corundum mines.

South of Stringer Lake, in north-central Carlow township, a band of leuco-syenite and hornblende syenite gneiss, over 1,000 feet wide, extends eastward along the north shore of the York River from the Boulter fault. The ground is low and swampy and exposures are rare.

The Fraser Lake syenite exposed at the north end of Fraser Lake is the only syenite in southern Carlow township. This intrusive has been described earlier in the section on Boulter gabbro as it appears to be an early syenite associated in age with this gabbro.

Lithology and Structure

The syenitic rocks, with the exception of the Fraser Lake syenite, are foliated rocks, and frequently contain inclusions of metasediment, usually amphibolite. Structurally, most of the syenite gneisses occur conformably interbanded with metasediments, granite gneiss, and nepheline gneiss, but occasionally cut and replace metasediments and nepheline rocks. As pointed out in the Brudenell-Raglan report,[1] some of these syenites, particularly in the corundum ranges, are produced by a process of replacement. Syenite pegmatites of both the fissure-filling and replacement types occur. The corundum syenite pegmatites are mainly of the replacement type.

Textures in the pink and buff syenites, which make up the greater part of this group, are usually hypidiomorphic granitoid. Some of the buff and yellow-brown syenites have a sugary, equigranular, non-interlocking texture, and the rock easily pulverizes to a sand. A porphyroblastic texture is sometimes found in metamorphic replacement facies.

Microcline, microcline perthite, and albite or oligoclase are the chief minerals in the syenites. Hornblende, biotite, corundum, and magnetite are characterizing accessories. Muscovite, zircon, apatite, titanite, pyrite, and occasional carbonate are minor accessories.

The relative proportions of plagioclase and potash feldspar range from 100 percent plagioclase to 90 percent microcline and microcline perthite.

[1] D. F. Hewitt, *Geology of the Brudenell-Raglan Area*, Ont. Dept. Mines, Vol. LXII, 1953, pt. 5

For mapping purposes the syenite group has been divided into seven lithologic subdivisions:

7a) Pink and white leuco-syenite and syenite gneiss.
7b) Hornblende syenite and syenite gneiss.
7c) Biotite syenite and syenite gneiss.
7h) Hybrid syenite gneiss (interbanded syenite gneiss and amphibolite); migmatite.
7p) Syenite pegmatite.
7k) Corundum syenite; corundum syenite gneiss.
7m) Corundum syenite pegmatite.

These are arbitrary lithologic subdivisions, and one type grades into another.

Pink and white leuco-syenite and leuco-syenite gneiss occur throughout the area but are most common in the north Carlow corundum range. These rocks are composed almost entirely of feldspar, with less than 5 percent mafic minerals. The grey alkaline syenite or oligoclase-andesine gneiss is grouped with the nepheline rocks since it is associated with the alkaline rocks in age and genesis. The buff syenites consist predominantly of plagioclase ranging from An_7 to An_{30} in composition, plus microcline, which may make up 30–40 percent of the rock. The pink syenites consist of plagioclase (albite to andesine) plus microcline and microcline perthite. The microcline and microcline perthite may make up over 70 percent of the rock. These leuco-syenites are frequently found in the corundum workings and may contain large feldspar porphyroblasts up to 3 or 4 inches in diameter.

Hornblende is the characterizing accessory of the hornblende syenite, hornblende syenite gneiss, and hybrid syenite gneiss. The hybrid syenite gneiss consists of interbanded amphibolite and syenitic material, which was introduced partly by injection and partly by replacement. Biotite syenite and biotite syenite gneiss carry 10–30 percent biotite. All these rocks have a banded structure due to the parallel alignment of mafic mineral, the tendency of the mafic minerals to segregate into rude layers, and the alignment of inclusions within the gneiss.

Corundum occurs in pink and buff, medium-grained granular leuco-syenites with muscovite and magnetite as the chief accessories. These corundum syenites occur in the north Carlow corundum range and in a few scattered places in Monteagle township. The corundum syenites are often associated spatially with grey nepheline gneiss and replace these gneisses. In most of the corundum workings in Carlow township, nepheline gneiss is absent, but occasional unreplaced relics are found. Corundum syenite pegmatites are composed of coarse crystals of microcline, microcline perthite and plagioclase up to 1 foot in diameter, with crystals or masses of bronze corundum ½–5 inches in diameter. These pegmatites occur as lenses, pods, or irregular patches lying conformably within the syenite gneiss sequence. They show no structural discordance with the surrounding gneisses and are probably of replacement origin.

Pink or yellow-brown syenite pegmatite or pegmatitic syenite, without well-defined cross-cutting, fissure-filling structure are common within the area.

GRANITE GROUP

The granite group includes the most common rocks of the map area and all those plutonic rocks consisting primarily of quartz and silicic feldspar. The granitic rocks are predominantly gneissic in structure. The granite group includes pink and grey leuco-granite, pink and grey biotite granite, pink and grey hornblende

granite and their gneissic equivalents, as well as hybrid granite gneiss, migmatite, injection gneiss of predominantly granitic composition, pegmatitic granite, and granite pegmatite. Some of the granite pegmatite in thin stringers interbanded with mafic gneiss, paragneiss, or amphibolite may be either veinitic or arteritic; other granite pegmatites are late fissure-filling dikes.

Occurrence

There are three main types of granitic rock easily recognizable within the map area. These are: (1) the grey, medium-grained, slightly foliated, biotite albite Boulter granite; (2) granite gneiss; and (3) the late fissure-filling Hybla granite pegmatites. The Boulter granite is a stock-like intrusive confined to southeastern Carlow township. The granite gneisses make up at least 60 percent of the rock west and north of the York River, including most of Monteagle



Hybrid granite gneiss with amphibolite schlieren. Roadcut on highway No. 62, south of Maynooth.

township and north Carlow township. The Hybla granite pegmatites are a swarm of fissure-filling granite pegmatites centred in an area within a radius of about 3 miles from the MacDonald feldspar mine.

Lithology and Structure

The lithology and structure of the early acid intrusive, the Boulter granite, has already been discussed.

The bulk of the rocks assigned to the granite group are a heterogeneous assemblage of gneissic granite, granite gneiss, and granitoid gneiss, which are largely undifferentiated as to age. Structurally these gneissic rocks are conformable with the metasediments, which they intrude and replace. Textures range from hypidiomorphic granitoid to equigranular or homoeoblastic. Cataclastic structure is sometimes present.

Oligoclase, quartz, and microcline are the chief constituents of the granite gneiss. Microcline perthite occurs in some types. Hornblende, pyroxene, and

biotite may be characterizing accessories. Minor accessories include muscovite, chlorite, zircon, apatite, titanite, carbonate, hematite, magnetite, and pyrite.

For mapping purposes the granite group has been divided into five lithologic subdivisions:

8a) Pink and grey leuco-granite and gneiss; alaskite.
8b) Hornblende granite and gneiss.
8c) Biotite granite and gneiss.
8h) Hybrid granite gneiss (interbanded granite gneiss and amphibolite); migmatite; injection gneisses; etc.
8p) Granite pegmatite; pegmatitic granite.

The pink and grey leuco-granite gneisses are composed predominantly of quartz, oligoclase, and microcline or microcline perthite. Typical pink leuco-granite gneiss is exposed on Burgess Mountain where it forms the main rock type. Immediately south of Burgess Mountain, on lots 15–18, concessions XII and XIII, Carlow township, there is a coarse-grained pegmatitic, leuco-granite consisting of quartz and feldspar ½–1 inch in grain size. It is quite massive. Magnetite, allanite, biotite, and hornblende are accessories.

Biotite and hornblende granite gneiss contain 10–30 percent of mafic constituents. Hybrid granite gneiss is formed by introduction of granitic material into amphibolite and paragneiss. In the hybrid granite gneiss subdivision are included all those rocks commonly described as *lit par lit* gneisses, migmatites, injection gneisses, granitoid gneisses, granitized sediments, and mixed gneisses.

For field nomenclature granite is defined objectively on the basis of minerals, texture, and structure, as a rock composed essentially of quartz and silicic feldspars having an interlocking texture and a structure not dominantly sedimentary or metamorphic. If the rock has metamorphic structure, that is, secondary foliation, it is termed granite gneiss. On the scale of mapping used in this area, an outcrop consisting of interbanded granite gneiss and amphibolite not separable into mappable bands, that is, bands less than about 100 feet wide, is designated *8a, 2a*, if granite gneiss predominates, or *2a, 8a* if amphibolite predominates. Where there has been intimate injection of granitic material into amphibolite on such a scale that it is no longer possible to separate mappable units of original and introduced material, the resulting migmatite or mixed gneiss is mapped as hybrid granite gneiss, *8h*.

Pegmatites

The granite pegmatites of the area may be divided into two general types:

1) Injection or replacement pegmatites of the non-dilatant type, including pegmatitic stringers, clots, patches, pods, and veins, in general conformable with or grading into the country rock.
2) Fissure-filling dilatant pegmatite dikes with sharp contacts and cutting relations.

1) Injection or Replacement Pegmatites.—Most of the pegmatite in Monteagle and Carlow townships is of the injection or replacement type and consists chiefly of pegmatitic stringers that make up much of the hybrid granite gneiss complex. This pegmatitic material has been injected into metasediments and forms some of the *lit par lit* injection folia of the hybrid gneisses. Some of the pegmatitic material permeated and pervaded the country rock and was emplaced by a process of replacement rather than injection. Feeder dikelets that formed

channels of access for some of the pegmatitic solutions during the waning of the late acid plutonic period are seen in a few places. Many of these pegmatites are comformable with the foliation of the country rocks in which they occur. In cases where these pegmatites occur in granitic rocks, the contacts may be gradational and indefinite.

2) *Fissure-Filling Pegmatites.*—Fissure-filling granite pegmatite dikes with sharp contacts and cutting relations with the country rocks occur in several places in the area. These dikes are thought to be of the dilatant type and were presumably intruded when the present surface of erosion was within the zone of fracturing rather than the zone of flowage. In contrast, injection and replacement pegmatites of type (1) are thought to have been emplaced at an earlier period when the present exposed surface was in a deeper zone, the zone of refusion, flowage and magma generation.



Hanging-wall contact of granite pegmatite with amphibolite and granite gneiss, MacDonald mine, Monteagle township. Large allanite crystals surrounded by radial shattering are visible in the pegmatite.

The Hybla pegmatites comprise a swarm of late granite pegmatites, over thirty in number, centred in south-central Monteagle township mainly between and south of the villages of Hybla and Monteagle Valley. Twenty-three of these pegmatites were worked for feldspar between 1920 and 1930, and a full description of these will be found under *Feldspar* in the chapter on *Economic Geology*. The most important feldspar mine is the MacDonald mine, which produced 35,048 tons of feldspar from 1919 to 1935. Other substantial producers were the Thompson, Woodcox, and Genesee No. 2 mines.

The fissure-filling granite pegmatites can be grouped into two types:

1) Simple or homogeneous type.
2) Complex or zoned type.

1) The simple or homogeneous type is an unzoned pegmatite having a rather simple mineral composition and a relatively uniform texture from wall to wall.

Sometimes the borders of the dike are of somewhat finer grain-size than the central portion. Graphic intergrowths of quartz and feldspar are very common in this type of dike and occasionally the entire simple dike will consist of graphic granite pegmatite.

2) The complex or zoned pegmatite is a coarsely-crystalline pegmatite consisting of mappable units or zones of contrasting mineralogy, structure, and disposition within the dike. Very commonly the core or central zone of the dike consists entirely of quartz. The intermediate zone usually consists of microcline or microcline perthite and quartz, and the wall zone of plagioclase, quartz, and microcline (perthite).

Most of the pegmatite dikes in the Hybla swarm strike N.40°–70°E. and dip steeply. The dikes vary in size and shape and are usually tabular, pod-shaped, or lense-shaped. The largest dike, the MacDonald, is 600 feet in exposed length and 50–75 feet in width. It is exposed for 120 feet in vertical depth in the workings.

The most abundant minerals in the pegmatites are quartz, microcline, microcline perthite, and albite. The following accessory minerals have been identified:

hornblende	magnetite	allanite
pyroxene	ilmenite	uraninite
biotite	pyrite	uranothorite
muscovite	pyrrhotite	microlite-pyrochlore
chlorite	chalcopyrite	ellsworthite
scapolite	hematite	hatchettolite
garnet	galena	calcio-samarskite
calcite	molybdenite	columbite
titanite		cyrtolite (zircon)
rutile		
tourmaline		
fluorite		
apatite		

Pleistocene and Recent Deposits

The area was glaciated during Pleistocene times, and a thick mantle of glacial drift covers most of the area. The north flanks of most of the hills are heavily covered with boulder drift. This is well shown in the case of Burgess Mountain in northern Carlow township, where outcrops are rare or lacking on the north side of this prominent ridge. Similarly on the north flank of the Carlow upland, south of the York River, there is a remarkable lack of outcrop. Glacial striae indicate the direction of ice movement was S.0°–15°E. The glacial drift is mostly sandy with numerous boulders. Extensive sand plains are developed in northwest Carlow along the Maple Leaf–New Carlow road.

On the north boundary of Monteagle township, from Maynooth east to the village of Maple Leaf, along highway No. 62, there is a well-developed series of kame terraces stepping down from an elevation of 1,350 feet near Maynooth to 1,100 feet at Maple Leaf. What appears to be a moulin kame was exploited for gravel just east of Maynooth village.

Just south of Selby Hill on the west boundary of Monteagle township there is an extensive area of outwash gravel over 40 feet thick. This well-sorted gravel is a source of highway aggregate. A large area of outwash sand forms a flat plain around Bird Creek in southwest Monteagle township.

CHAPTER III

STRUCTURAL GEOLOGY

Owing to metamorphism the criteria for determining tops of strata are lacking in Monteagle and Carlow townships, and interpretations of folding are based on attitudes of bedding and foliation in the metasediments and foliated plutonic rocks. Fracture cleavage is rarely developed in the area, but drag-folding is locally developed and gives some structural information.

Rock flowage has occurred in the metasedimentary rocks, particularly in the crystalline limestones, and there are many limestone tectonic breccias carrying fragments of other rocks.

Folding and Foliation

The rocks of the area are highly folded with dips ranging from horizontal to vertical. In Monteagle township the general trend of foliation is in a north-south direction, with dips steeply to the east. In detail there is much intricate folding. In northeastern Carlow the foliation strikes northeast and dips 30°–60°SE. To the southwest the foliation swings from northeast-southwest to a north-south direction paralleling the structural trend in Monteagle township. The York River follows the general structural trend of the medasediments swinging in a wide arc around the Carlow uplands, an intrusive mass of gabbro and granite.

There are several minor structures in the map area. At Graphite, in northwestern Monteagle township, the foliation in the amphibolite and granite gneiss indicates an open syncline pitching to the southeast, cut off along a northeast-trending fault. South of Bresnahan Lake, in southeastern Monteagle township, there is a marked swing in structure in the nepheline band from southwest with a southeasterly dip through south to southeast with a northeasterly dip. This may be a drag on a northwest fault.

In Carlow township the Carlow paragneiss shows some dragging on the Mallard Creek fault. In southeastern Carlow the structure in the Boulter granite southeast of the Little Mississippi River indicates a shallow syncline pitching northwest.

Faulting

There is evidence of faulting in Precambrian and Tertiary times. Old faults of Precambrian age are sometimes marked by a zone of limestone tectonic breccia or by the presence of granite pegmatite in the fault zone or fracture. In the section on *Physiography* the period of normal faulting in Tertiary times has been discussed. This faulting resulted in the development of the Madawaska highlands, an area of fault-block mountains standing up in relief above the Ottawa River lowlands.

In this map area the location of faults is based largely on the following evidence:

1) *The presence of pronounced topographic scarps, not developed by differential erosion of resistant and soft rocks.* On the assumption that the area was peneplaned in Precambrian times and later mantled by Paleozoic rocks, and that the present surface represents this early paleopeneplane ex-

humed, a topographic layer map, together with geological data, allows us to reconstruct the paleopeneplane surface and, on the basis of displacement or tilting of this surface, to place certain faults.

2) *The presence of pronounced linear depressions crossing the area.* When geological evidence is in agreement, these linears are assumed to be subsequent along faults.
3) *Discordance or displacement of geological structure.*
4) *Discordance or displacement of lithology or stratigraphy.* Evidence such as the truncation of a fold, an abrupt change in lithology or stratigraphy along strike at a linear depression, or the displacement of a marker horizon or dike, is assumed to indicate faulting.
5) *The presence of shearing, slickensides, gouge or brecciation, or other physical evidence of faulting in outcrop.* It is quite common in Monteagle township to find a fault zone sealed by 1–3 feet of limestone tectonic breccia even in cases where the fault transects diverse gneisses. Brecciation and fault gouge were also observed in places.



Dragfolding of hybrid syenite gneiss and amphibolite adjacent to a fault. The fault is filled with limestone tectonic breccia.

There are two main directions of faulting, a northwest set and a northeast set. The most prominent northwest fault in Carlow township is the *Boulter Fault*, which strikes N.60°W., entering the township on the east boundary in concession III, passing ½ mile north of Boulter post office, through New Carlow, and out of the township in concession XVI on the west boundary. The Carlow corundum range appears to terminate at this fault. The Carlow paragneiss, Boulter granite, and Boulter gabbro are offset or cut off by this fault.

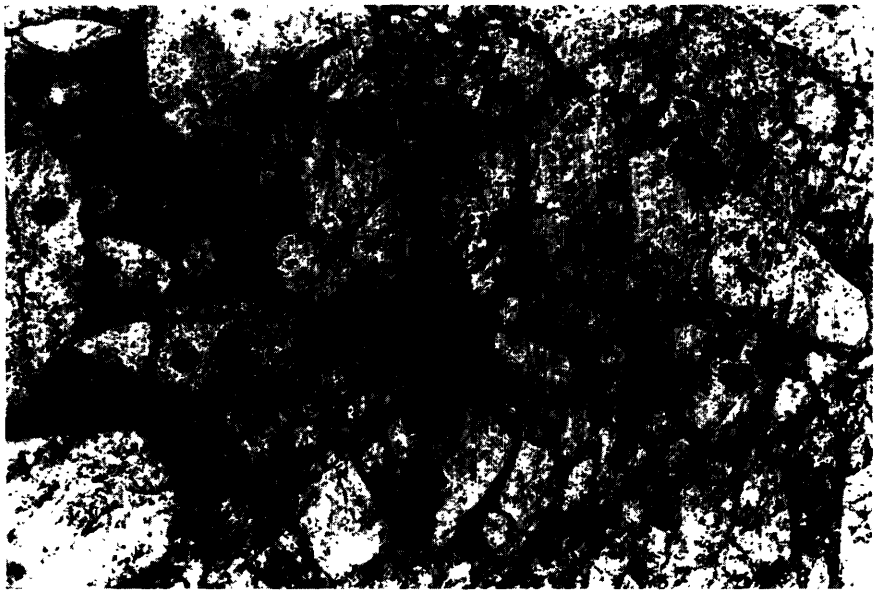
A second northwest fault parallels the Boulter fault about 2 miles to the southwest. This fault runs from Fraser Lake to the York River.

At Fraser Lake this fault cuts off the Boulter granite against a dragged segment of Carlow paragneiss. To the northwest it appears to cut off a small mass of metagabbro. Farther to the south is the east-west *Mallard Creek Fault*,

which crosses the Carlow township's south boundary on lot 16 and runs northwestward down Mallard Creek valley to the York River. To the east this fault separates the Mallard Lake metagabbro from the Boulter granite; to the west the Carlow paragneiss is dragged on this fault. West of the York River this fault appears to die out, but a parallel fault that may be its continuation passes through the south end of Salmon Trout Lake. Farther northwest another parallel extension of this series of faults passes through the south end of Graphite Lake.

Just north of the Genesee No. 2 feldspar mine at the south end of Salmon Trout Lake a small northwest-trending, flatly dipping branch fault cuts the amphibolite. The accompanying photo shows this fault cutting off a small drag fold in the amphibolite. The fault plane is filled with a 1-to 2-foot thickness of limestone tectonic breccia, which seals the fault zone. A similar limestone tectonic breccia occurs along a northwest-southeast fault on lot 12, concession V, Monteagle township.

At Monteagle Valley post office there is another west-trending fault, which



Granite breccia on the Monteagle Valley fault, near Monteagle Valley post office, Monteagle township.

cuts the granite gneiss–syenite gneiss–hybrid gneiss complex. At one point, as shown in the accompanying photo, the fault zone passes through competent gneissic granite, and a coarse granite breccia is produced.

The *Musclow Fault* in southwestern Monteagle township is a northwest-trending fault marked by a pronounced linear valley. It appears to cut off a wide band of pink hornblende syenite that extends southwest from Quirk Lake. Another northwest-trending fault enters Monteagle township from the south at South Boundary Lake and runs northwest across highway No. 62. This fault is marked by two pronounced scarp faces on lot 27, concessions I and II, and lot 29, concessions III and IV, Monteagle township.

The second major set of faults runs northeast by east, and is represented in Monteagle township by the fault which cuts off the Graphite syncline on

lots 20 to 25, concession XIII; the fault passing through the south end of Selby Lake, lot 25, concession X, and by the fault running southwest by west from Quirk Lake, lot 12, concession IV. This latter is marked by a zone of brecciation.

In Carlow township there is an outcrop of limestone tectonic breccia, over 300 feet long, exposed on the south shore of the York River, lot 11, concession X, which may mark an old east-west fault of early Precambrian age. Other limestone tectonic breccias and lime mylonite occur along the south side of the York River east of the Boulter bridge, lot 20, concession X.

A small vertically dipping fault striking N.20°W. cuts the hybrid granite gneiss-amphibolite sequence in the Selby Hill roadcut on highway No. 62 four miles south of Maynooth. Very good fault gouge and slickensides can be seen on the east wall of the roadcut.

CHAPTER IV

ECONOMIC GEOLOGY

There are occurrences of copper, corundum, feldspar, garnet, graphite, iron, lead, mica, nepheline syenite, rare element and radioactive minerals, kyanite, and sillimanite within the map area. Many of these occurrences are of no commercial interest and are described here only as a matter of record. The area is best known for its corundum mines, worked from 1908 to 1918, and its feldspar mines, worked from 1920 to 1935, and intermittently until 1950.

Copper

MONTEAGLE TOWNSHIP

Concession VIII, Lot 9

There are two small pits in an open field ¼ mile south of the concession road on lot 9, concession VIII, Monteagle township, close to the lot 8–lot 9 boundary line. The larger pit measures 6 by 8 feet and is drift-filled. The pits are sunk in rusty paragneiss, pyroxenite, and hornblendite that carry veinlets, up to 4 inches in diameter, of pyrite and pyrrhotite with rare chalcopyrite. These rocks are intruded by granite pegmatite. This occurrence is of no commercial interest.

Concession VIII, Lot 13

A small pit, measuring 10 by 10 by 3 feet deep, has been opened on the farm of D. E. Taylor, lot 13, concession VIII, Monteagle township, 300 feet south of the farm house. The pit exposes rusty-weathering paragneiss interbanded with limy metapyroxenite. Veinlets of pyrite and pyrrhotite, with minor molybdenite and chalcopyrite, occur in the metapyroxenite.

Corundum

From 1902 to 1916 corundum was produced from the deposits in the vicinity of Burgess Mines in northern Carlow township. The mineral corundum ranks next to diamond in hardness and was widely used as an abrasive until it was largely supplanted by the artificial abrasives, silicon carbide and alumina. During World War II there was a pressing demand for grain corundum for snagging wheels, used in the production of forgings and castings, and for corundum flour, used in grinding optical lenses, and a re-examination of the corundum deposits of eastern Ontario was made.

Corundum, which has the formula Al_2O_3, occurs in hexagonal, barrel-shaped crystals and in subhedral crystalline masses. In Monteagle and Carlow townships the corundum occurs chiefly in pink muscovite syenite, syenite pegmatite, nepheline gneiss, or grey oligoclase-andesine gneiss. In the nepheline rocks the corundum is usually grey or blue-grey in colour; in the syenites it is green, brownish-green, brown, or bronze. Lustre is vitreous to adamantine, and fracture is conchoidal; its hardness is 9, and its specific gravity about 4.

The corundum is extremely erratic and patchy in distribution. Rich patches of corundum pegmatite may contain 25 to 30 percent corundum. The average grade of corundum ore mined during the period from 1902 to 1916 was 5–10 percent.

HISTORY OF OPERATIONS

The occurrence of corundum on the site of Burgess Mines in northern Carlow township was first reported by W. F. Ferrier in 1896.[1]

In 1902 the Ontario Corundum Company began operation at Burgess Mines. Initially, the ore was hand-sorted, and a 15-percent concentrate was shipped to the United States for further concentration. A mill was erected in 1903 but burned down in 1904. A new mill, consisting of five Blake crushers, two impact crushers, two sets of rolls, a magnetic separator, and seven Hooper pneumatic jigs, was erected and operated by the Ontario Corundum Company until 1905 when the property was taken over by the Ashland Emery and Corundum Company. At this time corundum mining began at O'Grady Lake Cuts and continued until 1907. Subsequently, other small workings were opened up, including Buck Lake Cuts, Logan Cuts, Mackie Cuts, Herb's Cuts, and Jack's Cuts.

In 1910 the Armstrong Corundum Company leased the Burgess mill, and after two months the operation was taken over by the Manufacturers Corundum Company, which was operating the Craigmont deposits. This latter company operated at Burgess Mines until 1917 when the mill was closed, and the machinery shipped to Jewellville. In 1913 the Craigmont mill burned down, and the Burgess mill treated all the corundum ore mined in the area until 1917.

MONTEAGLE TOWNSHIP

Concession I, Lot 13 (Welsh Corundum Mine)

A small deposit of corundum was worked on lot 13, concession I, Monteagle township, in 1906, by the National Corundum Wheel Company of Buffalo, New York.

Corundum-bearing syenites occur in scattered patches on a north-south ridge over a length of 600 feet along strike, in a zone 100 feet wide. The syenite gneisses strike N.20°W. and dip steeply to the east. On the ridge there are several low-grade bands up to 25 feet wide and 100 feet long, running 3–5 percent corundum.

The main pit, located about ¼ mile north of the township boundary, measures 25 by 18 feet with a 10-foot face on the north side. The rock exposed on the north and west walls of the pit is a rather uniform, grey biotite-corundum syenite gneiss. This rock is cut by stringers and dikes of leuco-granite gneiss and granite pegmatite. Granite pegmatite is exposed on the east wall of the cut. Corundum, occurring as small ⅛–¼-inch crystals, makes up about 5 percent of the corundum syenite exposed in the pit.

[1]Geological Survey of Canada, *Annual Report*, Vol. X, 1897, pt. A, pp. 116–19.

Concession II, Lots 2 and 3 (Monteagle Minerals, Limited)

In 1906 the Canada Corundum Company opened up a corundum prospect on lots 2 and 3, concession II, Monteagle township. The corundum occurs in a grey nepheline-biotite-scapolite-plagioclase gneiss that forms a north-south ridge on the east side of the York River, a mile north of the township boundary. The nepheline gneiss band is 100 feet wide, strikes north, and dips 70°E. The nepheline gneiss extends 3,000 feet north of the York River.

The corundum occurs in bands within the nepheline gneiss and in some places averages 5 percent. The corundum is grey in colour and occurs as fine-grained aggregates rather than as individual crystals. Muscovite and magnetite occur in these corundum aggregates.

In 1906 a considerable amount of stripping and trenching was done, and a bulk sample was taken. No mining was carried out. In 1915 some diamond-drilling was reported to have been done.[1]

In 1947 and 1948 the deposit was re-examined by Louis Moyd, and a systematic program of trenching, stripping, and bulk sampling was carried out. The property was optioned to Ortona Gold Mines, Limited, in 1950, and some diamond-drilling was done. Further surface work and bulk sampling was carried out, and mill tests were run at the Bureau of Mines, Ottawa, during 1951, 1952, and 1953.

A more detailed description of the property will be found under the section on *Nepheline*.

Concession III, Lot 20

There is a small occurrence of corundum in medium-grained pink biotite leuco-syenite, with accessory magnetite and muscovite, on lot 20, concession III. The corundum-bearing band is 1 foot thick and can be traced for 30 feet. The corundum crystals range from 1/16 to 1/8 inch in size, the grade is low, and the occurrence is of no commercial interest.

Concession IV, Lot 21 or 22

There is a small occurrence of magnetite and corundum in pink leuco-syenite near the line between lots 21 and 22, concession IV, Monteagle township.

Concession V, Lot 14

In a field near the west fence line of lot 14, concession V, 3/8 mile south of the concession road, there is a flat outcrop of pink and buff, variegated biotite syenite carrying some patches of corundum. The corundum occurs in crystals up to 2 inches in diameter and is irregularly distributed through the rock.

Concession VI, Lot 16

Blue to grey corundum grains averaging 1/4 inch in diameter, occur irregularly distributed in a fine-grained, grey biotite syenite gneiss outcropping on lot 16, concession VI, Monteagle township, 500 feet south of the road in a field. Three to five percent corundum is present in small patches of the rock, but the occurrence is too small to be of economic interest.

Concession VI, Lot 17

Another small occurrence of corundum is reported on lot 17, concession VI, by W. F. Take. A buff-coloured, white-weathering, leuco-syenite carries corun-

[1]Louis Moyd, private report, November, 1948.

dum crystals up to ½ inch in size over an area of 4 square feet. The leuco-syenite is enclosed in a series of pink and buff variegated leuco-syenite and granite gneiss.

Concession X, Lot 11

A small occurrence of corundum in pink and buff variegated leuco-syenite may be seen on a path 100 feet west of the Monteagle valley road, ¼ mile south of Monteagle Valley post office.

Bronze corundum crystals up to 1 inch in diameter occur in an area of 4 square feet. The surrounding pink syenite carries muscovite but no corundum.

CARLOW TOWNSHIP

Concession XIII, Lot 16 (Ashland Emery and Corundum Company)

The workings of the Ashland Emery and Corundum Company are located half-way up the south face of Burgess Mountain on lot 16, concession XIII, ¼ mile north of the Burgess Mines road.

The workings consist of three shallow cuts. The northwestern cut has a length of 60 feet, a width of 20 feet, and a northeast face of 5–10 feet. The southern cut is 20 by 25 by 18 feet deep. The northeastern cut is 20 feet long with a 3- to 5-foot face.

The cuts are on the dip slope of the hill. The general strike of the rocks is N.70°W., and the dip is 15°S. The northwestern cut exposes massive pink hornblende-magnetite-titanite-allanite granite, pink aplitic leuco-syenite, variegated pink and white leuco-syenite with magnetite, all of which are cut by corundum syenite pegmatite and granite pegmatite. Some pink muscovite-corundum syenite gneiss and pink leuco-granite gneiss are also present. Two strong sets of joints, one striking N.23°E. and dipping 80°E., the other striking S.60°E. and dipping 75°N., are developed.

In the southeastern pit, pink leuco-syenite, pink and white variegated corundum syenite, granite gneiss, granite pegmatite, and corundum syenite pegmatite occur interbanded.

The upper or northeastern cut exposes a 6-foot long patch of corundum syenite pegmatite, running 15 percent corundum, overlain by pink granite pegmatite.

Corundum is distributed throughout these workings in a very spotty and irregular way, and there appears to be no persistent zones of ore grade or size.

Concession XIV, Lot 10 (Jack's Cuts)

These corundum workings consist of a series of four shallow cuts on the south face of a hill on lot 10, concession XIV, Carlow township. The general strike of the country rock is N.75°W., and the dip is 35°S. The cuts are on the dip slope of the hill and are quite shallow, following the corundum-bearing horizons up this dip slope.

Cut No. 1.—The western cut is 150 feet long, 50 feet wide, and 6–7 feet deep. The rocks exposed are grey and buff corundum syenite and corundum syenite pegmatite enclosed in pink and buff leuco-syenite. In one section of the face a 5-foot zone of grey corundum syenite, averaging 8–10 percent corundum, is exposed. Bronze corundum crystals range from 1/16 to about 2 inches in diameter. Biotite, muscovite, and magnetite occur as accessories in the grey corundum syenite. In several places this rock contains scapolite, and in two places a dull-greenish mineral, which may be gieseckite, was observed. At the northwest corner of this cut, a rich pod of pink corundum syenite pegmatite, carrying 40 percent corundum, occurs immediately below the grey corundum syenite

band. The grey syenite grades upward into buff syenite and then into pink syenite. Corundum is often well developed in the buff syenite zone. These rocks are all gneissic and are underlain by biotite paragneiss.

Cut No. 2.—Fifty feet east of the western cut, there is a second cut, 120 by 100 feet with a depth of 2–5 feet. The wall of this cut is oval-shaped and has a length of about 200 feet. The rocks exposed are grey scapolite-corundum-plagioclase gneiss, pink and buff syenite gneiss, and biotite paragneiss. In this cut there is again a single band of grey corundum syenite, 2–4 feet wide, which was mined on the dip slope of the hill. Corundum is irregularly distributed through the grey syenite and adjacent buff and pink syenites in grains $\frac{1}{16}$–1 inch in diameter.

Cut No. 3.—Thirty feet east of Cut No. 2 is a third cut trending northward measuring 80 by 30 by 8 feet deep. Here a buff corundum syenite band, 2 feet wide, is interbanded with pink leuco-syenite and cut by pink hornblende syenite pegmatite.

Cut No. 4.—One hundred feet east of Cut No. 3 there is a fourth cut measuring 60 by 25 by 3–4 feet deep. Relationships are similar to those in the other cuts.

Concession XIV, Lot 14 (Burgess Mine)

In 1902 the Ontario Corundum Company opened the Burgess mine on the Armstrong property, where corundum was originally discovered in this part of eastern Ontario by W. F. Ferrier in 1896. The Burgess mine is located at the base of the west face of Burgess Mountain, lot 14, concession XIV, Carlow township, $\frac{1}{2}$ mile north of the New Carlow road.

The main workings is an open cut in the side of the hill. The main face, trending northwest, has a length of 100 feet. The face is 60 feet high, and the cut extends 40 feet into the side of the hill, with considerable overhang. A second face, 75 feet long, extends northeast from the northwest end of the main face. Other small cuts and slashes occur on the hillside northeast of the main workings.

The rocks exposed in the Burgess mine consist of fine-grained pink aplitic leuco-syenite, buff and pink corundum-magnetite syenite, grey corundum-magnetite syenite, pink granite gneiss, grey scapolite gneiss, corundum syenite pegmatite, and pink hornblende granite pegmatite. The gneissic rocks occur interbanded with one another, usually with gradational contacts.

Corundum occurs predominantly in two facies, in the grey and pink muscovite-corundum-magnetite syenite and in the pink corundum syenite pegmatite.

A 12-foot zone of grey and pink corundum syenite, running 10–15 percent corundum, in grains ranging from $\frac{1}{4}$ to 1 inch in size, extends horizontally across the main face for a distance of 70 feet. Rich patches of corundum syenite pegmatite occur irregularly distributed throughout the workings. The Burgess workings appear to have one of the highest-grade and most persistent corundum bands examined in this area. The old workings followed the ore zone into the side of the hill until the overhanging granite gneiss–syenite gneiss cap rendered further work very dangerous.

Concession XIV, Lot 15 (Mackie Cuts)

The Mackie Cuts are located on the top of Burgess Mountain at its extreme west end. These workings are 500 feet above the road and may be reached by a trail, $\frac{3}{8}$ mile long, from a field $\frac{1}{4}$ mile north of the Burgess mine workings.

The workings consist of a main cut trending N.50°E. into the west face of the hill. This cut is 150 feet long and 66 feet wide at its widest point near the

northeast end. Both the northwest and southeast faces are very steep and are 35–50 feet high. The southeast wall of this main cut is undercut 15 feet at the base of the face.

Two smaller cuts openings to the northwest are located just northwest of the main cut and are separated from it by a narrow rock rib of granite pegmatite and syenite gneiss. The southwesterly of these two cuts is the larger, 45 by 20 feet, with a 30-foot face on the southeast side. The northeasterly cut is 36 by 20 feet, with a 12-foot face; its floor is about 15 feet higher than the southwest cut. Extensive dumps lie to the north and west.

Pink and white variegated leuco-syenite gneiss with some narrow bands of black hornblende amphibolite form the major country rock in the workings. These gneisses strike N.35°E. and dip 15°SE. Interbanded with them are grey and pink corundum-magnetite-muscovite syenite; and intrusive into all these are pink corundum syenite pegmatite, pink hornblende syenite pegmatite, and granite pegmatite. Associated with the pink and grey corundum syenite are some wide bands of buff corundum-magnetite syenite.

Bronze, yellow-brown, and green corundum occurs intergrown with magnetite in the syenite and pegmatite. On the northeast face of the main cut a 10-foot zone of pink corundum syenite pegmatite is exposed. It is overlain by pink aplitic leuco-syenite. Just to the east there is an 8-foot zone of pink and grey corundum syenite in which corundum ranging from 1/16 to 1/2 inch makes up about 10 percent of the rock. Patches of corundum syenite were noted on the southeast face, 20–25 feet above the floor of the cut. Along the northwest wall a 6-foot zone of pink and grey corundum syenite, running 10–15 percent corundum, can be traced for 30 feet before it is cut off by intrusive granite pegmatite.

Concession XIV, Lot 16

On the crest of Burgess Mountain, about 650 feet north of the Ashland Emery Company workings, there are a number of small exposures of variegated pink and white corundum syenite.

These syenite zones are 2–6 feet wide and are interbanded with pink pegmatitic granite gneiss and amphibolite. The corundum crystals are small, averaging about 1/8 inch, and are frequently rimmed with muscovite. The bands seen by the author did not appear to be of commercial size or grade.

Concession XIV, Lot 18 (Logan Cuts)

Three corundum cuts are located on the west side of a hill on lot 18, concession XIV, Carlow township. The country rock is interbanded pink and buff syenite gneiss, which strikes N.80°E. and dips 15°S.

The eastern cut is 200 feet long, 25 feet wide, and 12–15 feet deep. The rocks exposed are pink and buff syenite gneiss, enclosing a band of leucocratic nepheline-corundum-plagioclase gneiss 5–10 feet wide. The pinkish nepheline and grey plagioclase are aligned in rude nepheline-rich and nepheline-poor bands. Muscovite and large bronze corundum crystals, up to 6 inches in size, occur in the nepheline rock. The corundum crystals are usually oriented with long axes parallel to the foliation. The nepheline rock has been intruded and replaced by pink syenite. The fresh nepheline rock grades into a zone in which nepheline has been altered to pink hydronephelite; this zone in turn grades into a hybrid buff gieseckite syenite that is rich in corundum, muscovite, and biotite. This gieseckite zone grades into mottled pink and buff syenite with some corundum. Corundum occurs in the nepheline zone and in the hybrid alteration zones,

giving a total width of corundum rock of about 12 feet. The amount of corundum is variable and may average 10 percent.

The central cut is 75 feet long in an east-west direction, 30 to 40 feet wide, and has a face 10–25 feet high. Here, there is a series of banded pink and buff syenites enclosing a 6-foot band of hybrid buff corundum-gieseckite syenite. Barrel-shaped bronze and green crystals of corundum up to 5 inches long occur in a corundum syenite pegmatite zone, 6 feet wide, on the east face. This zone runs 10–15 percent corundum. The east face is cut by a flat fault with a rolling horizontal surface. Six inches of biotite schist and gouge occur on the fault plane.

Thirty feet to the southwest there is a third cut on the west face of the hillside. The cut has a length of 70 feet in a north-south direction, a width of 30 feet, and a face up to 25 feet in height. The cut exposes interbanded pink, buff, and grey plagioclase syenites. A pegmatite corundum syenite zone, 4 feet wide, exposed in the east wall runs 10–15 percent corundum. A second corundum zone occurs at the base of the cut.

Concessions XIV and XV, Lots 18 and 19

A large outcrop of pink, buff, and grey syenite gneiss interbanded with pink granite gneiss, hybrid granite gneiss, and amphibolite, and overlain by pink granite gneiss, extends across the lot 18–lot 19 line at the concession XIV–concession XV boundary. The syenite gneiss carries a number of small lenses of pink and buff corundum syenite pegmatite with corundum crystals up to 1 inch in diameter. This corundum occurrence is ¼ mile northeast of the Logan Cuts.

Concession XIV, Lot 21

On the west side of a low hill an outcrop ledge exposes a sequence of interbanded, pink and white leuco-syenite gneiss, amphibolite, and hybrid syenite gneiss, containing lenses of coarse-grained corundum syenite pegmatite up to 18 inches wide. In places the pink and white leuco-syenite gneiss adjacent to the corundum syenite pegmatite carries fine-grained corundum. These rocks are cut by granite pegmatite.

Concession XV, Lot 5

This corundum working is located on the side of a hill, 800 feet north of the New Carlow road in lot 5, concession XV, Carlow township. The cut trends N.55°E. and measures 120 by 40 feet with an average depth of 3–4 feet.

The pink and buff syenite gneiss and coarse-grained buff corundum-muscovite syenite exposed in the cut strike N.75°E. and dip 30°S.

The corundum-bearing zone has a width of 2½–3 feet and is exposed throughout most of the face. The bronze corundum crystals, up to 1 inch in diameter, occur in a medium-grained matrix of feldspar with muscovite, biotite, and magnetite, as accessories.

Concession XV, Lot 11 (Herb's Cuts, West Workings)

Two small cuts are located side by side on the edge of a low rise of ground just west of the stream on lot 11, concession XV, Carlow township. One cut is 15 feet square and 8 feet deep; the other is 20 feet square and 3 feet deep. The rocks exposed in these cuts are pink and buff syenite cut by pink syenite pegmatite. Corundum is sparsely and irregularly distributed in crystals, up to ¾ inch in diameter, in grey and buff syenite.

Concession XV, Lots 11 and 12 (Herb's Cuts, East Workings)

On the west face of a steep ridge about 70 feet high, there is a small cut, 50 feet long and 10–12 feet wide with a 12-foot face slashed into the hillside. The cut trends N.20°W. This cut is near the boundary line between lots 11 and 12, and it is uncertain on which lot the workings are located. The main rocks exposed in the cut are interbanded grey syenite and grey scapolite gneisses carrying accessory biotite, magnetite, muscovite, and garnet. The gneisses strike northwest and dip 40°NE. Interbanded with the grey syenite and scapolite gneisses are narrow bands and lenticular pods of grey corundum syenite with bronze corundum crystals up to ¾ inch in diameter. The corundum-bearing rocks are cut by white to pink leuco-syenite, and granite pegmatite containing titanite, allanite, magnetite, and hornblende. Some sulphides present give the rocks a rusty-weathering appearance. Brownish-white carbonate occurs irregularly scattered throughout the corundum-bearing bands, and bands of pink silicated crystalline limestone occur with titanite-garnet-scapolite skarn, which borders some of the granite pegmatites.

The corundum-bearing zone is irregular, with a maximum width of 10 feet. The grade is low, averaging 2–4 percent.

Elsewhere on this outcrop ridge other bands of corundum-bearing rock were noted. About 400 feet to the northeast a 6-foot band of white biotite corundum syenite, carrying 20–25 percent corundum, occurs interbanded with paragneiss and amphibolite. The band strikes N.45°E., dips 40°–45°SE., and is cut off along strike by crosscutting yellow-brown hornblende syenite pegmatite.

One hundred feet southeast of Herb's Cuts there is a 6-foot band of rich corundum syenite pegmatite exposed at the base of a steep outcrop. The bronze corundum, in stubby ½-inch crystals, makes up 20–30 percent of the rock over a length of 10 feet. This corundum-rich zone is cut off and surrounded by yellow-brown hornblende syenite. The band of corundum syenite pegmatite strikes N.45°E. and dips 40°–45°SE.

Corundum-bearing pink, buff, and white syenites occur interbanded with crystalline limestone, paragneiss, and scapolite gneiss at the south end of the ridge on which Herb's Cuts are located, 400 feet south of the cuts. The corundum syenites are exposed over a width of 100 feet and are narrow and discontinuous, rarely being traceable for more than 50 feet along strike. The grade of these narrow bands averages about 5 percent corundum.

Concession XVI, Lot 7 (Hoover Lake Cut)

The Hoover Lake corundum cut is located on the north side of a hill at its southeast end, about 900 feet northeast of the northwest end of Hoover Lake. The cut, measuring 45 by 20 feet by 10–15 feet deep, trends northwestward into the hillside. The country rocks strike N.70°W. and dip 55°S.

Exposed in the southwest wall of the cut is a 12-foot wide zone of grey corundum syenite, grey biotite corundum syenite gneiss, buff corundum syenite, pink corundum syenite, and pegmatite. The bronze-coloured corundum ranges from ⅛ to 2 inches in diameter. The grade of corundum on visual estimate runs 10–20 percent. The corundum zone is exposed over a length of 40 feet and is one of the best seen in Carlow township.

The country rock consists of amphibolite, hybrid syenite gneiss, and pink biotite syenite gneiss. Minor bands of scapolite gneiss and biotite paragneiss underlie the grey corundum syenite gneiss on the footwall side of the cut.

Concession XVI, Lots 7 and 8

A quarter of a mile north of Hoover Lake, on lots 7 and 8, concession XVI, there is an outcrop area of interbanded grey and buff corundum syenite gneisses, cut and replaced by pink leuco-syenite. The gneisses strike north-south and dip flatly to the east. At one place there is a narrow lense of nepheline-albite-corundum syenite, 2 feet wide and 15 feet long, enclosed in grey corundum syenite. The corundum-bearing bands range from 1 to 5 feet in thickness and are overlain to the east by barren pink hornblende syenite gneiss and amphibolite.

Concession XVI, Lot 9

A small outcrop of corundum syenite, carrying 10 percent corundum, is located on the edge of a small clearing ¼ mile north of the east end of Hoover Lake. The corundum-bearing zone that extends across the outcrop is exposed over a width of 8 feet and is bounded on the northwest by pink leuco-syenite. The corundum-bearing rock is a yellow-brown to buff leuco-syenite, which carries muscovite in large poikilitic flakes up to 1 inch across.

Concession XVI, Lot 11 (Buck Lake Cuts)

On lot 11, concession XVI, Carlow township, there are two groups of corundum workings south of Buck Lake. They are here referred to as the *North* and the *South* cuts.

South Cuts.—The main cut trends at N.15°W., is 100 feet long, 20 feet wide, and averages 4 feet deep. The rocks exposed are an interbanded complex of pink, buff, and grey syenite gneisses with variable amounts of hornblende, pyroxene, biotite, muscovite, and magnetite. Corundum occurs predominantly in the hybrid buff facies. The pink syenites grade into pink syenite pegmatite, sometimes containing vugs, with crystals of calcite, feldspar, and muscovite. Near the contacts with buff and grey syenite gneiss, the pink syenite pegmatite carries large euhedral corundum crystals up to 2 inches long surrounded by haloes of muscovite.

North Cuts.—The North Cuts are located 400 feet to the north, close to the township boundary, in an opening on the top of the hill. The main pit is circular in plan and 45 feet in diameter, with faces 2–8 feet high. The west side of this pit is water-filled. A number of smaller pits and trenches occur north and west of the main pit. The rocks exposed are pink and buff leuco-syenite, biotite syenite, and biotite paragneiss. Granite pegmatite occurs east of the main pit. Corundum occurs in variegated pink and buff leuco-syenite and biotite syenite. A few small, rich patches of corundum rock run as high as 15 percent corundum. The structure is highly variable with common drag folding and local contortions.

Seven hundred feet south of the Buck Lake Cuts, on the south edge of the outcrop area on lot 11, concession XVI, there is a 10-foot band of pink and buff biotite corundum syenite traceable for 30 feet. The corundum content of this band averages about 1 percent. The associated rocks are hybrid syenite gneiss, amphibolite, and pink leuco-syenite.

On lot 11, about 400 feet south of the township boundary and 250 feet west of the lower Buck Lake Cut, there is a 5-foot band of buff corundum syenite traceable for 20 feet. Bronze corundum crystals up to 3 inches long make up about 10 percent of this band. Magnetite and muscovite are associated with the corundum. The buff corundum syenite is interbanded with biotite syenite, and hybrid syenite gneiss. The syenite gneisses are cut by allanite-rich granite pegmatite.

Concession XVI, Lot 12

There is a small occurrence of corundum on lot 12, concession XVI, Carlow township, 3/8 mile north of the concession line. The corundum occurs in buff and grey syenite gneiss, and in scapolite gneiss, which occur interbanded with variegated pink and buff biotite syenite. The richest corundum patch, measuring 8 by 4 feet, runs 5 percent corundum.

Concession XVI, Lots 12 and 13

A small relict patch of buff corundum syenite in pink and buff variegated syenite occurs on the southeast end of a hill about on the lot line between lots 12 and 13, concession XVI, Carlow township. The corundum-bearing syenite patch has a diameter of 6 feet, the corundum occurs as 1/4 inch grains, and the patch averages 5 percent corundum.

Concession XVI, Lot 15

Corundum occurs on the dip slope of a large outcrop at the east end of a low ridge, 1/2 mile north of O'Grady Lake, on lot 15, concession XVI, Carlow township. Well-formed, barrel-shaped bronze crystals of corundum up to 2 1/2 inches long occur with magnetite and muscovite in a 2-foot-thick band of buff syenite in a sequence of pink and buff variegated biotite syenite and leuco-syenite gneisses. The horizon carries about 5 percent corundum and is exposed on the dip slope over an area 50 by 200 feet.

Concession XVI, Lot 15 (O'Grady Lake Strippings)

The main occurrence of corundum on lot 15, concession XVI, Carlow township, lies 1 1/2 miles north of the Burgess mine and can be reached by road and trail from the New Carlow–Boulter road. One-quarter mile north of O'Grady Lake on the O'Grady Lake trail there is a small cabin; the strippings lie on the crest of a low ridge 350 feet west of this cabin.

The main stripping trends N.60°E., and the rock is exposed over a length of 170 feet and a maximum width of 40 feet. The stripping exposes white corundum syenite and pink and white corundum syenite pegmatite, interbanded with hornblende plagioclase amphibolite. Some pink and white leuco-granite pegmatite is exposed on the north side of the stripping. The rocks strike N.75°E. and dip 30°S.

Corundum is irregularly distributed on the crest and dip slope of the stripping. The corundum crystals vary in diameter from 1/4 to 4 inches, and there are numerous irregular patches of green and brown corundum pegmatite running 30–40 percent in grade. On the dip slope an area 12 by 25 feet runs 20–40 percent corundum. The corundum zones exposed here are quite rich, but spotty and irregular in distribution. For the most part the corundum occurs as a thin veneer on the dip slope of the stripping and gives an erroneous impression of the richness of the material.

Concession XVI, Lot 16 (O'Grady Lake, South Workings)

The south O'Grady Lake cut on lot 16, concession XVI, is located 1 3/4 miles north of the Burgess mine and is reached by trail around the west side of O'Grady Lake. This cut is 1/4 mile northeast of the cabin on the O'Grady Lake trail.

This is the larger of the two O'Grady Lake workings, and consists of two parallel cuts each about 80 feet long, trending northwest by west. The faces exposed in these cuts range from 5 to 25 feet in height and increase in height

towards the uphill or northwest side of the cuts. The cuts are situated at the foot of the southeast face of a 50-foot hill, and are 25–50 feet wide.

The rocks exposed in these cuts appear to trend northwest and dip steeply southwest. A black amphibolite band occupies the ridge between the two adjacent cuts. In the cuts pink corundum syenite gneiss, grey corundum-biotite syenite gneiss, and grey corundum-scapolite-garnet gneiss are cut by pink syenite gneiss, which in turn is intruded by pink granite gneiss and granite pegmatite.

The cutting relations between the youngest granite gneiss and allanite granite pegmatite, the younger pink syenite gneiss, and the older grey and pink corundum and scapolite gneiss, are well shown. There are inclusions of grey scapolite gneiss completely surrounded by and caught up within pink granite gneiss.

Corundum is irregularly distributed, and the best zones run about 10 percent. The geological relations are complex, and the older corundum bands are intruded by and cut off by younger syenite and granite pegmatite. Therefore, corundum-bearing zones cannot be traced through the cuts.

To the north, on the crest of the hill, pink and grey variegated magnetite syenite gneiss is the prevalent rock type. No corundum was seen, but there is some muscovite.

These cuts do not appear to offer good possibilities for further development owing to the irregularity of the distribution of the corundum.

Concession XVI, Lot 17 (O'Grady Lake, North Workings)

The north O'Grady Lake cut on lot 17, concession XVI, Carlow township, is located 2 miles north of the Burgess mine and is reached by road and trail around the west side of O'Grady Lake. This cut is $\frac{3}{8}$ mile northeast of the cabin on the O'Grady Lake trail, and $\frac{1}{4}$ mile northeast of the southern O'Grady Lake cut.

Here a shallow open cut, 70 feet long, running northwest-southeast, exposes interbanded pink granite gneiss, pink granite pegmatite, buff corundum syenite gneiss, grey corundum biotite syenite gneiss, pink and buff variegated corundum syenite gneiss, and scapolite corundum gneiss. These rocks strike N.20°W. and dip 30°NE. Along the 5-foot face of the cut, a 5-foot zone of pink and buff corundum syenite gneiss is exposed over a length of 60 feet. The corundum averages $\frac{1}{4}$ inch in diameter, and the grade is about 10 percent.

Concession XVI, Lot 29

Two narrow bands of pink and buff corundum syenite are exposed on a 20-foot cliff, interbanded with hybrid granite gneiss, syenite gneiss, and scapolite gneiss. The gneisses strike N.80°E. and dip 20°–25°S. Corundum is distributed erratically in two bands, 1 and 4 feet wide respectively, which can be traced for 15 feet. The corundum content averages about 1 percent.

Concession XVI, Lot 30

Near the top of the hill, 800 feet west of the Craigmont road on lot 30, concession XVI, Carlow township, a band of corundum syenite, 12 feet thick, is exposed for a length of over 100 feet. The corundum occurs in the syenite and in patches of syenite pegmatite in crystals from $\frac{1}{4}$ to 2 inches in size. At one place the grade of corundum over a 6-foot width was judged to be 10 percent. Local pegmatitic patches run as high as 25 percent corundum. The corundum syenite is overlain by paragneiss.

Feldspar

Potash and soda feldspar are used in the manufacture of glass, pottery, porcelain, enamels, and other ceramic products. The potash feldspars, microcline and orthoclase, have the formula $KAlSi_3O_8$; the soda feldspar, albite, has the formula $NaAlSi_3O_8$. They vary in colour, being white to grey, pink, salmon-pink, or brick-red. In this area the potash feldspar is usually pink or red, and the soda feldspar grey. Feldspar has excellent cleavage and easily splits in two directions nearly at right angles to one another. Its lustre is vitreous to pearly on cleavage surfaces, and its hardness ranges from 6.0 to 6.5.

Feldspar deposits in eastern Ontario are generally operated by independent jobbers who mine crude lump feldspar from open-cut granite pegmatite dikes. Crude lump feldspar, hand-cobbed and sorted, is sold in carload lots to merchant grinding mills. No. 1 potash spar, consisting of carefully sorted pure feldspar containing less than 10 percent quartz and free from objectionable impurities such as pyrite, hornblende, mica, iron staining, tourmaline, garnet, etc., sold for $10 per ton, f.o.b. cars, in eastern Ontario in 1953.

HISTORY OF PRODUCTION

The Hybla area of Monteagle township has been one of the important feldspar-producing districts in Ontario. The initial production began in 1919 when the MacDonald mine was opened. This mine was operated until 1935 and produced 35,048 tons of feldspar. During the 1920's a number of other properties were opened, the most important of which were the Thompson mine, the Genesee No. 2 mine, and the Woodcox mine. These smaller mines had all ceased production by 1932.

In 1945 a new property, the Reeves mine, was opened by the Bancroft Feldspar Company and produced a total of 1,162 tons of feldspar in 1945 and 1946. The Hickey mine was operated by W. Jessup in 1949. From 1948 to 1950 the Genesee No. 2 mine was re-opened, and a small tonnage of feldspar produced. All feldspar properties in the area were inactive in 1953.

The accompanying table lists the properties that have produced in the Hybla area of Monteagle township.[1]

Location	Name of mine	Operators	Years of operation	Approximate production
Monteagle Township:				
Con.VI,lot 20	Plunkett mine	American Molybdenite Co.; Sidney Orser.	1921, 1927	2 cars
Con.VI,lots 21,22	Watson mine	P. J. Dwyer; Mount Eagle Feldspar Co.; Consolidated Feldspar Co.	1919–26	500 tons
Con.VI,lot 24,N.½	McCormack mine	P. J. Dwyer	1926	Prospect
Con.VI,lot 24,S.½	McCormack mine	Dillon and Mills; P. J. Dwyer	1920, 1926	150 tons
Con.VII,lot 11	Thompson mine	Feldspar Mines Corp.	1923–25, 1927	2,715 tons
Con.VII,lots 18, 19	MacDonald mine	Verona Mining Co.; Genesee Feldspar Co.	1919–35	35,048 tons
Con.VII,lot 21	Cairns mine	Dillon and Mills; Feldspar Mines Corp.; P. J. Dwyer	1920–24	2 cars
Con.VIII,lot 13	Taylor mine	P. J. Dwyer; Consolidated Feldspars, Ltd.	1925–26	1 car
Con.VIII,lot 14	Genesee No. 2 mine	Genesee Feldspar Co.; D. Vardy; W. Jessup.	1926–31, 1948–50	2,846 tons
Con.VIII,lot 15	Bartlett mine	P. J. Dwyer	1926	Prospect
Con.VIII,lot 17	Woodcox mine	Feldspar Mines Corp.	1921-23	4,087 tons
Con.IX,lot 30,S.½	Hickey mine	W. Jessup	1949	166 tons

[1]D. F. Hewitt, *Feldspar in Ontario*, Ont. Dept. Mines, Industrial Mineral Circular No. 3, 1952, pp. 10, 11.

MONTEAGLE TOWNSHIP

Concession VI, Lot 20 (Plunkett Mine)

The main showing on the Plunkett farm, lot 20, concession VI, Monteagle township, is a granite pegmatite dike located 200 feet east of the lot 20–21 boundary, 2,000 feet south of the concession road. A path leads from the Plunkett farmhouse to the mine, a distance of ½ mile. The workings are on the south edge of a field.

The granite pegmatite dike strikes N.55°E., has a width of 20 to 25 feet, and is stripped for a distance of 175 feet along strike, with both walls well exposed on the flat outcrop surface. It is difficult to determine the dip of the dike owing to the flatness of the outcrop surface, but in the small pit at the northeast end of the dike, the dip appears to be nearly vertical. The country rocks consist of interbanded rusty feldspathic biotite paragneiss, amphibolite, and granite gneiss, with minor amounts of scapolite pyroxenite.

The pegmatite is composed chiefly of graphic granite, with a few pink microcline perthite crystals up to 24 inches in diameter. The dike is not of commercial interest at present owing to the high content of graphic granite and the presence of considerable amounts of hornblende as an impurity. Minerals present in the dike are as follows: graphic granite, abundant; pink microcline perthite, abundant; smoky and milky quartz, abundant; pink and white albite, common; hornblende in 3- to 4-inch crystals, common; titanite, common; molybdenite, rare; pyrite, scarce; biotite, scarce; magnetite, scarce; and allanite, rare to scarce.

A small pit, 25 by 12 feet with a 5-foot face on the southwest side, was opened at the northeast end of the dike. Sixty feet southwest of this pit a branch dike, 10 feet wide, leaves the main dike and runs westward for 20 feet to disappear under drift; some blasting was done on this dikelet. The property was opened by the American Molybdenite Company in 1921. Further work was done in 1927 by S. Orser. Two cars of feldspar are reported to have been shipped.

A second small showing has been opened on the same lot, 1,300 feet north of the main dike. Here a small pit, 10 by 10 by 3 feet deep, has been opened on a small granite pegmatite. The occurrence is 700 feet south of the concession road and 100 feet east of the lot 20–lot 21 boundary in an open pasture. The granite pegmatite consists predominantly of plagioclase, smoky quartz, and pink microcline perthite. Amazonite, ellsworthite, euxenite, titanite, garnet, purple fluorite, and hornblende were also noted in material from the small dump. The country rock is paragneiss and crystalline limestone. The dike is not sufficiently well exposed to determine its size, attitude, or extent.

Concession VI, Lot 21 (Watson Mine, No. 1 Showing)

The Watson No. 1 pegmatite dike is located on the farm of John Twa, lot 21, concession VI, Monteagle township. Twelve hundred feet south of the concession road, on the road running south from Price's Corner, there is a stone culvert and a gate on the west side of the road. From this gate a trail runs 350 feet south to the workings, which are in the bush on the east edge of a cleared field on the side of a low hill.

The granite pegmatite dike strikes N.50°–60°E. and appears to dip 50°–70°NW. The dike has a width of 10 feet and has been opened by a cut 90 feet long and 10–15 feet wide. The wall rock is interbanded pink granite gneiss, syenite gneiss, and amphibolite, which strikes N.80°W. and dips flatly north in the vicinity of the pit. The pegmatite–wall rock contact is exposed on the northwest side of the dike.

The granite pegmatite consists predominantly of graphic granite, smoky and milky quartz, pink potash spar, and soda spar. Allanite crystals were noted along the south wall of the dike. Titanite, hornblende, and pyrite also occur in the dike.

Concession VI, Lot 22, North Half (Watson Mine, No. 2 Showing)

The Watson No. 2 granite pegmatite dike is located on the farm of John Twa, lot 22, concession VI, Monteagle township. On the south side of the concession road, between concessions VI and VII, there is a gate ¼ mile east of the railway crossing. From here a trail leads 400 feet south to the main mine working.

The main working is a cut and adit driven eastward into the face of a hill. The granite pegmatite dike strikes N.65°–85°E. and dips 50°N.; the dip appears to flatten to 35°N. near the top of the hill, and the strike swings from N.65°E. to N.85°E. as it flattens. The country rock, consisting of rusty-weathering paragneiss, silicated crystalline limestone, amphibolite, and granite gneiss, strikes N.60°W. and dips 40°N. The pegmatite dike consists predominantly of pink microcline perthite, white soda spar, quartz, and graphic granite. Biotite, titanite, and hornblende are present in minor amounts. The dike is 15–18 feet wide, the feldspar crystals are of small size, averaging 18 inches, and the amount of graphically intergrown quartz and feldspar is large.

The main cut at the foot of the hill runs N.65°E. for a length of 60 feet; it has a width of 25 feet, narrowing to 18 feet at the face. The face is 40 feet high at the east end of the cut, and both walls of the dike are well exposed. From this face an adit 8 by 10 feet runs for a distance of 100 feet into the side of the hill. On the top of the hill, above the face, the dike is stripped for a distance of 50 feet along strike, and two shallow, 5-foot pits have been opened to test the spar.

The Watson showings were operated between the years 1919 and 1926 by P. J. Dwyer, Mount Eagle Feldspar Company, and Consolidated Feldspar Company, of Toronto. Production is reported to have totalled 500 tons of grades 1 and 2 spar.

Concession VI, Lot 22, South Half (Watson Mine, No. 3 Showing)

The No. 3 showing of the Watson mine is located on the south half of lot 22, concession VI, near the lot 22–lot 23 boundary, 2,250 feet south of the concession road and 1,450 feet west of the road running south from Price's Corner. The pit is located on the west face of the hillside, 150 feet southwest of the extreme southwest corner of the cleared fields on the farm of John Twa. This showing is ⅜ mile south of the No. 2 showing.

The 25-foot wide granite pegmatite dike strikes N.55°E. and dips steeply northwest. The pit measures 50 by 30 by 30 feet. The northwest wall of the pit exposes the country rock at the top of the cut, a medium-grained pink granite gneiss interbanded with some amphibolite. The lower part of the face exposes coarsely crystalline, pink microcline perthite. Much graphic granite appears in the walls and on the dump. The chief mineral constituents are pink graphic granite, potash spar, and white and smoky quartz. Hornblende, biotite, and some white soda spar graphically intergrown with quartz are also present.

Two hundred feet north a prospect trench on the hillside exposes granite pegmatite cutting pink granite gneiss.

Concession VI, Lot 24, North Half (McCormack Mine, North Showing)

The northern granite pegmatite dike on the farm of R. McCormack is located on the north half of lot 24, concession VI, Monteagle township. The workings are in the bush on the side of a hill, 400 feet west of the railway, 1,600 feet south of the concession-road grade crossing.

The granite pegmatite dike has a width of 12 feet, strikes N.40°E., and dips 60°NW. The dip of the dike flattens upwards to 50 degrees. The dike is exposed for a length of 90 feet. The walls of the dike are well defined and sharp, and the wall rock is amphibolite and hybrid granite gneiss that strike N.60°W. and dip 70°N. The pegmatite is composed chiefly of graphic granite, pink potash feldspar, buff soda spar, and quartz. The graphic granite occurs near the walls with coarser 1- to 2-foot crystals of potash feldspar and quartz in the centre of the dike. Some green amazonstone, biotite, hornblende, magnetite, titanite, allanite, and ellsworthite also occur in the dike. The average size of the potash feldspar crystals present in the dike is too small to make the deposit a profitable feldspar operation.

The dike has been opened along strike by a cut, running S.45°W., into the side of the hill. The cut is 60 feet long, 15–20 feet wide, and there is a 50-foot face at the southwest end. The extension of the dike is stripped to the southwest of the main cut for 30 feet, and a small prospect pit has been sunk at the southwest end. The property was worked by P. J. Dwyer in 1926. No production was reported.

A small pit in a field on lot 25, concession VI, ¼ mile southwest of this working exposes pink granite pegmatite, which may be the extension of this dike on strike.

Concession VI, Lot 24, South Half (McCormack Mine, South Showing)

The south showing on the farm of R. McCormack, the south half of lot 24, concession VI, Monteagle township, is located on the side of the hill 400 feet south of the north showing and is 200 feet west of the railway.

The granite pegmatite dike has a width of 10–12 feet and is opened for a length of 180 feet up the hillside. The dike strikes N.35°–40°E. and dips steeply to the north. The minerals present in the dike consist chiefly of pink microcline perthite, graphic granite, quartz, and soda spar. There is very little commercial-grade potash spar over one foot in size present in this dike. Hornblende and pyrite are minor accessories.

The dike was opened up by a cut that rises in several benches up the hillside. The main cut has a length of 145 feet and a width of 10–15 feet. A small prospect pit, 12 by 6 by 6 feet deep, is sunk on the top of the hill 30 feet from the southwest face of the main cut.

This property was opened by Messrs. Dillon and Mills in 1920 and reopened by P. J. Dwyer in 1926. Production of 150 tons is reported.

Concession VI, Lot 25

A small cut has been opened in the side of an outcrop ridge of coarse-grained granite pegmatite on lot 25, concession VI, Monteagle township. The face of the cut is 25 feet long and 8 feet high and strikes N.25°W. The pegmatite is composed chiefly of pink microcline perthite graphically intergrown with quartz. Minor biotite, magnetite hornblende, titanite, and allanite are present.

One contact of this dike with the hornblende syenite wall rock is exposed

near the southeast end of the cut. Here the contact appears to strike N.90°E. and dips 30°N. This occurrence is of little present interest since the feldspar crystals are only 2 feet in diameter and include much graphic granite.

Concession VII, Lot 11 (Thompson Mine)

The Thompson mine is located adjacent to the lot-line road on the farm of R. Thompson, lot 11, concession VII, Monteagle township. The granite pegmatite dike strikes N.60°E. dips 75°N. and can be traced from the road for a distance of over 500 feet to the southwest. The dike has a width of from 20 to 25 feet, but the contacts are irregular, with numerous offshoots. The dike consists predominantly of pink microcline perthite, milky quartz, and white soda spar, with epidote, allanite, pyroxene, hornblende, sericite, chlorite, titanite, and hematite as accessories. The dike appears to be poorly zoned with a core of quartz; an intermediate zone of pink potash spar, white soda spar, and quartz; and a wall zone of graphic granite in which some soda spar is intergrown. The country rock is pink leuco-granite gneiss, amphibolite, limy pyroxenite, and fine-grained, grey hornblende syenite gneiss that strikes N.20°W. and dips 20°–40°E.

The workings consist of three pits. The eastern pit measures 180 feet in length and 20–25 feet in width, with a face of 30 feet at the west end. One hundred and eighty feet to the southwest along strike a second small pit, measuring 30 by 20 by 12 feet deep, was sunk 20 feet west of the barn. This pit exposes the dike, which here consists predominantly of graphic granite. A third pit, 50 feet west of No. 2 pit, measures 80 by 20 by 10–12 feet deep.

This property was worked from 1923 to 1925 and again in 1927 by Feldspar Mines Corporation, a subsidiary of the Pennsylvania Pulverizing Company. Production amounting to 2,715 tons, mostly of second-grade spar, was reported from this property. The proportion of clean, clear potash spar crystals is small; the dike consists largely of graphic granite and offers poor possibilities for further commercial exploitation at the present time.

Concession VII, Lots 18 and 19 (MacDonald Mine)

The MacDonald mine was the largest feldspar operation in the Hybla area and is well known for its interesting assemblage of radioactive minerals.

Location and Access

The main workings of the MacDonald mine are located on lot 18, concession VII, Monteagle township, 2 miles by road east of Hybla station, which is on the Canadian National railway, 10 miles north of Bancroft. Three smaller open cuts are located on lot 19, concession VII, just west of the main workings.

Production History

The MacDonald mine was opened in 1919 by the Pennsylvania Feldspar Company, which leased the feldspar rights from Peter MacDonald. This company and its successors, the Verona Mining Company and the Genesee Feldspar Company, operated the mine until 1928. From 1929 to 1935 some production was reported by Peter MacDonald from the dumps, and from pits on lot 19. The total production reported to the Ontario Department of Mines from this property amounted to 35,048 tons of feldspar.

Workings

The workings are shown on the accompanying map. The main dike strikes west and dips 60°–70°N. The main workings have a length of 550 feet, a maximum width of 70 feet, and a depth of 120 feet. The dike is exposed on the side

of an east-facing hill and was originally developed by an open cut that was driven westward along the dike from the hillside. At the west end of this open cut the dike narrows to 15 feet in width and gradually pinches out. Subsequently, a second open cut was driven westward on the dike at an elevation 40 feet below the original cut. As seen on the accompanying map the portal of this cut was 120 feet east of the portal of the upper cut.

The lower cut was run a distance of 110 feet westward on the dike and then extended 175 feet as an adit. The lower part of the dike was removed by stoping upward from the lower level to break out into the upper open cut, and the two levels are now joined by a large open stope along the central part



View of main workings, MacDonald feldspar mine, Monteagle township, looking east.

of the dike. The vertical elevation of the lip of the cut at the west end of the main workings, above the floor of the lower cut at the portal of the open stope, is 113 feet; thus a large vertical section of this dike is available for examination.

To the northwest and west of the main workings, there are three other small open cuts on parallel granite pegmatite dikes:

Southwest Cut.—A hundred feet west of the main workings a small cut 110 feet long, 25 feet wide, and 20 feet deep, has been opened on a small granite pegmatite dike that cuts the amphibolite, lime metapyroxenite, syenite, and granite gneiss country rocks.

Northeast Cut.—A hundred and fifty feet north of the southwest cut is a shallow cut, 20 by 50 by 8 feet deep, on a small graphic granite pegmatite.

Northwest Cut.—A hundred feet west of the northeast cut, there is a large, water-filled open cut 250 feet long, 40 feet wide, and 25–30 feet deep. This cut opens to the west. The granite pegmatite dike strikes N.70°E. and dips steeply to the north.

Geology

The country rocks in the vicinity of the MacDonald mine consist of highly syenitized and granitized Grenville metasediments, syenite gneiss, granite gneiss, and pegmatite. The Grenville metasediments consist of paragneiss, amphibolite, and crystalline limestone. These original sediments have been intruded and replaced by the late acid plutonic rocks that are represented in this vicinity by the syenite and leuco-granite gneisses. The sediments now consist of feldspathic paragneiss, scapolitic and pyroxenic amphibolite, lime metapyroxenite, silicated limestone, lime silicate skarn, and hybrid granite and syenite gneisses. These are intruded by fine-grained, black lamprophyre dikelets, which may be related in age to the late granite pegmatite.

The late granite pegmatite dikes occupy east-west fractures that cut the country rocks. The main granite pegmatite dike strikes east-west and dips 60°–70°N. The smaller granite pegmatites to the northwest and west strike N.70 E. and dip steeply to the north. The structure of the country rock gneisses in the vicinity of the MacDonald pegmatites is extremely variable, and it is difficult to determine their general trend because of local folding. The granite pegmatites are definitely crosscutting and have sharp though irregular contacts with the country rock. The wall rocks in the immediate vicinity of the granite pegmatite dikes may have been feldspathized to some extent, but the author attributes most of the granitization and metasomatism to an earlier widespread period of acid plutonic activity, which affected the whole region.

Shape.—The main dike is lens-shaped. At its western end it has a width of 5 feet and rapidly widens to the east and with depth, until a maximum width of about 70 feet is reached towards the centre of the workings. At the eastern end in the lower cut the dike is not well exposed but does not appear to exceed about 25 feet in width.

Internal Structure.—The main dike shows a zonal arrangement of internal units. The units usually present include: (1) a fine-grained graphic granite border zone; (2) a wall zone of medium-grained albite-microcline-quartz pegmatite; (3) an intermediate zone of coarsely crystalline quartz and microcline perthite; and (4) a central core and segregated patches of massive quartz, sometimes containing microcline. The coarsely crystalline salmon-pink to white calcite pods that occur within the dike may have formed about the same time as the latest quartz of the core towards the end of pegmatite stage.

General Description.—Entering the mine from the lower or easternmost cut, the north wall is seen to consist of pink leuco-granite gneiss and calcite-amphibole-pyroxene gneiss intruded by pegmatitic stringers. The pegmatite-wall rock contact is exposed, and the border zone of the pegmatite is fine-grained graphic granite pegmatite underlain by a medium-grained quartz-albite-microcline pegmatite with crystals 8–10 inches in size. At the mouth of the stope a good section is exposed on the west wall. Here the gneiss-pegmatite contact is exposed. It is irregular, and pendants of gneiss extend down into the pegmatite. There is a graphic granite pegmatite zone at the contact followed by medium-grained quartz-albite-microcline, quartz-microcline, and massive quartz towards the

south wall near the core of the pegmatite. On entering the stope, pink and white calcite can be seen in the pillar in massive quartz. The open stope has a maximum height of 25 feet from floor to back at a point 30 feet west of the portal. The south wall of the stope consists of coarse-grained quartz and microcline and minor soda spar in crystals 5–6 feet in diameter. The north wall and the back of the stope expose medium-grained granite pegmatite, microcline, quartz, and soda spar, in crystals 1–2 feet in diameter, with some graphically intergrown quartz and soda spar. Some gneiss is exposed at the base of the south wall and in the back 60 feet west of the portal. Radioactive minerals with shatter haloes, and massive sulphides, occur in the granite pegmatite towards the west end of the stope and in the pillars between the stope and the upper open cut.

In the upper open cut the hanging-wall country-rock gneiss is exposed continuously. For 10–15 feet below the contact the pegmatite is medium-grained, and finally coarse-grained in the intermediate and central portions of the dike. In places large pendants of gneiss extend down into the pegmatite. Towards the west end of the upper cut the quartz core is well exposed along the foot of the south wall.

Northeast Cut.—The country rocks exposed along the margins of this pegmatite are grey hornblende-plagioclase-scapolite gneiss, pyroxenic amphibolite, hornblende syenite, granite gneiss, and interbanded earlier granite pegmatite. The pegmatite is composed largely of medium-grained graphic granite, microcline perthite, plagioclase, and quartz. There appears to be too much graphic intergrowth of soda spar and quartz for the deposit to be of commercial interest. The dike is about 15 feet wide at the west end of the cut, where both walls are exposed, and appears to dip to the south.

Northwest Cut.—The wall-rock gneisses are well exposed along the north wall of the cut and consist of scapolitic and pyroxenic amphibolite, silicated limestone, hornblende syenite, granite gneiss, and pegmatite. The dike–wall rock contact is sharp but irregular. Tongues of pegmatite extend into the amphibolite. The granite pegmatite of the dike is younger than most of the granite pegmatite that occurs interbanded with the amphibolite. At the contact there is a 2- to 3-foot wall zone of graphic granite pegmatite, followed by an intermediate zone of coarse microcline and quartz in crystals up to 6 feet in size. Three feet below the contact within the pegmatite there are several large allanite crystals, averaging 12 inches in diameter, surrounded by marked radial shattering.

Southwest Cut.—At its eastern end the granite pegmatite is 4–5 feet wide, strikes east, and dips steeply north. The wall rocks are silicated limestone, skarn, metapyroxenite, scapolitic and pyroxenic amphibolite, hornblende syenite, granite gneiss, and pegmatite. The pegmatite has a fine-grained wall zone, 2–3 feet wide, and an intermediate zone consisting of microcline perthite and quartz in crystals up to 3 feet in size. The cut is water-filled, and the central part of the dike is not exposed.

Mineralogy

The main minerals of the dike are quartz, microcline perthite, and plagioclase. Some of the largest feldspar crystals measure 15 feet across. Quartz masses up to 30 feet occur. The quartz is milky, glassy, or smoky. The plagioclase ranges from 10 to 20 percent anorthite content. Hornblende, pyroxene, biotite, and chlorite occur in the outer zones of the pegmatite. Scapolite is found near the contacts, and abundant dark, red-brown garnet occurs near the walls. Magnetite is the most

common metallic oxide; some ilmenite also occurs. Masses of pyrite and pyrrhotite are present on the dump, and minor amounts of chalcopyrite and molybdenite were reported by Ellsworth.[1]

Titanite and zircon are common. The MacDonald mine is well known for its cyrtolite, a radioactive variety of zircon. The cyrtolite occurs in single crystals or masses of crystals that are up to 1 inch in size and frequently covered with hematite. These crystals show elongated double prisms and shorter pyramidal faces. The cyrtolite often occurs in feldspar or in pink or salmon-coloured calcite, which occurs as pods within the quartz of the dike. Associated with the cyrtolite is the radioactive mineral ellsworthite, a hydrous uranium, calcium, iron titano-tantalo-columbate of the pyrochlore-microlite series. This mineral is waxy yellow-brown to shiny black in colour and commonly occurs in calcite or feldspar. Allanite, in masses up to 1 foot in diameter, also occurs in the dike, and allanite, cyrtolite, and ellsworthite are all frequently surrounded by radial shatter patterns in the adjacent quartz, feldspar, or calcite.

Ellsworth[2] also reports purple fluorite, uranothorite, and galena. Uraninite is reported by P. A. Peach.[3]

In the Northwest Cut on lot 19, concession VII, the granite pegmatite consists of microcline perthite, quartz, and soda spar with allanite, biotite, hornblende, zircon, titanite, magnetite, ilmenite, and pyrite. The allanite crystals along the hanging-wall side of the dike in the wall zone are particularly common. They are up to 2 feet in length and are surrounded by pronounced radial shatter zones.

Concession VII, Lot 21 (Cairns Mine)

The Cairns mine is located at the south end of lot 21, concession VII Monteagle township. The workings are 600 feet west of the lot 20–lot 21 boundary road, 400 feet north of the concession road, in a small woodlot.

The main pit is 50 by 30 feet with a 12-foot face at the west side. It is water-filled but is reported to be 25 feet deep. Hanging-wall amphibolite is exposed on the west wall of the dike, but owing to lack of outcrop in the vicinity, the size and attitude of the dike are difficult to determine. Two other small cuts are located 30 and 40 feet southwest of the main pit and may be on strike of the dike, in which case the strike would be about N.50° E., and the dip to the northwest.

Clean, pink potash microcline perthite crystals, up to 18 inches in size, were noted in exposed parts of the dike. Soda spar and milky and smoky quartz make up the other predominant minerals in the dike. There is some graphic granite and closely intergrown quartz and feldspar aggregates. Titanite, hornblende, pyrite, and magnetite, with occasional crystals of a black vitreous mineral, tentatively identified as ellsworthite, occur in material on the dump.

Spence[4] described the deposit (reported as located on lot 20, concession VII), as follows:

> Opened by Messrs. Dillon and Mills in 1920, and subsequently worked in a small way by the Feldspar Mines Corporation and Mr. P. J. Dwyer. Idle since 1924.
>
> A small pit, 40 by 20 by 25 feet deep, was opened on a 30-foot dyke consisting largely of graphic granite and carrying considerable greenish soda spar, as well as calcite and iron-bearing impurities. Very little clean spar was secured and only 2 cars are reported to have been shipped.

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[1]H. V. Ellsworth, *Rare-element Minerals of Canada*, Geol. Surv. Can., Economic Geol. Series, No. 11, 1932, p. 203.

[2]H. V. Ellsworth, *op. cit.*, pp. 203–9.

[3]P. A. Peach, *Some Pegmatites from Eastern Ontario and Their Geologic Environment*, unpublished thesis for degree of Doctor of Philosophy, University of Toronto, 1950.

[4]Hugh S. Spence, *Feldspar*, Mines Branch, Can. Dept. Mines, No. 731. 1932, p. 47.

Concession VII, Lot 25

On lot 25, concession VII, Monteagle township, there is a small pit measuring 20 by 10 by 6 feet deep on a granite pegmatite dike striking N.60°E. and dipping vertically. The dike is exposed at intervals along strike for a distance of 250 feet. The country rock is pink and grey granite gneiss interbanded with rusty-weathering paragneiss.

The pegmatite consists of massive, coarse-grained, poorly segregated quartz and feldspar. Individual feldspar crystals up to 6 inches in diameter occur, but the dike does not appear to offer commercial possibilities for feldspar production.

Concession VIII, Lot 13 (Taylor Mine)

The Taylor mine is located on the north half of lot 13, concession VIII, Monteagle township, on the farm of David Taylor. The workings are located on the north face of a steep hill, 800 feet northwest of Mr. Taylor's farm gate on the Hybla-Monteagle Valley road.

Here a granite pegmatite, 20 feet wide, is exposed on the cliff face and appears to strike N.60°E. and dip about 50°SE. The pegmatite consists predominantly of pink potash feldspar and quartz in graphic intergrowth, with some pure pink potash microperthite crystals up to 2 feet in size. Some red garnets up to ½ inch in diameter occur near the footwall in the dike. The hanging wall of the dike consists of a limestone mylonite breccia in which there are numerous fragments of pink granite gneiss. The country rock consists of interbanded amphibolite, silicated crystalline limestone, and hybrid syenite and granite gneiss.

A small adit, 8 by 8 feet, was driven southward for 15 feet into the face of the cliff and then turned at S.60°W. for a further 15 feet to follow the dike southwest along strike. This work was done by P. J. Dwyer, and by Consolidated Feldspars, Limited, of Toronto, during 1925 and 1926. One carload is reported to have been shipped. The proportion of graphic granite in this dike is high, and the size and grade of the potash feldspar present does not warrant further development under present conditions.

Concession VIII, Lot 14, South Half (Genesee No. 2 Mine)

The Genesee No. 2 mine is located 200 feet south of the road at the foot of Salmon Trout Lake, on the west face of the ridge that forms the eastern shore of the lake. A flat-lying body of granite pegmatite outcrops on the face of the ridge. This pegmatite is capped by rusty paragneiss, limy amphibolite, and limestone tectonic breccia, all interbanded with pink and buff granite and syenite gneisses. The pegmatite body appears to be a relatively flat-lying pod that extends eastward into the hillside. The pegmatite consists predominantly of pink microcline perthite and quartz, both of which occur in large crystals and masses up to 15 feet in diameter. Some graphic granite is present near the wall-rock contacts. Soda spar, sericite, ellsworthite, and pyrite occur in small amounts.

The workings consist of a large cavern opened in the side of the hill. The portal of the cavern measures 40 feet in width and 25 feet in height. The cavern has been run eastward into the hillside a distance of 110 feet and has a maximum width of 60 feet. The north wall has a length of 150 feet and extends 40 feet westward from the mouth of the workings. Large irregular masses of quartz and pink potash feldspar, free from impurities, form the walls and roof of the workings. Country rock is exposed at one place in the north wall. A considerable

amount of good, grade I potash feldspar is still available in the walls of the working, but the amount of quartz present is large.

This property was opened in 1926 by the Genesee Feldspar Company, and production continued until 1931. In the period from 1948 to 1950 the mine was reopened by D. Vardy and by W. Jessup. Total production amounted to 2,846 tons.

Two hundred and fifty feet northwest of the main working there is a small cut near the top of the ridge. This cut has a length of 30 feet and a face of 10–12 feet, which exposes pink microcline and quartz intergrown in graphic and fine-grained pegmatitic intergrowths. A third small cut is located 350 feet southeast of the main working. A small cut 12 feet long on the side of the hill near its base exposes graphic granite pegmatite. Neither of these small workings show commercial possibilities.



Limestone tectonic breccia near contact of Genesee No. 2 pegmatite, Salmon Trout Lake, Monteagle township.

Concession VIII, Lot 14, North Half

At the north end of lot 14, concession VIII, Monteagle township, there is a small open cut on a granite pegmatite dike. This open cut is located near the top of the north face of a steep hill overlooking Salmon Trout Lake. It measures 30 by 40 feet in diameter and has two steps, of 6 feet, cut into the hillside. The granite pegmatite cuts amphibolite and can be traced for 400 feet to the west along the face of the ridge.

The pegmatite consists of potash feldspar, quartz, and soda spar, with rare allanite. There is too much graphic granite present in the dike for it to be of commercial interest as a feldspar deposit.

Concession VIII, Lot 15 (Bartlett Mine)

No. 1 Showing.—In 1926 P. J. Dwyer prospected a granite pegmatite dike located on the west shore of Salmon Trout Lake near the south end of the lake, on lot 15, concession VIII, Monteagle township. The prospect can be reached

by a trail leading northwest from the road at the south end of the lake; the distance from the road to the pit is 800 feet.

The granite pegmatite dike strikes N.70°E., and its north contact with hornblende granite gneiss–hybrid gneiss–syenite gneiss country rock is exposed at the water's edge on the lake shore. The dike has a width of about 80 feet; its dip is not known. Near the north wall the dike consists of pink graphic granite and closely intergrown feldspar and quartz. Near the centre of the dike pink potash feldspar (microcline perthite) crystals up to 4 feet in diameter can be seen with large masses of milky quartz; many of the large crystals have intergrown laths of quartz throughout. Some hornblende and allanite are present.

Forty feet from the lake shore a pit, 30 feet long, 20 feet wide, and 6 feet deep, has been opened. Other smaller prospect pits are found to the north. The surface exposures have too high a percentage of graphic granite to allow profitable commercial development of this dike. As the dike is located at lake level the quarry site is also unfavourable.

No. 2 Showing.—On lot 15, concession VIII, Monteagle township, a small pit, 10 by 15 by 5 feet deep, has been opened on a granite pegmatite on the crest of a hill south of the road, 1,000 feet east of J. Bartlett's farmhouse. The pit was opened in 1951 by K. Bowser, but no production has been reported. The walls of the dike are not exposed. The pegmatite consists predominantly of graphic granite, with some small quantities of clean, pink potash spar. Exposures of granite pegmatite to the southwest of the pit on the same hill may be on the same dike, in which case its strike would be about N.60 E. The country rock, exposed farther down the hillside, is interbanded hybrid syenite gneiss, granite gneiss, and amphibolite.

Concession VIII, Lot 17 (Woodcox Mine)

The Woodcox mine is located 500 feet south of the road in an open field on the old Woodcox farm on lot 17, concession VIII, near the lot 16–lot 17 boundary, Monteagle township.

The granite pegmatite dike trends N.60°E., with a nearly vertical dip. The open cut on the dike has a length of 330 feet and an average width of 30–35 feet. The cut is filled with water, and very little can be seen of the dike at the present time. Along the south side of the cut, granite pegmatite and the country rock, a pink leuco-granite gneiss, are exposed. This wall-zone pegmatite appears to be composed largely of graphic granite. Along the north side of the cut there are two outcrops of granite pegmatite and one outcrop near the east end, showing the contact of the pegmatite with pink leuco-granite gneiss. A small exposure of pegmatite near the centre of the cut on the north side exposes large 5- to 6-foot crystals of good grade, pink potash feldspar, with very little associated quartz. The material on the dump shows a considerable amount of medium-grained (4- to 6-inch) mottled pink and white potash spar, as well as some graphic granite. Amazonstone, peristerite, hornblende, magnetite, biotite, titanite, pyrite columbite, ellsworthite, allanite, muscovite, calcite, hematite, and epidote were also noted on the dump.

The Woodcox mine was worked from 1921 to 1923 by Feldspar Mines Corporation, a subsidiary of the Pennsylvania Pulverizing Company. Production amounting to 4,087 tons was reported.

The best description of the Woodcox mine is given by H. V. Ellsworth[1] in his report.

The workings are 20 to 30 feet deep and are not everywhere the full width of the dyke. Part of the pit is at present filled with waste rock. This dyke contained a considerable amount of good, coarsely-crystallized, pink microcline with massive white quartz, but some parts were rather "dirty" from the feldspar miners' point of view, containing in abundance minerals such as hornblende, pyroxene, black mica, titanite, pyrite, and hematite, resulting from the decomposition of the pyrite. Some red garnets, dark purple fluorite, and black tourmaline were found. Allanite in crystals an inch long are abundant in some of the fine-grained parts. Many rusty cavities containing either massive red hematite or reddish hematite mud were encountered. The titanite crystals are in places almost completely altered to a yellowish powder. The whole appearance of the dyke is suggestive of considerable alteration by descending waters, which penetrated through fractures caused by the expansion of masses of radioactive minerals.

Nodular masses of brown to black, radioactive minerals, commonly associated with crystals or masses of greyish cyrtolite, and with columbite, were of not unusual occurrence. Such masses in places reached a weight of 100 pounds and they invariably produced marked disintegrative effects on the surrounding quartz and feldspar, the rock within a radius of a yard or two being in some instances completely shattered by fractures radiating from the central mass. The feldspar surrounding the radioactive minerals is unusually red and apparently softened and somewhat altered for a distance of 1 to 3 feet from such a mass, the effect being the greater the nearer the feldspar is to the radioactive minerals. These phenomena (the invariably shattered condition of rock enclosing radioactive minerals and the red coloration of neighbouring feldspar) have been noted in a large number of varied occurrences. The common pegmatite minerals do not apparently produce shattering in quartz and feldspar. For magnitude and intensity of such effects the Woodcox dyke is unique, for nowhere in Canada have such large individual masses of radioactive minerals been found in quartz and feldspar.

Near the middle of the dyke toward the west end, several tons (it is said even carloads) of beautiful amazonstone (a green variety of microcline) were mined and shipped. Since the end of 1923 mining operations have ceased.

Mr. R. H. Thompson, superintendent of the mine, stated that during the summer of 1923 a large mass of calcite was encountered at a point in the bottom of the working near the west end. Work there was stopped and the depression allowed to fill with water, forming a pool several feet deep. Not much of the calcite was removed, but fragments seen on the dump were white to pinkish, very pure, coarsely crystallized, cleavable material resembling that of the MacDonald mine. To the north of the calcite mass is a cavern which perhaps was originally occupied by calcite. An investigation of this calcite mass would be extremely interesting in view of the radioactive mineral content of the MacDonald mine calcite. It may be significant that the radioactive minerals found in this dyke occur in the eastern part, almost none being found in the western half where the calcite is situated. The calcite may, therefore, serve as the storehouse for radioactive minerals in this part of the dyke.

Hatchettolite, cyrtolite, and columbite from this dyke have been described by Walker and Parsons[1] with analyses by E. W. Todd . . .

[1]University of Toronto Studies, No. 16, 1923.

Ellsworth[2] has also described calciosamarskite from this dike.

Concession VIII, Lot 25

A small pit measuring 20 by 10 by 6 feet deep was sunk by P. J. Dwyer on a small granite pegmatite dike on lot 25, concession VIII, near the lot 26 boundary. The dike strikes N.60°E. and dips vertically. The dike is exposed along strike for a distance of 250 feet. It consists of massive, coarse-grained, poorly segregated quartz and pink potash feldspar. Individual feldspar crystals do not exceed 6 inches in diameter. The country rock is pink and grey, hybrid granite gneiss.

Concession IX, Lot 30, South Half (Hickey Mine)

The Hickey mine is located on the northwest flank of a small hill, 3/8 mile east of highway No. 62. It is easily reached by following the concession-line road east from the highway.

[1]H. V. Ellsworth, *Rare-element Minerals of Canada*, Geol. Surv. Can., Economic Geol. Series, No. 11, 1932, p. 209.

[2]H. V. Ellsworth, *op. cit.* p. 203.

The granite pegmatite dike has a width of 15–20 feet, strikes N.40°–60°E. and dips 40°N. The dike is exposed over a length of 130 feet on the side of the hill. The country rock, consisting of interbanded pink granite gneiss, hybrid granite gneiss, and amphibolite, strikes N.10°E. and dips 20°E. Pink microcline microperthite, quartz, and graphic granite are the chief constituents of the dike. The potash feldspar occurs in clean crystals up to 5 feet in diameter, but most of these average 2 feet. Large 2- to 5-foot patches of milky to smoky quartz are abundant. Along the footwall in the upper part of the dike, quartz and microcline perthite form an intimate graphic mixture in a 6- to 8-foot wide zone. Good potash spar is confined to a narrow zone in the centre and hanging-wall side of the dike. Outside of quartz and graphic granite there are few impurities. Chlorite and vugs containing hematite occur in places. Some chloritization and epidotization extend into the wall rock from the dike.

The workings consist of an open cut, 80 feet long by 20–30 feet wide, running northeastward into the hillside. There is a 40-foot face on the east end of the dike. On top of the hill above the working face there is an area of stripping, 80 by 50 feet. A small pit, 12 by 15 by 4 feet deep, was opened 40 feet from the rim of the main cut. The graphic intergrowths of potash spar and quartz are well exposed on the glaciated surface at the top of the hill. The proportion of large crystals of pure potash spar exposed in the dike is small.

The mine was opened and operated in 1949 by W. Jessup of Bancroft. A total of 166 tons of feldspar was produced.

Garnet

MONTEAGLE TOWNSHIP

Concession V, Lots 3 and 4 (Quirk Deposit)

The garnet showing staked by J. Quirk on lots 3 and 4, concession V, Monteagle township, is described by V. L. Eardley-Wilmot[1] as follows:

> About 9 miles north of Bancroft a deposit about 40 feet wide, of dark, brick-red, fairly clear, massive or cryptocrystalline garnets of the andradite variety, occurs in granite gneiss. The garnet is much broken up and has quartz, hornblende, and feldspar freely scattered throughout it. The ridge in places has the appearance of solid garnet, but close examination shows it to be composed of masses of minute, clear red garnet crystals with the above minerals sprinkled throughout.
>
> The garnets would not be suitable for abrasive coated papers but could be used for glass grinding.

Frequently associated with the nepheline syenite gneisses in the Bancroft area there is a diopside-garnet-scapolite skarn that is a contact metamorphic deposit formed by the nepheline syenite intrusion. It forms part of the alkaline gneiss sequence. The garnet examined by the writer from the Quirk deposit is of this type, an orange-brown, massive garnet associated with pyroxene and scapolite. It forms part of the alkaline gneisses of the Goddard Lake area, and in prospecting for other garnet deposits of this type, the contacts of the nepheline gneiss bands should be carefully examined.

Graphite

The mineral graphite is a soft, black, crystalline form of carbon, which occurs in rocks as disseminated flakes, amorphous bands or veins, or foliated mixtures of amorphous lump and flake graphite. In the Monteagle-Carlow area the graphite deposits are of the flake variety, the flake occurring disseminated

[1]V. L. Eardley-Wilmot, "Garnet," *Abrasives*, Mines Branch, Can. Dept. Mines, No. 677, 1927, pt. III, p. 13.

through paragneiss and crystalline limestone. Flake graphite has perfect basal cleavage, a metallic lustre, and a grey to black streak. It is extremely soft, having a hardness of 1–2 depending on impurities. Graphite is resistant to acids and heat and is a good conductor of heat and electricity.

Graphite is used in lubricants, paints, lead pencils, foundry facings, dynamo brushes, electrodes, dry batteries, crucibles, and numerous other articles. The carbon content, percentage and characteristics of associated impurities, and the size and toughness of the flake, are important qualities to test in examining a graphite ore. Graphite of ore grade should have at least 7–10 percent recoverable graphite, with a high proportion of flake.

MONTEAGLE TOWNSHIP

Concession V, Lot 16

There is a small showing of graphite on lot 16, concession V, Monteagle township, just north of a small lake on the south half of the lot. Flake graphite up to ¼ inch occurs in crystalline limestone that is intruded by granite gneiss and pegmatite. There is one small test pit. A grab sample of graphitic limestone, taken by J. E. Thomson, ran 1.97 percent graphite.[1]

Concession XIII, Lot 23 (Tonkin-Dupont Mine)

Concession XIII, Lot 24 (National Graphite Mine)

The Tonkin-Dupont Graphite Company of New York began mining on lot 23, concession XIII, Monteagle township, in 1912. The property is situated ½ mile east of Graphite station on the Canadian National railway. In 1913 this company produced 198 tons of refined graphite, valued at $19,800, and, in 1914, 240 tons, valued at $28,800, from their graphite mill located at Wilberforce. The bulk of the ore treated at the Wilberforce mill during these years came from the Monteagle township deposit.

In 1915 the National Graphite Company opened a mine on lot 24 on the continuation of the Tonkin-Dupont orebody and shipped 2,000 tons of ore to a mill at Mumford station, Haliburton county. From this ore, 44½ tons of graphite, value at $6,611.84, was recovered. In 1916, 6,300 tons of ore was shipped, and 310 tons of graphite, valued at $50,840, was produced.

These properties have been inactive since 1917. In 1942 S. H. Law of Toronto held the mineral rights on both properties, and some investigations were carried out. In 1952 S. H. Law and Mackenzie Red Lake Gold Mines did 1,100 feet of diamond-drilling on these properties, and in 1953 the main workings on lot 24 were dewatered and sampled.

The graphite flake occurs in crystalline limestone, associated with silicated limestone, green metapyroxenite, rusty paragneiss, amphibolite, granite gneiss, and pegmatite. The graphite occurs in flakes ranging from 1/16 to ¼ inch in size. The best ore sections run 15–20 percent graphite. The grade was reported as about 7 percent by Spence.[2] Phlogopite and molybdenite occur with the graphite. Diopside, epidote, tremolite, scapolite, garnet, magnetite, pyrrhotite, titanite, and apatite occur in the lime silicate skarn.

[1] Jas. E. Thomson, *Mineral Occurrences in the North Hastings Area*, Ont. Dept. Mines, Vol. LII, 1943, pt. 2, p. 35.

[2] Hugh S. Spence, *Graphite*, Mines Branch, Can. Dept. Mines, No. 511, 1920, p. 26.

The location of workings and diamond-drill holes are shown on the accompanying map. On lot 23 there are four pits. Pit *A*, located southeast of the barn, is 80 by 40 by 25 feet deep. The graphite occurs in crystalline limestone in flakes up to 3/16 inch in diameter. Rusty paragneiss occurs interbedded with the crystalline limestone. The rocks strike N.45°W. and dip 80°SW. A chip sample, taken across 13.5 feet on the north side of the pit by J. E. Thomson,[1] assayed 12.6 percent graphite. There is some phlogopite with the graphite.

Pit *B*, located just northwest of the barn, is 120 feet long, 35 feet wide, and 10 feet deep to water level. The northeast wall is crystalline limestone with graphite flakes up to 1/8 inch in size. The southwest wall of the pit is rusty paragneiss and amphibolite. The rocks strike N.65°W. and dip 35°SW. A chip sample across a 16-foot width of graphitic crystalline limestone taken by J. E. Thomson contained 10.37 percent graphite.[2]

Pit *C*, located 300 feet northwest of the farmhouse, is 30 by 40 by 15 feet deep. The rocks exposed are silicated crystalline limestone, rusty paragneiss, and amphibolite. The main pit on the Tonkin-Dupont property is Pit *D*, an open cut 200 feet long and 15–40 feet wide trending N.75°W. parallel to the strike of the limestone and paragneiss. The formations dip about 35°SW., and the open cut follows the formation down dip. Spence[3] reports that this pit has a depth of 75 feet. The rocks exposed are silicated crystalline limestone containing phlogopite and graphite, rusty paragneiss, and amphibolite and grey granular diopside rock.

There are four pits on lot 24 on the former National Graphite property. Pit *E*, which is the main pit on the property, is 60 by 30 feet at the surface. The pit was dewatered in 1953 and consists of a large open stope, 150 feet deep, dipping about 70°W. At the 150-foot level the opening is 150 feet long in a northwesterly direction and 20–40 feet wide. There are two benches at the northwest end of the stope. The rocks exposed consist of graphitic crystalline limestone, lime metapyroxenite, rusty paragneiss and amphibolite, and some granite pegmatite. Within the stope there is considerable folding, and the bedding is not well marked. The width of the graphite-bearing horizon that was mined is difficult to determine since it is not well exposed in the walls. Some graphite ore occurs on the southwest wall.

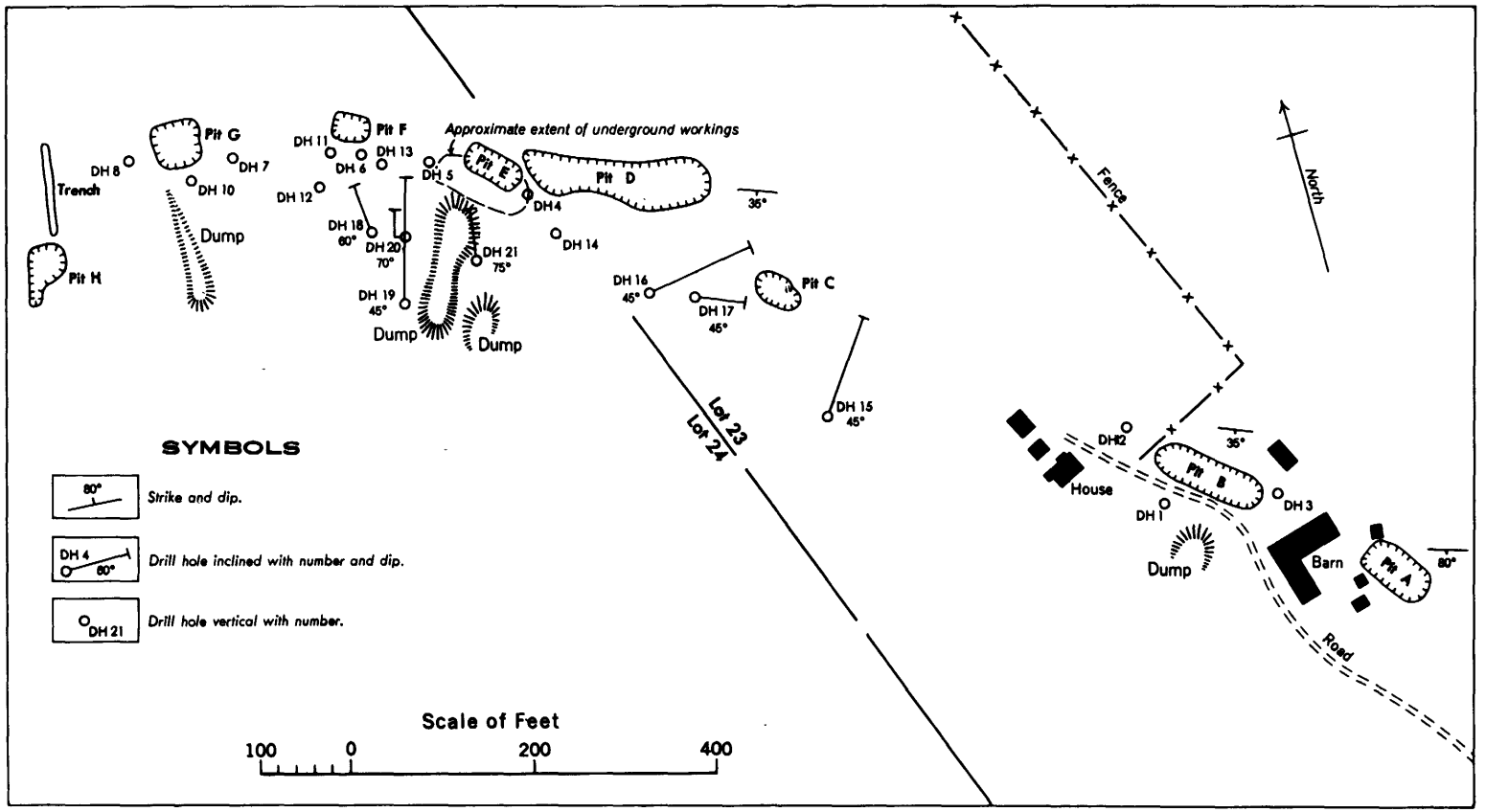
Pit *F*, measuring 20 by 30 by 20 feet deep, exposes interbedded crystalline limestone, silicated limestone, lime silicate rock, and paragneiss. Pit *G* measures 40 by 40 feet and is about 10 feet deep. The rocks exposed are rusty paragneiss, metapyroxenite, and silicated limestone. A little graphite occurs in pits *F* and *G*. Pit *H* is a stripping 20 by 30 by 7 feet deep. No graphite was observed.

The best graphite section cut in diamond-drilling was in hole No. 13 where an ore intersection between 89 and 105 feet was estimated by the writer to run 15–20 percent, 1/8–1/4 inch, graphite flake. Other narrower sections were cut in other holes, and at least two graphite-bearing horizons are indicated. Further drilling is necessary before a clear picture of the structure and the possibilities of the deposit can be known.

Concession XIV, Lots 13 and 14

A 10-foot wide graphite-bearing band of paragneiss is exposed on these lots on the property of Sam Robinson of Greenview. The graphite zone is exposed on the hillside just east of the road. The paragneiss strikes N.40°W. and dips

[1] J. E. Thomson, *op. cit.* p. 36.
[2] *Ibid.*
[3] H. S. Spence, *op. cit.*, p. 28.



Sketch Map of the Tonkin-Dupont and National Graphite Workings, Monteagle Township

25°NE. It is underlain by crystalline limestone. The graphite zone can be traced for over 300 feet on surface and is best exposed in a small open cut 12 by 8 feet in the side of the hill. The graphite occurs in flakes up to $\frac{3}{8}$ inches in diameter, averaging $\frac{1}{8}$ inch. The adjacent paragneisses to the east carry disseminated graphite flakes over a width of 40 feet. An analysis of a channel sample, taken by J. E. Thomson[1] across the 10-foot width of the graphite zone exposed in the pit, indicated 2.97 percent graphite. The graphite is in a medium-grained quartzo-feldspathic paragneiss that weathers to a rusty-brown colour.

CARLOW TOWNSHIP

Concession VIII, Lot 10

The graphite prospect pit on lot 10, concession VIII, Carlow township, is located 1,200 feet north-northwest of a small cabin on the southwest shore of McWhirter (Stoney) Lake. The prospect pit is on the west side near the top of the hill just west of the lake. The pit measures 12 by 15 feet and is 6 feet deep down to water level.

The rocks exposed in the pit are interbanded amphibolite and crystalline limestone cut by granite pegmatite. The crystalline limestone is pure, containing a few scattered flakes of phlogopite and no graphite. Graphite, in fine flakes up to $\frac{1}{8}$ inch in diameter and in fine seams, lenses, and patches, occurs disseminated in the amphibolite. Some samples from the dump contain considerable fine graphite; material exposed in the pit is of poor quality and grade.

Iron

The Boulter gabbro, described earlier, occupies the central part of Carlow township, in the vicinity of Boulter post office. This gabbro stands out as a prominent magnetic anomaly of 5,000–6,000 gamma intensity on the Bancroft aeromagnetic sheet. Diorite, syenite, and pegmatite are associated with the gabbro. There are several small occurrences of magnetite in gabbro, syenite, and adjacent metasediments. These magnetite bodies are probably differentiates of the Boulter gabbro.

Two small showings of magnetite are located on lots 17, concessions V and VI, Carlow township. Lindeman and Bolton mapped part of lots 16, 17, and 18, concessions V and VI, Carlow township, and geological and magnetic maps of the area are published in their report.[2]

In 1949 and 1950 a magnetic survey of part of the Boulter gabbro mass was carried out by Louis Moyd of Bancroft. In 1950, 8 drill holes totalling 1,012 feet, were drilled on lot 21, concession VI, and lot 17, concessions V and VI, Carlow township.

CARLOW TOWNSHIP

Concession V, Lot 17

On the north end of lot 17, concession V, Carlow township, on the farm of Alexander Hamilton, a magnetic anomaly was reported by Lindeman and Bolton.[3] Outcrops are scarce and consist of crystalline limestone, paragneiss

[1] J. E. Thomson, *op. cit.*, p. 37.
[2] E. Lindeman and L. L. Bolton, *Iron Ore Occurrences in Canada*, Mines Branch, Can. Dept. Mines, No. 217, 1917 (maps Nos. 193, 193A).
[3] E. Lindeman and L. L. Bolton, *op. cit.*, map No. 193.

and syenite. In 1950 the anomaly was drilled. One hole, located 393 feet south and 442 feet west of the northeast corner of lot 17, concession V, was drilled south at a dip of 45° for 80.3 feet. A summary of the log follows:[1]

LOG OF DRILL HOLE, LOT 17, CONCESSION V, CARLOW TOWNSHIP

	Footage
Overburden	0.0–10.0
Green amphibolite	10.0–10.3
Magnetite disseminated in amphibolite (35.6 percent iron)	10.3–13.4
Pink syenite, grey gneiss, and amphibolite, some magnetite	13.4–27.7
Magnetite ore in grey gneiss and amphibolite (42.8 percent iron)	27.7–32.2
Amphibolite, grey gneiss and syenite mineralized with magnetite and pyrrhotite	32.2–48.0
Magnetite ore in amphibolite (31.9 percent iron)	48.0–50.0
Grey gneiss and amphibolite	50.0–56.0
Magnetite ore in green amphibolite (46.6 percent iron)	56.0–63.1
Grey to pink syenite	63.1–80.3

Concession VI, Lot 17

On the north end of lot 17, concession VI, there is a magnetite showing on the farm of Angus McDiarmid. The property was examined by Lindeman and Bolton[2] and by J. E. Thomson.[3]

Magnetite occurs disseminated in a rusty pyroxene amphibolite that is interbanded with hornblende syenite. These rocks strike N.30°W. Gabbro and hornblendite cut the amphibolite, and a later tourmaline granite pegmatite cuts all these rocks. The magnetite-bearing zone is exposed on a stripping 180 feet long and 20–30 feet wide. The magnetite ore zone trends N.30°W. conformable with the bedding of the amphibolite. Two partial analyses of the iron ore are given in the accompanying table:

PARTIAL ANALYSES OF IRON ORE, LOT 17, CONCESSION VI, CARLOW TOWNSHIP

	No. 1	No. 2
	percent	percent
Iron	43.70	44.22
Silica	.....	10.77
Sulphur	0.02	0.11
Phosphorus	0.12	.....
Phosphorus pentoxide	.....	0.27
Titanium oxide	.....	2.88
Vanadium	.....	trace
Insoluble	10.50	.....

Analysis No. 1.—Average sample across ore zone taken by Lindeman and Bolton.[4]
Analysis No. 2.—A chip sample across 36 feet at the main exposure taken by J. E. Thomson.[5] Analysis by the Provincial Assay Office, Toronto.

A magnetic survey by Lindeman and Bolton indicated a length of 360 feet for the magnetite body. Two other small anomalies were picked up 850 feet southwest of the main showing.

In 1950 one diamond-drill hole was put down 81.1 feet on the main showing. The hole trends S.69°W. and dips 45°. A summary of the log follows:[6]

[1]Louis Moyd, private report, 1950.
[2]E. Lindeman and L. L. Bolton, *op. cit.*, p. 114 and maps Nos. 193, 193A.
[3]J. E. Thomson, *op. cit.*, p. 38.
[4]E. Lindeman and L. L. Bolton, *op. cit.*
[5]J. E. Thomson, *op. cit.*
[6]Louis Moyd, private report, 1950.

Log of Drill Hole, Lot 17, Concession VI, Carlow Township

	Footage
Overburden	0.0–10.4
Pink syenite	10.4–29.1
Amphibolite cut by pink syenite	29.1–40.9
Magnetite ore zone (19.2 feet averaging 37.95 percent iron) consists of pink syenite with magnetite, amphibolite, magnetite in amphibolite, syenite with magnetite, magnetite and pyrrhotite in amphibolite	40.9–60.1
Amphibolite	60.1–66.7
Grey syenite	66.7–74.0
Amphibolite and paragneiss cut by grey syenite	74.0–81.1

Concession VI, Lot 21, South Half

Several small magnetic anomalies were outlined on the south half of lot 21, concession VI, Carlow township, by Louis Moyd in the fall of 1949. Six diamond-drill holes, totalling 850 feet, were drilled on this lot in 1950. These diamond-drill holes cut gabbro, diorite, and pyroxenite with minor accessory magnetite. No concentrations of magnetite were found. One sample of gabbro from No. 1 drill hole was found by Mr. Moyd to consist of 45 percent bytownite plagioclase, 30 percent augite, 10 percent magnetite, 8 percent biotite, and 7 percent secondary hornblende after pyroxene.

Lead

MONTEAGLE TOWNSHIP

Concession II, Lot 21

A few pounds of massive galena were taken from a prospect pit on the farm of John Hawley, lot 21, concession II, Monteagle township. The occurrence is in a calcite vein in lime metapyroxenite. It is of no commercial interest.

Mica

Some phlogopite mica occurs associated with calcite, pyroxene, and scapolite in lime metapyroxenite skarn deposits in Carlow and Monteagle townships. There has been a small production from two properties.

To be of commercial interest mica should occur in books at least 6 inches in diameter and be free from flaws, reeves, checks, wedging, and inclusions. The mica should be free-splitting.

MONTEAGLE AND CARLOW TOWNSHIPS

Concession IX, Lot 1, Monteagle Township

Concession IX, Lot 1, Carlow Township

Phlogopite mica occurs in a basic pyroxenite pegmatite interbanded with leuco-granite gneiss on the northern halves of these two lots. The dike is ¼ mile northeast of Peter Freymond's farm. The dike rock is a coarse-grained scapolite pyroxenite, containing red and green apatite crystals up to 4 inches across, and phlogopite crystals up to 1 foot across, as well as feldspar, calcite, and titanite. The contacts of the pyroxenite are extremely irregular, and the pyroxenite appears to form a conformable band in the leuco-granite gneiss sequence. The band strikes north at the south end, swings northeastward at its north end, and can be traced for ¼ mile, with phlogopite mica occurring irregularly throughout its length. The band dips to the east.

The phlogopite crystals, although of good size, are commonly checked, bent, and corrugated, and it is difficult to find any good-quality sheet mica.

One cut in the side of a hill on lot 1, concession IX, Carlow township, has a face 50 feet long and 15 feet high. There is a large dump, and the property is reported to have been worked in the 1920's. In 1952 some work was done on the property by Harvey Krier.

Concession XI, Lot 1, Monteagle Township

Concession XI, Lot 1, Carlow Township

Four small mica pits ranging, in size from 10 by 10 by 6 feet deep to 3 by 2 by 2 feet deep, have been opened up in a scapolite pyroxenite outcropping in a field ⅓ mile south of the Monteagle Valley–New Carlow road. These workings are reported to have been opened by Max Miller in the 1920's.

Phlogopite mica, in books up to 6 inches in diameter, occurs in scapolite stringers cutting the scapolite pyroxenite, a massive, coarse-grained rock consisting of dark-green pyroxene and white scapolite. Titanite, in crystals up to 1 inch in size, calcite, apatite, stilbite, and chabazite, often in well formed crystals, occur in irregular veinlets and patches in the pyroxenite. The phlogopite is of poor quality, being checked, corrugated, and bent. The pyroxenite rock occurs interbanded with leuco-granite gneiss and amphibolite. These country rocks strike at N.20°E. and dip 45°S.

MONTEAGLE TOWNSHIP

Concession II, Lot 18

Sidney Orser is reported to have mined mica on lot 18, concession II, Monteagle township, south of the road just west of Musclow post office. The property is owned by Freeman Hawley. An open cut, 75 feet long and 10 feet deep, is opened in green metapyroxenite that occurs with leuco-granite gneiss and pegmatite. Books of phlogopite, up to 4 inches in size, occur in pyroxenite. Twelve and one-half tons of cobbed mica and 40 tons of scrap were shipped in 1924.[1]

Concession IX, Lot 22

A few books of phlogopite mica, up to 4 inches in size, occur in lime metapyroxenite in a small pit near the farm buildings on lot 22, concession IX.

CARLOW TOWNSHIP

Concession XIV, Lots 1 and 2

There is a small occurrence of phlogopite mica on the Armstrong farm, lots 1 and 2, concession XIV, Carlow township. Books of phlogopite up to 6 inches in size occur in scapolite metapyroxenite on the side of a north-facing hill about ½ mile south of the New Carlow road.

Nepheline

The mineral nepheline, $NaAlSiO_4$, is the characterizing feldspathoid of the nepheline gneiss group found in Carlow and Monteagle townships. Nepheline syenite is being mined at Blue Mountain, in Methuen township, Peterborough county, by American Nepheline, Limited, as a ceramic raw material for the glass and ceramic industries. In the glass batch it is used as a source of alumina and alkalis. It replaces feldspar in some ceramic bodies, glazes, and enamels.

[1]W. R. Rogers and A. C. Young, *Statistical Review of Ontario's Mineral Industry in 1924*, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 1, p. 165.

To be of interest commercially, nepheline syenite deposits should be low in ferromagnesian minerals. The rock is crushed, and a separation of the ferromagnesian minerals, usually biotite, hornblende, and magnetite, is made. The marketed product consists of nepheline, plagioclase, and microcline. For use in the glass and ceramic trades the iron content should be less than 0.07 percent. Nepheline syenite now being produced in Canada has an alumina content of 24 percent.

The nepheline gneisses are also of commercial interest because of their corundum content, and the spatial and genetic association of the corundum syenites with the nepheline rocks.

A general description of the nepheline rocks is given in the section on general geology. Individual occurrences are described below.

MONTEAGLE TOWNSHIP

Concession I, Lots 11–13, and Concession II, Lots 8–11

(Bresnahan Lake Nepheline Gneiss)

East of Bresnahan Lake, on lots 8, 9, 10, and 11, concession II, Monteagle township, there is a 30-foot band of grey, nepheline-poor plagioclase gneiss that strikes N.65°–75°E. and dips 35°–60°S. The nepheline-plagioclase gneiss is interbanded with and grades into pink and buff syenites. All these rocks are cut by granite pegmatite dikes and stringers. The nepheline-plagioclase gneisses sometimes contain up to 25 percent hornblende and biotite. At the east end of the band the nepheline content is higher, sometimes reaching 50 percent. The gneissosity is strongly developed.

This band of nepheline gneiss extends westward south of Bresnahan Lake and then swings southward to the Welsh corundum mine on lot 13, concession I, Monteagle township. The band is too narrow, discontinuous, and of too low a grade to be of commercial interest.

Concession II, Lots 2 and 3 (Monteagle Minerals, Limited)

In 1906 the Canada Corundum Company began exploratory stripping and trenching on a corundum prospect on lots 2 and 3, concession II, Monteagle township. The deposit consists of a 100-foot band of nepheline-scapolite-corundum gneiss, which forms a north-south ridge on the east bank of the York River, 1 mile north of the township boundary. The nepheline gneiss band strikes north-south, dips 70°E., and occurs in a sequence of limestone, amphibolite, and paragneiss. This band has been traced for a distance of 3,000 feet north of the river. The deposit is accessible by boat from Reber's Landing.

In 1906 a considerable amount of trenching and stripping was done, and a bulk sample taken. In 1915 some diamond-drilling is reported to have been done.[1]

In 1947 investigation of the deposit was begun by Louis Moyd for the American Abrasive Company. A systematic program of trenching and sampling was carried out, and a bulk sample of 5 tons was taken for testing. The property was optioned to Ortona Gold Mines, Limited, in 1950, and further trenching and 1,925 feet of diamond-drilling carried out. Further surface work and bulk sampling followed, and detailed mill tests were run at the Bureau of Mines in Ottawa during 1951, 1952, and 1953. This latter program aimed at producing a ceramic raw material together with by-products of corundum and mica.

[1]Louis Moyd, private report, November, 1948.

The main deposit consists of a ridge, 1,200 feet long and up to 70 feet in height, that extends north from the river. The rock is well exposed in six trenches that cross the ridge at right angles to the north-south strike of the gneiss. The main rock type exposed on the ridge is muscovite-biotite-nepheline-scapolite-plagioclase-corundum gneiss. The rock is medium to coarse in grain size; on weathered surfaces the rock is grey in colour; and on fresh surfaces the rock is a greasy yellow-grey due to its content of nepheline and scapolite. After exposure to the sunlight the scapolite on the freshly broken surfaces turns deep blue. The corundum is present in bands in the nepheline gneiss and, in places, averages 5 percent. It occurs in fine-grained aggregates of grey crystals that stand up in prominent knobs on the weathered surface of the rock.

Garnet-hornblende-nepheline-scapolite gneiss occurs interbanded with nepheline-biotite-plagioclase gneiss and nepheline-scapolite gneiss. The garnet-hornblende facies is common at the west end of a trench (No. 1650). Amphibolite and crystalline limestone also occur in places interbanded with the nepheline gneiss. The footwall is amphibolite and crystalline limestone. The hanging wall is nepheline-poor plagioclase gneiss, syenite gneiss, and amphibolite. Diamond-drill sections supplied by Louis Moyd indicate that the main nepheline gneiss band is divided into two parts by a narrow band of amphibolite. Nepheline-hornblende-plagioclase gneiss appears to be more common on the second ridge to the north of the river where some trenching has also been done.

A mineralogic analysis of a sample from this deposit was reported by Louis Moyd[1] as follows:

	Percent
Andesine	40
Nepheline	15
Potash feldspar	10
Scapolite	10
Muscovite	10
Biotite	10
Corundum	5
Spinel	trace

A milling test of bulk samples from the property indicate that a satisfactory nepheline-plagioclase-scapolite product can be recovered by flotation, with by-products of corundum and muscovite.

Concession IV, Lots 3, and Concession III, Lots 4, 5 and 6 (Goddard Lake Nepheline Gneiss)

The Goddard Lake nepheline-gneiss band, striking N.25°E. and dipping 60°E.–70°E., extends from the west shore of Goddard Lake on lot 3, concession IV, Monteagle township, in a southwesterly direction for 1 mile, through lots 4, 5, and 6, concession III.

Nepheline-plagioclase gneisses, averaging 30 percent nepheline, occur interbanded with nepheline-poor plagioclase gneiss, nepheline-hornblende-plagioclase gneiss (up to 30 percent hornblende), nepheline-biotite-plagioclase gneiss, pink and buff leuco-syenite gneiss, and some narrow lenses of amphibolite. Magnetite is a common accessory, sometimes making up as much as 10 percent of the rock. Small patches of nepheline pegmatite with nepheline crystals, 4–6 inches in diameter, also occur in the syenite sequence. The nepheline gneisses are invaded and replaced by pink and buff leuco-syenites. Some granite pegmatites intrude the syenites.

At the north end the nepheline band has a width of 400 feet. At the south end a second band, about 50 feet wide, occurs 400 feet west of the main band.

[1]Louis Moyd, private report, November, 1948.

CARLOW TOWNSHIP

Concessions VI and VII, Lots 4 and 5

Three outcrop areas of nepheline-plagioclase gneiss were examined on the east side of the York River on lots 4 and 5, concessions VI and VII, Carlow township. Nepheline-plagioclase gneiss occurs interbanded with nepheline-poor plagioclase gneiss, pink leuco-syenite, and syenite pegmatite. Stringers of nepheline pegmatite cut the nepheline gneisses. The nepheline-plagioclase rock is a medium-grained gneiss consisting of up to 50 percent nepheline, plus plagioclase and accessory magnetite, muscovite, and biotite. The gneissosity is not well developed. The rocks strike north and dip steeply east.

Concession X, Lots 12 and 13

On the north bank of the York River there is an outcrop of nepheline gneiss consisting of an interlocking aggregate of nepheline and albite, with some hornblende, biotite, and magnetite. The gneiss strikes N.50°E. and dips 30°E. On the south side of the river there is a long band of nepheline-plagioclase gneiss exposed across lots 12 and 13. The main rock types present in the band are nepheline-plagioclase gneiss averaging 20 percent nepheline, 75 percent plagioclase, and 5 percent biotite and magnetite; and nepheline-poor alkaline gneiss consisting of over 90 percent plagioclase. The rock is very similar to the Bresnahan Lake nepheline gneiss of Monteagle township.

Concession X, Lot 23

A small area of outcrop of melanocratic nepheline-pyroxene gneiss occurs on lot 23, concession X, Carlow township, 250 feet northeast of the York River, and 600 feet south of the wagon road shown on the map. The rock is composed predominantly of nepheline and pyroxene; the nepheline content ranges from 30 to 40 percent. The structure of the rock is slightly gneissic, but the nepheline rock is quite uniform in composition throughout the exposures.

Concession X, Lot 26

On the north bank of the York River at Dan Prentice's cabins on lot 26, concession X, Carlow township, there is a small outcrop of nepheline gneiss and crystalline limestone. Nepheline-scapolite-garnet-hornblende gneiss occurs interbanded with crystalline limestone and paragneiss. All these rocks appear to have been contorted and sheared.

Concession XIV, Lot 18 (Logan Cuts)

As described under *Corundum*, on page 33, there are narrow bands of nepheline-corundum-plagioclase gneiss exposed in the Logan corundum cuts.

Concession XVI, Lots 7 and 8

North of Hoover Lake on lots 7 and 8, concession XVI, Carlow township, a two-foot nepheline-corundum band occurs as a relict in pink corundum syenite gneiss. This occurrence is described under *Corundum* on page 36.

Concession XVI, Lot 28

A narrow nepheline-biotite-scapolite gneiss band, 6 feet wide, occurs on a low bluff on the east shore of a small pond on lot 28, concession XVI, Carlow township. The band strikes north, dips flatly to the east, and can be traced for a length of 400 feet. The nepheline gneiss is interbanded with crystalline limestone and paragneiss. The nepheline content ranges from 0 to 50 percent and averages about 5 percent. The occurrence is of no commercial interest.

Rare Element and Radioactive Minerals

The presence of rare element and radioactive minerals in the Bancroft area has been known for many years. The MacDonald feldspar mine in Monteagle township is one of the best known early radioactive mineral localities in Canada, being famous as the locality where ellsworthite was first described. Since 1948, when uranium prospecting began in earnest, and in particular since 1953, when Centre Lake Uranium Mines, Limited, began underground development, there has been great interest in the Bancroft area as a prospecting ground for uranium deposits. Encouraging results were obtained on several properties in the Bancroft area, and underground exploration was carried on in 1953 and 1954 on the Centre Lake, Croft, and Cardiff Uranium properties in Cardiff township and the Faraday Uranium property in Faraday township. Although interest has centred in these townships, considerable prospecting and staking has been carried out in Monteagle township, which lies just northeast of Bancroft. Most of the radioactive deposits so far reported in Monteagle township occur in segregated granite pegmatites and, as such, do not offer good possibilities as uranium prospects. However, a few deposits of the non-segregated, replacement type are known, and parts of both Monteagle and Carlow townships are good prospecting areas for uranium mineralization.

TYPES OF RADIOACTIVE MINERAL DEPOSITS

Lithologically, the radioactive mineral deposits of the Bancroft area can be divided into the following types:

I. Pegmatite Deposits

A) Segregated (zoned) granite pegmatites
B) Non-segregated granite and syenite pegmatite dikes
or non-segregated pegmatitic granite and syenite dikes
1) Leucocratic type (e.g. Dyno, Faraday)[1]
2) Mafic type (e.g. Centre Lake, Croft)[1]

II. Metasomatic Deposits

A) Limestone (e.g. Homer Yellowknife, Normingo)[1]
B) Metapyroxenite (e.g. McLean-Hogan)[1]
C) Syenite and granite (e.g. Fission east showing)[1]

III. Vein Deposits

A) Calcite - fluorite - apatite veins (e.g. Cardiff Uranium)[1]

These types of deposits may overlap; for example, the calcite-fluorite-apatite vein deposits often have zones of metasomatic alteration adjacent to the vein fissures. Metasomatic alteration also plays an important part in some of the non-segregated pegmatitic granite and syenite dikes, as for example at Centre Lake Uranium Mines, Limited.

Characteristics and diagnostic features of the various types of deposits follow:

I. Pegmatite Deposits

A) Segregated Zoned Type

a) Giant crystallization: large size of individual minerals.
b) Segregation of chemical constituents into pure minerals, in contrast with

[1] Properties quoted here as examples are located outside the area covered by this report. For descriptions of these properties see: J. Satterly and D. F. Hewitt, *Some Radioactive Mineral Occurrences in the Bancroft Area*, Ont. Dept. Mines, Geol. Circ. No. 2, 1955.

non-segregated dikes in which mineral intergrowths and replacement textures are common.

c) Zoning of the dike into lithologic units from wall to core.

d) Absence of replacement: no clots or segregations of partially digested or reconstituted mafic minerals within the dike; no migmatites within the dike.

e) The dike is fissure-filling, usually with sharp walls; inclusions and horses of country rock have definite boundaries.

f) Shape is generally lenticular, pod-shaped, or branching.

g) Uranium occurs as complex oxides of rare earths, titanium, columbium and tantalum, and rarely, as uraninite.

h) Uranium minerals are usually confined to certain definite lithologic units within the dike.

B) Non-Segregated Granite and Syenite Pegmatite Dikes

a) Grain size is variable; frequently the dike is pegmatitic granite rather than pegmatite.

b) Lack of segregation of minerals.

c) Lack of regular zoning of the dike into lithologic units usually found from wall to core in a normal zoned granite pegmatite.

d) Where different lithologic units are present in the dike, the units may be quite irregular in size, shape, and position; marked changes in lithology or texture frequently occur along the dike.

e) Shape is usually irregular, sometimes lenticular.

f) Peristerite (plagioclase with an iridescent sheen) is common.

g) Zircon, titanite, and allanite are common accessories.

h) Uranium occurs as uranothorite and uraninite, and rarely as the complex oxides of columbium, tantalum, and titanium.

i) Yellow secondary uranium minerals are often present coating fractures.

j) Uranium minerals occur in shoots within the dike but not in any particular lithologic unit. There may be hanging-wall and footwall enrichment. These suggest structural rather than genetic controls.

k) A brick-red coloration of the minerals is characteristic of uranium-bearing zones.

1) Leucocratic Type (e.g. Dyno, Faraday)[1]

a) Lack of mafic minerals, except magnetite.

b) Characteristically pegmatitic granite.

c) Magnetite is often abundant as a characterizing accessory.

2) Mafic Type (e.g. Centre Lake)[1]

a) Evidence of abundant replacement of minerals within the dike indicates a complex history of recurrent replacement and metasomatism.

b) Assimilation, digestion, and reconstitution of wall rock and wall rock inclusions is often a feature.

c) Metasomatic alteration of wall rocks, with the development of porphyroblasts, is often present.

d) There may be development of migmatites and *lit par lit* gneisses.

e) Dikes may grade from syenite to granitic to extremely quartz-rich.

[1]Properties quoted here as examples are located outside the area covered by this report. For descriptions of these properties see: J. Satterly and D. F. Hewitt, *Some Radioactive Mineral Occurrences in the Bancroft Area*, Ont. Dept. Mines, Geol. Circ. No. 2, 1955.

f) Biotite, hornblende, or pyroxene may be present as mafic minerals. Where there has been assimilation and digestion of limy wall rocks, the mafic mineral is often pyroxene.

g) Purple fluorite is common.

II. Metasomatic Deposits

A) Limestone

B) Metapyroxenite

a) Uranium-bearing zones occur in limestone or lime metapyroxenite near the contacts of granite, syenitic, or pegmatitic intrusives.

b) There is frequent development of skarn minerals (diopside, tremolite, scapolite, phlogopite, apatite, epidote and others) in the limestones.

c) Salmon-pink to red coloration of the carbonate is characteristic.

d) Uranium-bearing zones are irregular in size and shape, and erratic in distribution within the limestone host rock.

e) Uranium occurs as uranothorite and uraninite.

C) Syenite and Granite

a) Uraninite crystals occur in fine- to medium-grained syenite or granite, usually accompanied by red coloration of the host rock.

b) Uraninite mineralization is generally associated with fractures as an introduced mineral.

c) Uranothorite is rarely present. No known occurrences of complex oxides of columbium, tantalum, and titanium have yet been found in the Bancroft area.

III. Vein Deposits

A) Calcite-Fluorite-Apatite Veins

a) Occur as lenticular, discontinuous, fissure-filling veins.

b) Veins are frequently well-banded.

c) Grain size is medium to coarse, ¼–3 inches.

d) Apatite, hornblende, black mica, and scapolite form large crystals.

e) Later movement along the fissure is often indicated by shearing and flowage of the vein material, and incorporation of brecciated wall rock fragments in the vein.

f) Uranium commonly occurs as uraninite crystals, rarely as pyrochlore.

g) Walls of the fissure are usually lined with crystals of hornblende, feldspar, apatite, titanite, black mica, and scapolite.

h) The vein stage in many cases has been preceded by a pegmatitic stage and concomitant metasomatic alteration of the walls. Re-opening of the fissure allowed emplacement of the vein.

i) Uraninite crystals may occur frozen to the walls.

j) Fluorite is deep purple to almost black in colour. Apatite is frequently dark red.

General Characteristics

The following features are commonly noted in uranium occurrences of all types in the Bancroft area, but the presence of one or more of these features is not necessarily indicative of uranium mineralization:

Minerals

1) Quartz is usually smoky, sometimes black or red in colour.

2) Peristerite feldspar is particularly common in the pegmatite deposits.

3) Calcite in limestone replacement, pegmatite, and skarn deposits is often salmon-pink to red in colour.

4) Deep purple fluorite and green or red apatite are characteristically found in the pegmatites, particularly the mafic granite and syenite type, in the vein deposits, and in the metapyroxenite replacement deposits.

5) Zircon and titanite are frequently abundant accessory minerals in all types of pegmatite, and often present in skarns, metapyroxenites, and syenite and granite replacement deposits.

6) Sulphides are locally abundant, and molybdenite in particular is often present in the richer sections of the deposit.

7) Magnetite is an abundant accessory in certain zones of many leucocratic pegmatites and occasionally occurs as segregated pods.

In some cases there appears to be a definite association between magnetite and uranium.

Rock Alteration

1) Uranium mineralization is often accompanied by a brick-red alteration of the host rock and minerals. Uranium-bearing dikes are usually of a deeper-red or pink colour than barren dikes in the same vicinity.

2) Patches and pots of skarn minerals may be present in all types of deposits. Small patches of calcite, cream to salmon-pink in colour, often with scapolite, diopside, apatite, titanite, black mica, and sulphides are particularly common in the mafic replacement type of non-segregated pegmatitic granite and syenite dikes.

Petrology

1) The pegmatitic dikes that carry uranium mineralization are generally more sodic than the barren pegmatites. Leuco-granite pegmatites, consisting primarily of quartz and microcline, are usually barren.

MINERALOGY OF THE RADIOACTIVE MINERAL DEPOSITS

The radioactive minerals most commonly found in the Bancroft area are the following:

Mineral	Main Constituents	Maximum percent	
		U_3O_8	ThO_2
Oxides and silicates:			
Uraninite	$UO_2.UO_3$	95	15
Thorite	$ThO_2.SiO_2$	.....	82
Uranothorite	$(U, Th)O_2.SiO_2$	30	50
Columbates, tantalates, titanates:			
Euxenite	Titanian $(Y, Ce)(Ti, Cb, Ta)_2O_6$	15	17
Polycrase	Columbian $(Y, Ce)(Ti, Cb, Ta)_2O_6$		
Pyrochlore	$NaCaCb_2O_6F$	20	5
Microlite	$(Na, Ca)_2Ta_2O_6(O, OH, F)$		
Yellow secondary alteration products:			
Uranophane	$CaO.2UO_3 2SiO_2.6H_2O$	60	3
Radioactive accessory minerals:			
Allanite	$4(Ca,Fe)O.3(Fe,Al,Ce)_2O_3.6SiO_2.H_2O$	2	6
Cyrtolite	$ZrO_2.SiO_2$	4	5

The following remarks apply to the occurrence of these minerals in the Bancroft area:

Uraninite

Uraninite is isometric and occurs in steel-grey to black cubes and octahedrons with a submetallic lustre. Hardness is 5-6; specific gravity, 8-10.5.

In the Bancroft area it occurs chiefly in non-segregated pegmatites, limestone, metapyroxenite and granite or syenite replacement deposits, and in calcite-fluorite-apatite veins. It may be distinguished from magnetite by its lack of magnetic properties and its radioactivity. Uraninite can be fairly readily panned using a gold pan, which will separate it from magnetite.

All uraninite from the Bancroft area contains thorium in amounts of 8 to 40 percent ThO_2.[1] Those with the higher thorium content are more properly called uranium thorianite. The latter appears to be characteristic of the occurrences in the limestone.

Thorite

Thorite is tetragonal and occurs in square prismatic crystals similar to zircon in habit. It is variable in colour, black, brown, or yellow, with vitreous to glassy lustre. Hardness is 4.5–5; specific gravity, 4.1–6.4. Thorite occurs in some of the non-segregated pegmatitic dikes in the Bancroft area, but it is difficult to identify in hand sample without an X-ray. It may be confused with zircon or uranothorite.

Uranothorite

Uranothorite, a variety of thorite, is one of the most common radioactive minerals in the Bancroft area. Occasionally it occurs in small elongated rectangular blades, but most often as irregular grains or patches of no definite crystal shape. It usually has a bright vitreous to glassy lustre and ranges in colour from yellow, orange, red, or brown, to black.

Uranothorite is commonly found in the non-segregated pegmatitic dikes, and in limestone and metapyroxenite replacement deposits, but is rare in segregated pegmatites, veins, or granite and syenite replacement deposits.

Euxenite-Polycrase

Euxenite and polycrase commonly occur in jet black to brown or yellow irregular patches in segregated pegmatite dikes. These minerals are orthorhombic and rarely occur in stout prismatic crystals. The lusture is glassy or vitreous; hardness, 5.5–6.5; specific gravity, 4–5.8. In the Bancroft area minerals of the euxenite-polycrase series have so far been found to occur only in the segregated granite pegmatites. Lyndochite, which occurs in the Quadeville pegmatites, is a high-lime euxenite.

Pyrochlore-Microlite

Pyrochlore and microlite are isometric and are sometimes found in good octahedral crystals, as well as in irregular grains and patches intergrown with other minerals. These minerals are usually brown, yellow-brown, or black in colour, with a bright vitreous to glassy lustre. Hardness is 5–6; specific gravity, 4.2–6.4. Good pyrochlore crystals are rare but occur in two calcite-fluorite-apatite vein type of deposits in the Bancroft area. Ellsworthite, the uraniferous, titanian pyrochlore, is common in the segregated granite pegmatites of the Hybla area where it occurs in salmon-pink calcite or feldspar. The MacDonald mine is a well-known example.

Hatchettolite, the uraniferous pyrochlore, has been reported from the Woodcox mine.

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[1]S. C. Robinson, Geological Survey of Canada, personal communication.

It is often very difficult to distinguish uranothorite, euxenite, polycrase, pyrochlore, and microlite from one another in hand specimen, and chemical or X-ray analysis may be necessary for identification of these minerals.

Uranophane

This is the most common, yellow secondary alteration product of the primary uranium minerals in this area.

Allanite

This monoclinic mineral is usually found in shiny, vitreous jet-black masses, or bladed, elongate crystals. Occasionally it is yellowish-brown or reddish in colour. Hardness is 5.5–6; specific gravity, 2.7–4.2. This black vitreous mineral is a common accessory of many granites, syenites, and pegmatites in the area. Although it carries less than 2 percent uranium oxide, and less than 6 percent thorium oxide, it is often present in sufficient amounts in these rocks to give a geiger counter reading several times background. Similarly the radioactive zircon, cyrtolite, may also be present in sufficient amounts to contribute substantially to the radioactivity, but neither allanite nor cyrtolite can be classed as uranium ore minerals, and are of no present commercial value as sources of uranium. Allanite and zircon as well as other radioactive minerals are frequently surrounded by haloes of radial shattering.

Cyrtolite (Radioactive Zircon)

Zircon is tetragonal and occurs in square prismatic crystals with good pyramidal terminations. It is white, grey, brown, or red in colour with a glassy to dull resinous lustre; hardness, 5–7.5; specific gravity 4.6–4.7. Small, well-formed crystals of zircon are a characteristic accessory of most of the pegmatites of the area. Zircon crystals also occur in metapyroxenite, skarn, and granite or syenite replacement deposits. Zircons are rarely found in calcite-fluorite-apatite veins but are common in the metasomatized wall zones of these deposits.

PROSPECTING FOR RADIOACTIVE DEPOSITS IN THE AREA

Within the townships of Monteagle and Carlow, the area north and west of the York River, and the York River valley itself, appear to be favourable prospecting ground for radioactive deposits. Pegmatitic dikes of the non-segregated type and replacement deposits of the metapyroxenite, limestone, and skarn type offer possibilities in this area. Frequent association of the columbium minerals with the alkaline rocks in other areas suggest that the York River alkaline belt may be of some potential prospecting interest.

In Monteagle township many of the segregated granite pegmatite dikes in the Hybla area carry radioactive minerals. As the radioactive minerals usually occur in patches or pods of sparse and erratic distribution, or are confined to certain narrow lithologic units within the dike, these deposits do not offer good possibilities for economic mining of radioactive minerals.

The occurrence of radioactive minerals in the Hybla pegmatites is summarized in the accompanying table, and descriptions of the properties will be found under *Feldspar* (page 39).

Location	Name of mine	Minerals
Monteagle township:		
Con. VI, lot 20	Plunkett mine	Allanite, ellsworthite
Con. VI, lot 21	Watson mine (No. 1 showing)	Allanite
Con. VI, lot 24, N.½	McCormack mine (north showing)	Allanite, ellsworthite
Con. VI, lot 25		Allanite
Con. VII, lot 11	Thompson mine	Allanite
Con. VII, lots 18, 19	MacDonald mine	Allanite, ellsworthite, cyrtolite, uraninite, uranothorite
Con. VII, lot 21	Cairns mine	Ellsworthite
Con. VIII, lot 14, S.½	Genesee No. 2 mine	Ellsworthite
Con. VIII, lot 14, N.½		Allanite
Con. VIII, lot 15	Bartlett mine	Allanite
Con. VIII, lot 17	Woodcox mine	Columbite, ellsworthite, allanite, cyrtolite, hatchettolite, calciosamarskite

Other occurrences of radioactive materials are described below.

MONTEAGLE TOWNSHIP

Concession III, Lots 7 and 8 (S. J. Carr)

In August, 1954, J. Satterly[1] visited this property and supplied the author with the following details. S. J. Carr has stripped the slope of an outcrop ridge on the line between lots 7 and 8, concession III, Monteagle township. The 100-foot stripping exposes a medium- to coarse-grained leuco-granite pegmatite cutting gneissic metagabbro or amphibolite. The pegmatite is exposed for a length of 250 feet on the ridge and pinches out to the south. Its exposed width at the north end of the stripping is about 50 feet. The contact of the pegmatite strikes N.25°E.

In the pegmatite are scattered crystals of allanite 1–2 by 5 inches in size. In the allanite there are lenses and grains of orange-brown uranothorite. Although the allanite seems to be associated with fractures in the pegmatite, many fractures are present without any allanite.

Concession III, Lots 27 and 28

The granite pegmatites on lots 27 and 28, concession III, Monteagle township, carry allanite and zircon. Prospect pits were opened up by J. F. Ferrill, The occurrence is described by F. F. Osborne:[2]

> Allanite is quite abundant in the material mined by J. F. Ferrill on lots 27 and 28, concession III, of Monteagle. It is possible that by concentrating the material, the cerium earths and radium might be recovered. The radioactive shattering around the allanite has made the rock crush easily.
>
> Three hundred pounds of the granitic pegmatite from the Ferrill occurrence were sent to the Temiskaming Testing Laboratories for a concentrating test. The product obtained from the Wilfley table amounted to 2.15 per cent of the whole sample. Under the microscope, it is seen to consist of allanite, titanite, magnetite, zircon, and hornblende. The concentrate was analyzed in the laboratories of the Ontario Department of Mines and gave 3.74 per cent of rare earth elements. Cerium, thorium, and zirconium were detected spectroscopically. This would amount to about 1.6 pounds of the rare earths recoverable from a ton of the granite pegmatite.

[1]Geologist, Ontario Department of Mines.

[2]F. F. Osborne, *Non-Metallic Mineral Resources of North Hastings County*, Ont. Dept. Mines, Vol. XXXIX, 1930, pt. 6, p. 45.

Concession IV, Lots 11, 12, and 13 (Quirk Showing)

On the farm of J. E. Quirk, lots 11, 12, and 13, concession IV, Monteagle township, a number of shallow pits and trenches have been opened up, exposing a radioactive red hornblende granite pegmatite. The main pits are located on the side of a hill about 700 feet south of Mr. Quirk's house. The country rock consists of paragneiss, limy amphibolite, green metapyroxenite, and pink leucogranite. Closely associated with the pegmatite, and occurring as irregular inclusions and patches in the pegmatite, are pyroxene-scapolite skarn and calcite-hornblende-apatite rock. The red hornblende granite pegmatite carries pink to salmon-coloured calcite, apatite, biotite, titanite, zircon, black garnet, tourmaline, pyroxene, and black to reddish-brown uranothorite. Uranothorite also occurs in the calcite-apatite-hornblende rock and in the skarn.

Samples of pegmatite sent to the Radioactivity Division of the Geological Survey of Canada indicated 0.55 R, 0.14 R, 3.55 R, and 4.48 R. A. H. Lang[1] reports that ". . . tests on these indicated that most of the radioactivity was probably caused by thorium, and uranothorite was identified in one sample."

Concession VI, Lot 2, Concession VII, Lots 4 and 5

Some work was done in the summer of 1954 by R. H. Thompson and L. Black on the farm of Mrs. W. M. Thompson, lots 4 and 5, concession VII, and lot 5, concession VI, Monteagle township. The property was examined in August, 1954, by J. Satterly who supplied the following details.

A pegmatite is exposed for a length of 70 feet and a possible width of 15 feet in a creek bed on lot 4, concession VII. Crystalline limestone is exposed on one bank of the creek and may represent the hanging wall of the pegmatite, but exposures are poor.

The dike is a medium-grained hornblende granite-to-syenite pegmatite with accessory titanite, magnetite, zircon, and, rarely, uranothorite.

Concession X, Lot 8 (Welsh Farm)

In a field 700 feet north of the barn on the farm of Mr. Welsh, lot 8, concession X, Monteagle township, there is a small 8-foot exposure of interbanded amphibolite, pyroxenite, and granite pegmatite. The rock is distinctly gneissic and contains numerous knobs of black vitreous allanite up to 4 inches in diameter. The allanite makes up about 10 percent of the exposure.

Sillimanite and Kyanite

CARLOW TOWNSHIP

Concessions XI and XII, Lot 21

An outcrop on the boundary line between concessions XI and XII consists of interbanded amphibolite and sillimanite-garnet-biotite paragneiss. Sillimanite is common, and some sillimanite-rich zones up to 10 feet wide carry 15 percent of this mineral in fine needle-like aggregates.

[1]A. H. Lang, *Canadian Deposits of Uranium and Thorium*, Geol. Surv. Can., Economic Geol. series No. 16, 1952, p. 148.

Concession XII, Lots 23 and 24

On lots 23 and 24, concession XII, Carlow township, several outcrops in open fields, ¼ mile south of the New Carlow–Combermere road, are composed of kyanite-sillimanite-garnet-biotite paragneiss. The kyanite occurs in blue-bladed crystals up to ¼ inch in diameter. Needle-like aggregates of sillimanite occur with the garnet and kyanite. The amount of kyanite and sillimanite is small, rarely exceeding 5–10 percent, and the bands are narrow and interbanded with biotite paragneiss. The occurrence is of no commercial interest.

APPENDIX

MINERAL OCCURRENCES IN MONTEAGLE AND CARLOW TOWNSHIPS

1. Monteagle Township

Mineral	Concession and lot	Name of property or owner	For description see page
Copper	VIII, 9	.....	28
	VIII, 13	D. E. Taylor	28
Corundum	I, 13	Welsh Corundum mine	29
	II, 2, 3	Monteagle Minerals, Ltd.	30
	III, 20	.....	30
	IV, 21 or 22	.....	30
	V, 14	.....	30
	VI, 16	.....	30
	VI, 17	.....	30
	X, 11	.....	31
Feldspar	VI, 20	Plunkett mine	40
	VI, 21	Watson mine (No. 1 showing)	40
	VI, 22, N. ½	Watson mine (No. 2 showing)	41
	VI, 22, S. ½	Watson mine (No. 3 showing)	41
	VI, 24, N. ½	McCormack mine (north showing)	42
	VI, 24, S. ½	McCormack mine (south showing)	42
	VI, 25	.....	42
	VII, 11	Thompson mine	43
	VII, 18, 19	MacDonald mine	43
	VII, 21	Cairns mine	47
	VII, 25	.....	48
	VIII, 13	Taylor mine	48
	VIII, 14, S. ½	Genesee No. 2 mine	48
	VIII, 14, N. ½	.....	49
	VIII, 15	Bartlett mine	49
	VIII, 17	Woodcox mine	50
	VIII, 25	.....	51
	IX, 30, S. ½	Hickey mine	51
Garnet	V, 3, 4	Quirk deposit	52
Graphite	V, 16	.....	53
	XIII, 23	Tonkin-Dupont deposit	53
	XIII, 24	National Graphite mine	53
	XIV, 13, 14	.....	54
Lead	II, 21	.....	58
Mica	II, 18	.....	59
	IX, 1	.....	58
	IX, 22	.....	59
	XI, 1	.....	59
Nepheline	I, 11–13 II, 8–11	Bresnahan Lake nepheline gneiss	60
	II, 2, 3	Monteagle Minerals, Ltd.	60
	III, 4–6 IV, 3	Goddard Lake nepheline gneiss	61
Rare element and radioactive minerals	III, 7, 8	S. J. Carr	69
	III, 27, 28	.....	69
	IV, 11–13	Quirk showing	70
	VI, 2 VII, 4, 5	.....	70
	X, 8	Welsh farm	70

2. Carlow Township

Mineral	Concession and lot	Name of property or owner	For description see page
Corundum	XIII, 16	Ashland Emery and Corundum Co.	31
	XIV, 10	Jack's Cuts	31
	XIV, 14	Burgess mine	32
	XIV, 15	Mackie Cuts	32
	XIV, 16	.....	33
	XIV, 18	Logan Cuts	33
	XIV, XV, 18, 19	.....	34
	XIV, 21	.....	34
	XV, 5	.....	34
	XV, 11	Herb's Cuts (west workings)	34
	XV, 11, 12	Herb's Cuts (east workings)	35
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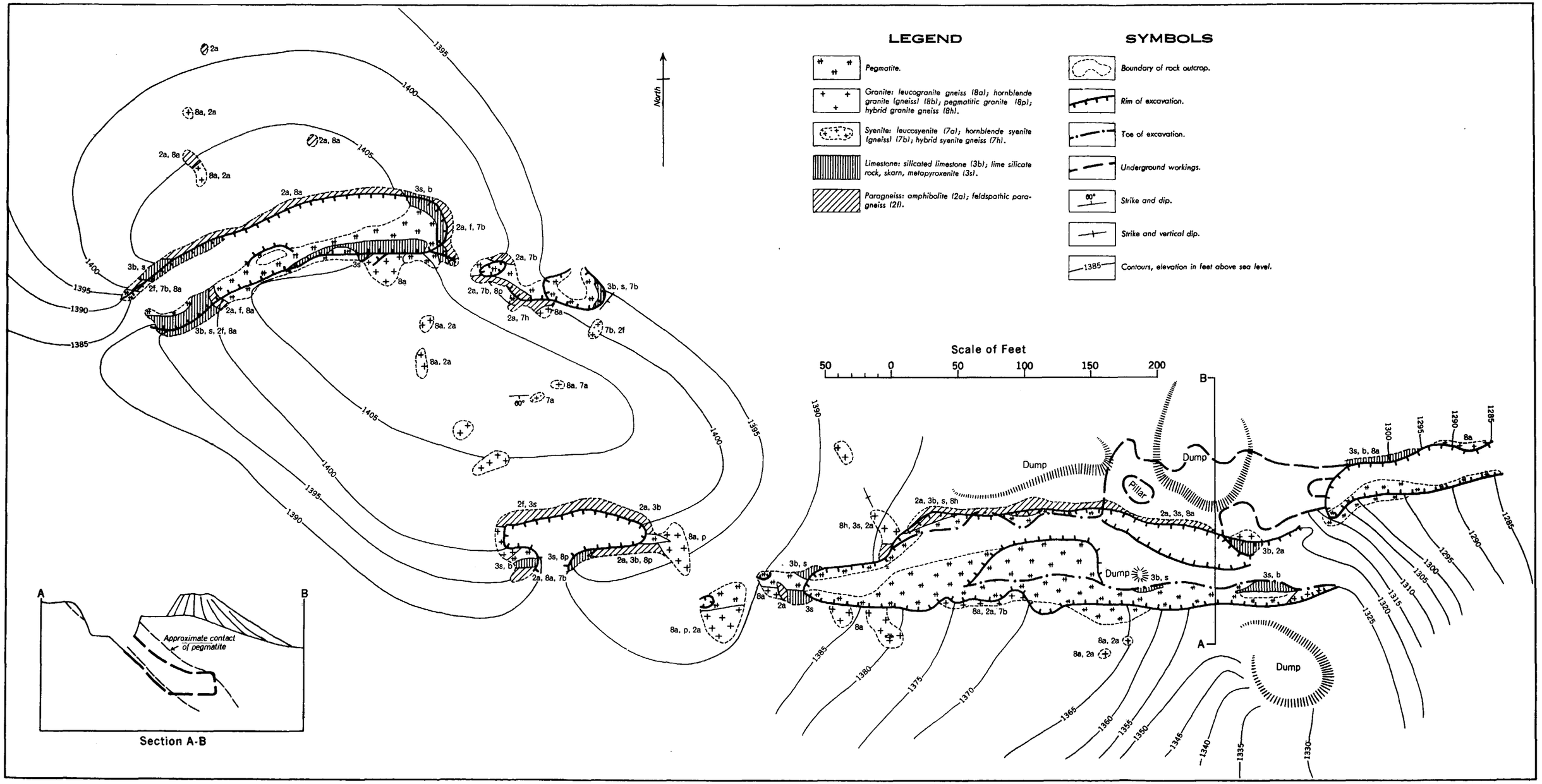
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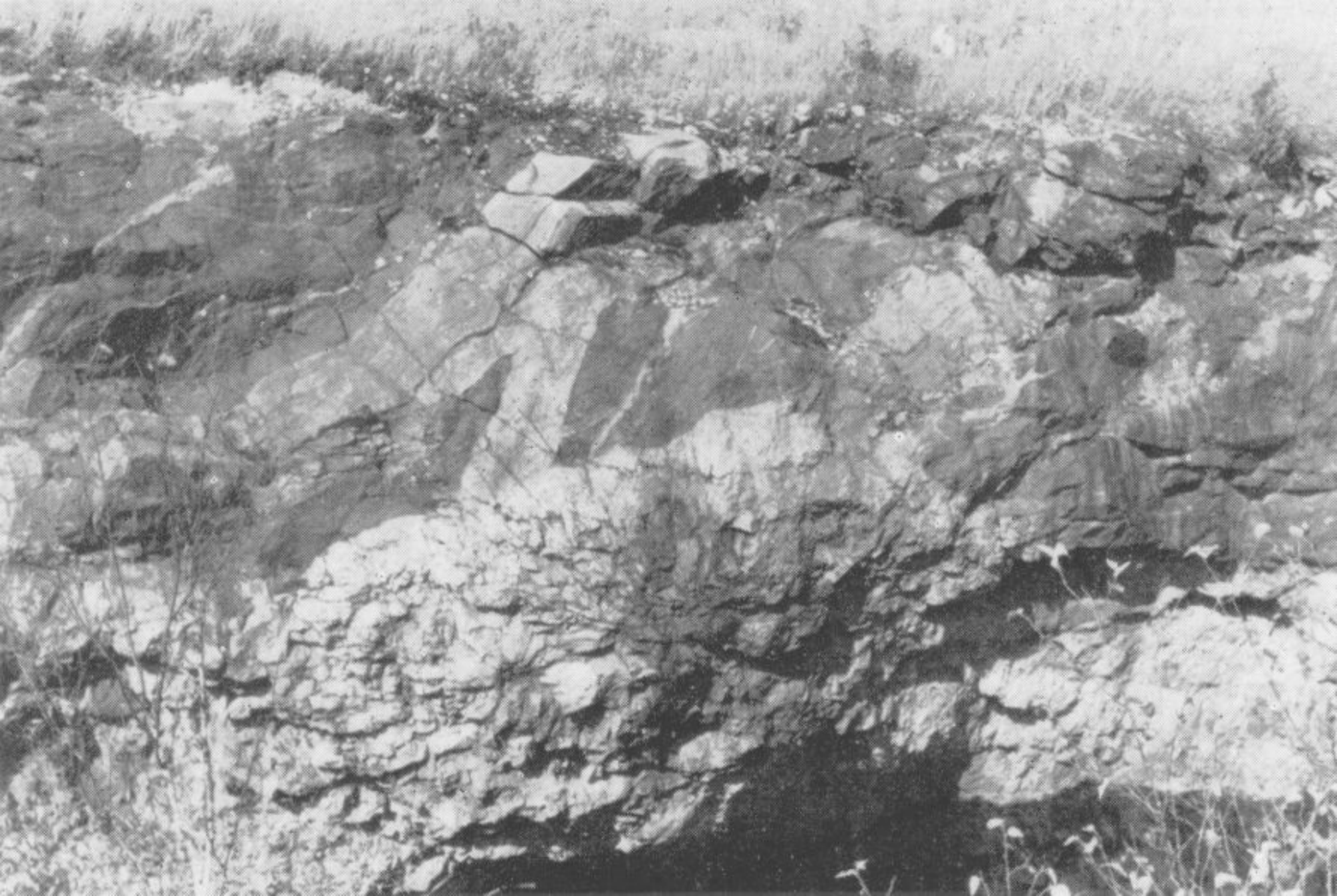
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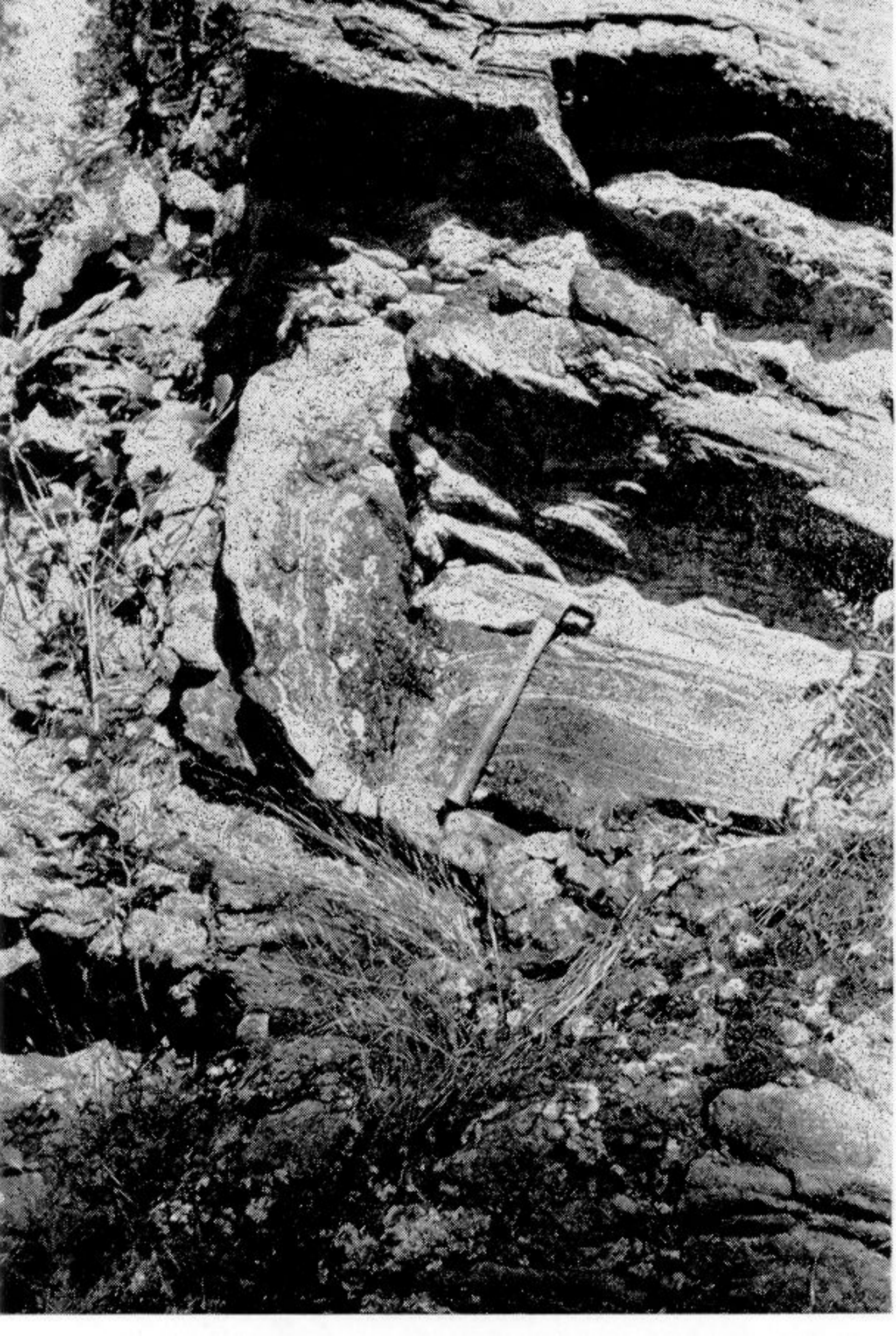












PROVINCE OF ONTARIO

DEPARTMENT OF MINES

HON. PHILIP T. KELLY, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

M. E. HURST, *Provincial Geologist*

SIXTY-THIRD ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. LXIII, PART 7, 1954

Geology of Godfrey Township

By

NELSON HOGG

PRINTED BY ORDER OF

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COLOURED GEOLOGICAL MAP AND PLANS

(In pocket at back of report)

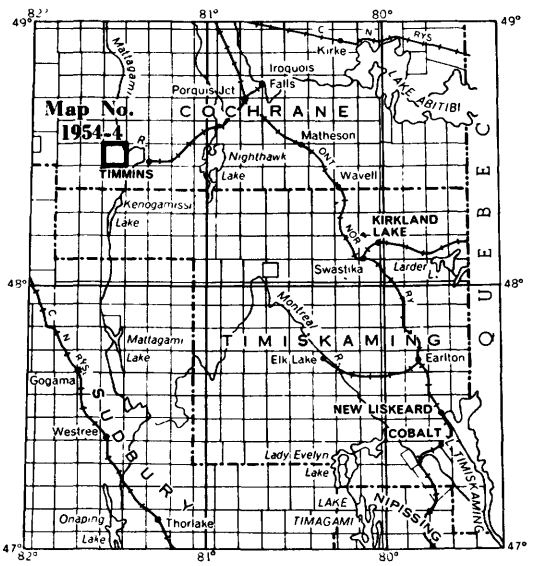
Map No. 1954-4—Township of Godfrey, District of Cochrane, Scale, 1 inch to 1,000 feet.
Geological plan of part of the Jamieson copper property in lots 9 and 10, concession VI, Godfrey township.
Geological plan of parts of the Mordey copper and Phillips-O'Neill properties, lot 9, concession III, Godfrey township.

Geology of Godfrey Township

By Nelson Hogg

INTRODUCTION

Although Godfrey township has no record of mineral production, it has been continuously and actively prospected since the discovery of gold in the Porcupine area in 1909. Even before that time the township must have been investigated by prospectors travelling the Mattagami River, which crosses the northeast corner of the township.



Key map showing the location of Godfrey township, district of Cochrane. Scale 1 inch to 50 miles.

As early as 1907, when he surveyed Godfrey township, T. D. Green made note of a "hunter's old delapidated log cabin" on the north shore of Keeley Lake.

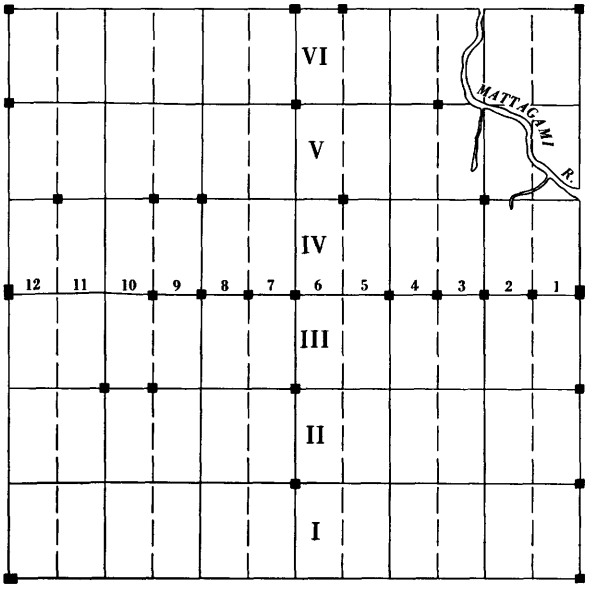
The south boundary of the township follows Niven's first base line, surveyed in 1899 by A. Niven; the north boundary, Niven's second base line, surveyed in 1905; and the west boundary, Niven's first meridian line, also surveyed in 1905.

The detailed geological mapping described in this report and shown on the geological map (see map No. 1954-4 in back pocket) results from an investigation of mineral occurrences in Godfrey and Turnbull townships in 1949. In the course of this investigation the principal mineral occurrences were mapped in detail by plane table. At that time it was recognized that further detailed mapping on a

regional scale was needed to outline the structural setting of the known mineral occurrences and thereby point the way for further exploration work.

With this in mind, mapping was carried on during the summers of 1951 and 1952; it was done directly on air photographs on a scale of 1 inch to 800 feet. Compass traverses were run at about 400-foot intervals in areas of sparse outcrop and were plotted on the air photographs in the field so that location could be checked and adjusted during the traverse. In the eastern part of the township, where overburden is heavy and outcrop practically non-existent, traverses were more widely spaced and were run through those areas where, from a study of the photographs, the possibility of locating outcrop seemed reasonable.

The combination of slash, burn, windfalls, and tag alders, which characterizes the terrain over most of the township, makes pace-and-compass traversing a slow and tedious job.



Plan showing the survey posts that were found by the geological survey party mapping in Godfrey township during 1951 and 1952.

Acknowledgments

During the detailed examination of mineral occurrences in 1949, capable assistance was rendered to the author by E. H. Phinn, A. D. Graham, and W. W. Cummings.

In 1951 the field party consisted of E. H. Nickel, John Walker, R. Stevenson, and D. A. Wilson, with Mr. Nickel as chief assistant. In 1952 Mr. Walker acted as chief assistant with J. Tanner as junior assistant. All these university students carried out their duties conscientiously and showed great interest in the work being done. Mr. Nickel and Mr. Walker deserve special credit for the manner in which they did independent mapping and supervised the work of the party. In July, 1952, Mr. Walker, assisted by Mr. Tanner, mapped much of the difficult terrain in eastern Godfrey township. He has also made important contributions to the information published in this report concerning the gabbro-granite complex, which he is studying as a thesis problem.

The data from mining companies, available through the office of the resident geologist of the Ontario Department of Mines at Timmins, have been used freely in the preparation of the map and report.

The author is indebted to a number of local prospectors whose assistance facilitated the field work. George Jamieson and Fred Steep were of particular assistance because of their knowledge of the terrain and history of the township.

The value of discussion and correspondence with J. Satterly of the Ontario Department of Mines, who examined many of the thin sections of rocks, is gratefully acknowledged. Dr. Satterly has also borne the burden of supervising the reproduction of the map and report as the author has since left the Ontario Department of Mines.

Means of Access

Godfrey township is six miles west of Tisdale township, where the main orebodies of the Porcupine gold camp are located. It adjoins, at its northwest corner, the township of Robb in which the Kam-Kotia copper-zinc deposit is located.

The Mattagami River, flowing north into the Moose estuary and James Bay, crosses the northeast corner of the township, from mile-post IV on the east township line to the boundary between lots 2 and 3 on the north township line. This great river has given access to the area since the earliest days of exploration out of James Bay. It was used as part of the route to Godfrey township until 1942, when an all-weather gravel road was constructed from Timmins to the Kam-Kotia mine in Robb township. This road, known as the Kamiskotia road, crosses Godfrey township diagonally in a northwesterly direction. It is the only motor road in the township suitable for normal motor traffic. Numerous bulldozed tractor roads, used for hauling wood, intersect the township; but they are not passable for most vehicles during the summer months. One road of this type, known as Feldman's road, has been improved so that trucks with high clearance can travel it in dry weather. It runs from the camps of the Feldman Timber Company on Keeley Lake to the company's camps on the Kamiskotia road, in lot 7, concession V.

Niven's first base line, which was the principal trail leading into the southern portion of Godfrey township for many years, is now a poor foot trail, wet over much of its length.

The Lally road, which follows the line between concessions III and IV across the township, is also a wet trail during the summer months and is little used except as a winter road.

The Hollinger trail, which leaves the Lally road to follow the boundary between lots 10 and 11, was, at one time, used as a wagon road to service the Kam-Kotia mine during its early development. It is now badly overgrown and provides only a poor foot trail.

An ever-changing network of bulldozed winter roads dissects the township. Many of those roads, which show up clearly on the air photographs of 1946, could not be followed on the ground in 1951. Numerous other freshly cut roads were not on the air photographs used in mapping. It is probable that many of the roads shown on the map will be of little use in a few years.

Previous Geological Work

The earliest organized geological work in Godfrey township was probably that of Parks,[1] who reported on the geology along Niven's first base line.

A. G. Burrows,[2] in his early work in the Porcupine area, carried out a certain

[1]William A. Parks, *Niven's Base Line, 1899*, Ont. Bur. Mines, Vol. IX, 1900, pp. 125–42.
[2]A. G. Burrows, *The Porcupine Gold Area*, Ont. Bur. Mines, Vol. XX, 1911, pt. 2.

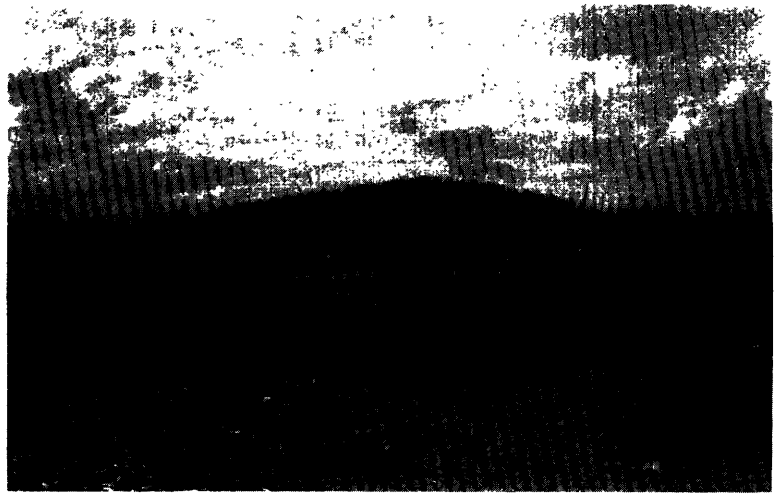
amount of reconnaissance work in Godfrey township and included the results on his map of the Porcupine area.

The first comprehensive mapping of the entire township was done in 1924 by F. L. Finley,[1] who mapped the geology of Godfrey township along with Turnbull, Robb, and Jamieson townships, as part of the Kamiskotia Lake gold area.

No geological mapping was done in the period between 1924 and 1949, when the writer began an examination of mineral occurrences in the township.

Topography and Drainage

The topography of Godfrey township is characterized by moderate relief, typical of the Precambrian Shield. Elevations range from a low of about 820 feet at the Mattagami River to a high of 1,366 feet on Mount Jamieson, just south of the Jamieson township boundary in lot 7.



View of Mount Jamieson from the gravel pit on the Kamiskotia road. The area in the foreground was burned in the forest fire of 1947.

The township lends itself to subdivision topographically into two almost equal parts. In the west half, there are numerous outcrops of rock that rise from the general level of swamps and lakes to a height of not more than 100 feet. This rather bold terrain is modified by glacial deposits of sand, gravel, and boulders that form gently sloping knolls on the south side of rocky hills. In concessions I and II, in the west half of the township, spruce swamp covers most of the area, which has only occasional low rock outcrops.

The east half of the township has low relief and few outcrops of rock. It is covered with stratified clay and silt to depths up to 200 feet. Low hills of sand and gravel resting on the clay form a low rolling surface. An esker deposit, broken up by tributaries of the Mattagami River, in lots 3 of concessions IV, V, and VI, provides the boldest relief in this part. The Mattagami River and its tributaries, which drain the entire township, cut through clay banks up to 50 feet high.

The principal creeks that drain the township, with the exception of Godfrey

[1] F. L. Finley, *Kamiskotia Gold Area*, Ont. Dept Mines, Vol. XXXIV, 1925, pt. 6.

Creek, flow in a northeasterly direction into the Mattagami River. Godfrey Creek flows into the Kamiskotia River and thence to the Mattagami.

The largest lake is Godfrey Lake (known locally as Aconda Lake), and it is little more than half a mile in length. It has low, swampy shores except along its southwest margin. Steep Lake, Forbes Lake, and South Godfrey Lake are small lakes with predominantly low and swampy shore lines. Keeley Lake, the second largest lake in the township, has a rather bold, rocky shore line except along its northern margin. Apparently it is deeper than the other lakes.

Natural Resources

Forest products and fur are the only natural resources that have been exploited on a commercial basis in Godfrey township.

The increasing population of the Porcupine area has, of recent years, eliminated fur-bearing animals to a point where trapping is no longer important.



View of the south shore line of Keeley Lake. The hills rising from the lake are rhyolite.

The forests have in the past yielded good crops of jackpine for lumber, white and black spruce for pulp, and a small amount of red and white pine. Lumbering operations and forest fires have taken a heavy toll until, at the present time, cutting is almost entirely confined to the southwest corner of the township where a few good stands of black spruce remain in the swamps. Most of the accessible white birch has been cut for firewood to supply the town of Timmins, but a few good stands remain. Apart from this, the only trees that have not been extensively cut are poplar, balsam, and cedar. The balsam has been almost eliminated during recent years by the bud-worm. A few good stands of cedar remain in the larger swamps. In the eastern, clay-covered part of the township there are many isolated clumps of mature balm of Gilead trees, towering above the spruce slash and heavy underbush.

In 1947 a forest fire, originating in lot 11, concession VI, burned a large proportion of concessions V and VI from lots 7 to 12.

The east half of the township, covered by flat clay soil, is suitable for agriculture. Mountjoy township, to the east, has a similar soil and is being cultivated up to the Godfrey township boundary in a number of places.

GENERAL GEOLOGY

The consolidated rocks of the township are all of Precambrian age. Exposures in the northwestern part are sufficient to permit a reasonable interpretation of the relationship of these Precambrian rocks. The east half and most of the southwest corner are covered with unconsolidated material of Pleistocene and Recent age. Knowledge of the bed rock in these areas is limited to a very few outcrops, a few diamond-drill holes, and rather scant geophysical information. In order to interpret the structure of the Precambrian rocks, full use has been made of available information on the adjoining townships of Mountjoy and Bristol; but even so, the total information available on this large area is far from satisfactory. There is little doubt that the results will bear revision when further drilling and geophysical work have been done.

The classification of Precambrian rocks of the township presented here differs in one respect from previous reports on the area. The writer believes that the acid intrusives and the basic intrusives have originated in the same parent magma and that there is little age difference between them. Since no exposures were seen where either type of intrusive cuts rocks younger than the volcanic of Keewatin age, the intrusives have been designated only as post-Keewatin. The more conventional terms, Haileyburian and Algoman, have been avoided, although some of the feldspar porphyry dikes encountered in the eastern part of the township might properly be included under Algoman.

The term Keewatin is loosely used to apply to all the Precambrian volcanics and sedimentary deposits. The relationship of volcanics to sediments is not known, nor is the nature of their contact. In Mountjoy township, both sediments and volcanics face north in the vicinity of Sandy Falls. The same sediments in the east half of Mountjoy township have been mapped by Hurst,[1] and assigned to the Keewatin series. Similar sediments, which probably belong to the same age group, were mapped in Murphy township by L. G. Berry.[2] In that case the sediments appear to lie conformably on the volcanic rocks, the contact being marked by a band of agglomerate. Berry has also assigned both sediments and volcanics to the Keewatin. Thus the term Keewatin as used in this report is in keeping with previous work in the area.

Table of Formations

CENOZOIC	
RECENT:	Peat, humus, silt.
PLEISTOCENE:	Sand, gravel, boulders, boulder clay, stratified clay.
	Great unconformity
PRECAMBRIAN	
MATACHEWAN(?):	Quartz diabase.
	Intrusive contact
POST-KEEWATIN:	Lamprophyre. Trap. Quartz porphyry, quartz feldspar porphyry. Granite, granophyre, quartz porphyry. Quartz diorite. Gabbro, diorite.
	Intrusive contact
KEEWATIN:	
Volcanics:	Rhyolite: spherulitic rhyolite, quartz porphyry, fragmental rhyolite, tuff, agglomerate. Andesite, basalt: pillow lava, spherulitic lava, amygdaloidal lava, fragmental lava, tuff, agglomerate.
Sediments:	Greywacke, argillite, conglomerate.

[1] Map No. 47a, *Porcupine Area, District of Cochrane, Ontario*, Ont. Dept. Mines, 1938.

[2] L. G. Berry, *Geology of the Bigwater Lake Area*, Ont. Dept. Mines, Vol. XLVIII, 1939, pt. 12 (map No. 48n, *Bigwater Lake Area, District of Cochrane, Ontario*).

Precambrian

KEEWATIN

The Keewatin series in Godfrey township includes three distinctive groups: sediments, intermediate-to-basic volcanics, and rhyolitic volcanics. Little is known of the nature or structure of the sedimentary member, which has been encountered in a few diamond-drill holes. The acid and intermediate-to-basic volcanics form an interbedded and mutually intrusive complex, which is well exposed in the west half of the township. Dikes and sills of rhyolite intrude the andesitic lavas, and conversely, dikes and sills of andesite intrude the ryholitic volcanics. The correct interpretation of these intrusive relationships is complicated by the resemblance borne by these rocks to some of the post-Keewatin intrusive types.

Sediments

Rocks of sedimentary origin are believed to underlie quite a large area in the southeastern part of the township. The outline of this area is a matter for con-



Conglomerate with pebbles of slaty sediment, and rhyolite and chert, lot 6, concession V.

jecture because there are no outcrops within it. Diamond-drilling by Minesta Gold Mines, Limited, is reported to have encountered sedimentary rocks in lots 1, 2, 3, and 4 in concession II, and in lot 1, concession III. The writer was not able to examine the core from this drilling, which was completed in 1939. The sediments are described in company diamond-drill records as consisting of interbedded greywackes and slates, with some narrow beds of conglomerate. One band of conglomerate, striking N.60°E., was traced in three drill holes for a length of 1,000 feet.

Sediments, consisting of interbedded greywacke and argillite, are exposed along the Mattagami River below Sandy Falls in Mountjoy township. These exposures come to within half a mile of the Godfrey township boundary. The sediments strike about N.75°E., dip 40°–75°N., and face north. They are thought to be part of the same mass of sedimentary rock that underlies the southeast corner of Godfrey township.

A second area of sedimentary rock has been mapped in lot 6, concession V. It is thought to be a separate unit not connected with the large sedimentary area

described above. Outcrops of angular conglomerate, or agglomerate, are exposed over a strike length of 200 feet and a width of 1,000 feet. Discontinuous lenses of massive greywacke constitute a minor part of this rock. These lenses do not provide a reliable indication of strike and dip, but they do suggest that the dip may be quite flat. The entire exposure is thought to be an interflow conglomerate within the rhyolitic volcanics.

Acid Volcanics

Rhyolitic volcanics constitute the most widespread petrographic division in the township. They include massive porphyritic rhyolite, spherulitic rhyolite, fragmental rhyolite, thinly bedded tuffs, and pyroclastics.

Although most of the rhyolite is of extrusive origin, it has also intruded the older volcanics in the form of sills and dikes. The andesitic pillow lava exposed in lot 9 concession IV, is so badly cut up by intrusive rhyolite that only disconnected remnants remain. Similarly, on the property of Mordey Copper



Massive rhyolite illustrating the typical hackly surface and closely spaced jointing. The outcrop is just southwest of the Kamiskotia road near the gravel pit on lot 8, concession VI.

Mines, Limited, a north-striking pillow lava flow is interrupted by east-trending, dike-like bodies of rhyolite porphyry. These dike-like bodies are similar petrographically, even under the microscope, to extrusive rhyolites with tuffaceous members exposed in the same locality.

The intrusive rhyolites of Keewatin age are difficult to distinguish in the field from quartz porphyries belonging to the post-Keewatin group of intrusives. There is little doubt that errors have been made in the field in the distinction of these rock types, and it is probable that these errors favour the inclusion of post-Keewatin types with the volcanic rocks. In some cases the division has been made on the basis of metamorphism, since the Keewatin rocks are in general more highly sheared. Under the microscope, a more accurate distinction can be made because the post-Keewatin types frequently have a granophyric or graphic texture developed in the matrix, whereas the matrix of the rhyolites is either a mosaic of quartz and feldspar or a mass of tiny spherulites. The minerals apatite and leucoxene are generally present in small amounts as accessories in the post-Keewatin acid intrusives, but not in the rhyolites.

Photomicrographs by P. A. Peach



Photomicrograph of dense rhyolite from Mount Jamieson. Note large, fractured phenocryst on left and small spherulitic structures in the groundmass. (Crossed nicols X 50.)



Photomicrograph of rhyolite porphyry illustrating the prominent quartz phenocrysts (white) in a cryptocrystalline groundmass. Note the fracturing in the quartz phenocrysts and the strain pattern developed in the quartz phenocryst at lower left. The specimen is from the south half of lot 6, concession VI. (Crossed nicols X 25.)

Most exposures of rhyolite present a white-weathering, blocky surface, the blocky appearance being produced by a well-developed pattern of jointing. The fresh surface is generally dark-grey except in the cherty varities, which may be one of various shades of grey and pink. Where the rhyolites have been sericitized, and particularly in zones of shearing, they have a waxy. yellow colour both on the fresh and weathered surfaces. This type of alteration is well developed on outcrops of sericitized spherulitic lava on the Jamieson property in lot 10, concession VI.

The bulk of rhyolite exposed is porphyritic, having well-developed quartz "eyes" ranging in size from pin-points to those four millimetres in diameter. Varieties that appear cherty or porcelainic in hand specimens exhibit the same porphyritic texture under the microscope. The groundmass is a mosaic of quartz, feldspar, and sericite. Albite occurs as small phenocrysts, but the feldspar of the matrix is mainly orthoclase.



Tuffaceous bedding in fragmental rhyolite, southwest quarter of south half of lot 11, concession V.

Most of the rhyolite on Mount Jamieson, in lot 7, concession VI, is fine-grained, comprising cherty material, fine-grained fragmental rhyolite, and spherulitic rhyolite. Very few discontinuous lenses of crudely bedded tuff, and a few amygdaloidal patches were observed. The spherulitic variety is so fine-grained in texture that the spherulites can barely be discerned without the aid of a hand lens. Under the microscope they are seen to consist of tiny rosettes of clear feldspar and quartz, about 0.2 millimetres in diameter, separated by a little sericitic material.

The fine-grained rhyolites are, in places, fractured, and the curving fractures are bordered by waxy yellow, sericitic selvages.

Along the east slope of Mount Jamieson, where it falls off into low ground, is a flow of quartz porphyry with well-developed, one- to two-millimetre, quartz eyes. Its weathered surface is darker and smoother than that of the fine-grained rhyolites with which it has a well-defined contact. The east margin of this quartz porphyry is poorly exposed, but there is evidence that it grades upward into

finer-textured rhyolite. This band of quartz porphyry has been traced from the north township boundary for a little over one mile, where it has been displaced about half a mile to the west by faulting. It can then be traced south for an ad-



Agglomerate consisting of rhyolite fragments in an andesite matrix. The agglomerate occurs on the contact between rhyolite and andesite east of Forbes Lake in the southwest quarter of the south half of lot 9, concession III.



Banding in a fragmental rhyolite flow top, the southwest quarter of the south half of lot 11, concession V.

ditional one and a half miles to the centre of lot 7, concession IV, where it enters a large, drift-covered area.

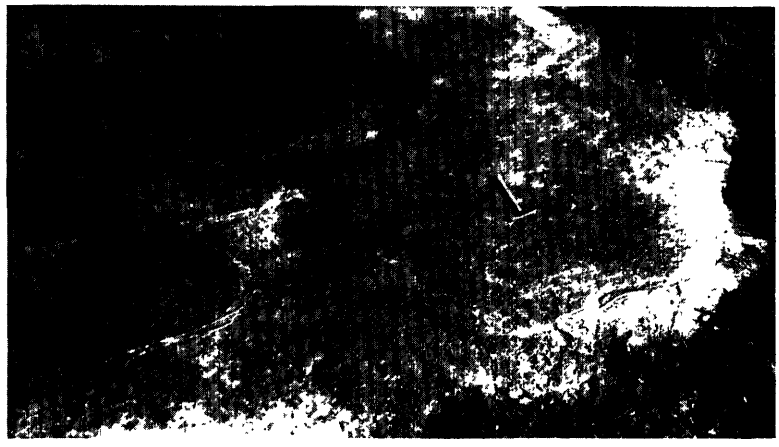
One of the best exposures of fragmental rhyolite is in the centre of lot 9, concession V, where the rhyolite band is made up entirely of fragmental material. The fragments, which are rhyolitic, are angular and elongated, ranging in length from one to three inches. Farther north on this same horizon, in lot 9, concession VI, thinly bedded tuffs are well developed.

The best examples of pyroclastic rhyolite and interbedded tuffs, are exposed along the east side of Godfrey Creek, in lot 12, concession IV.

The very fine-grained rhyolites west of Keeley Lake are characterized by highly contorted flow-banding that trends in a northerly direction. Similar banding is a feature of the rhyolite south of Forbes Lake and in lot 11, concession V, west of Steep Lake. These three occurrences probably belong to the same rhyolite flow, which is cut by faulting and by later acid intrusives.

The rhyolite in lots 9 of concessions II, III, and IV and most of the rhyolite in lot 9, concession I, is porphyritic with prominent eyes of quartz. It exhibits intrusive relationships with the andesitic volcanics in a number of places. Much of the breccia associated with it is probably of intrusive origin and occurs along the margins where rhyolite cuts andesite.

There is little evidence to support a volcanic origin for this rhyolite porphyry. It is generally sheared and is similar lithologically to other rhyolite porphyry



Balloon-type pillow in andesite, the southwest quarter of the north half of lot 9, concession IV. The pillows strike N.10°E. and face east; the hammer handle points north.

known to be extrusive. About 600 feet east of Forbes Lake, in lot 9, concession III, a contact between andesite and rhyolite porphyry is marked by agglomerate and crude banding in the rhyolite. The agglomerate consists of large, rounded fragments of rhyolite porphyry in an andesitic groundmass.

Intermediate and Basic Volcanics

The intermediate and basic volcanics include massive lavas, pillow lavas, amygdaloidal lavas, and fragmental lavas, with minor amounts of interbedded tuff and pyroclastic material. No comprehensive petrographic study has been made of these rocks, which are similar to the intermediate and basic volcanics of the Porcupine area. They are highly altered by chloritization, saussuritization, and locally by carbonatization. The term andesite has been used to describe them in the field and will be used in this report. Like the rhyolites, they are not exclusively extrusive in origin, but occur also as dikes and sills intruding older volcanic strata. They are not as widespread as the acid volcanics but provide the best information regarding the structure of the Keewatin rocks.

The most prominent band of andesitic volcanics extends from the north

boundary of the township in lot 10, to the south boundary of lot 9, concession III, where it is lost in a drift-covered area. It has a certain amount of interbedded rhyolitic lava and is interrupted by rhyolitic intrusives and other acid intrusives, particularly in the vicinity of Steep Lake.

The preponderance of pillowed flows permits these volcanics to be traced with some assurance through the area of intrusives and beyond the eastward-striking fault in concession IV. A pillowed flow, characterized by giant pillows with broad selvages, can be traced for more than half a mile in lot 10, concession VI. It helps to outline the folding indicated on the map in this area. Well-developed fragmental flow tops are locally prominent, but none were found to provide



Andesitic pillow lava, claim P.27215, the northeast quarter of the south half of lot 9, concession III. *The hammer handle points north, and the pillows face east.*

horizon markers for more than a few hundred feet. On an outcrop about half a mile north of Steep Lake, in lot 10, concession V, six narrow flows of andesitic lava, separated by fragmental flow tops, are exposed. The flows are pillowed and range in thickness from 30 to 100 feet. The fragmental bands are only 5–10 feet thick.

Andesitic rocks, thought to be contemporaneous with the intrusives, occur as dikes and sills intruding older volcanics. These intrusive bodies consist of fine-grained, uniform, massive andesite, and they occur most commonly in the lower part of the principal andesite band described above. Such intrusives are well exposed in the south half of lot 11, concession V, where they form narrow dikes

intruding dense rhyolite. Much of the andesite mapped in the outcrop area northeast of Godfrey Lake is also of this massive variety and presumably intrudes the rhyolitic volcanics. In the area both north and south of Forbes Lake there are numerous examples of andesite in dike-like bodies intruding quartz porphyry.

Many narrow dikes in the southwestern part of the township, having an andesitic appearance on their weathered surface, belong to the later post-Keewatin period of intrusion. Thin-section study shows that these andesitic-looking rocks are quartz-albite porphyries related to the granophyric intrusives; they are described in more detail on page 22. In the Forbes Lake area, dikes of this type occur as well as dikes of andesite belonging to the volcanic series. It is quite probable that some have been erroneously included with the volcanic rocks on the map.

Outcrops of andesitic volcanics in the northeastern part of the township are rare. A few outcrops of pillowed lava and fragmental lava were mapped in lot 1,



Mattress- and bun-type pillows on andesitic lava, claim P.27215, the northeast quarter of the south half of lot 9, concession III. The hammer handle points north, and the pillows face east.

concession VI, and a small outcrop of massive lava was found on the east bank of Little Waterhen Creek in lot 3, concession IV. Better exposures occur in lots 11 and 12, concession VI, of Mountjoy township, where the flows strike N.65°E. and face north.

The structural relationship of these few exposures to the andesites in the west half of the township is not known. The two areas are separated by two miles of drift, which has not been explored by drilling or geophysical methods.

POST-KEEWATIN INTRUSIVES

The intrusive rocks of Godfrey township represent almost half the exposed rocks, and include varieties ranging in composition from gabbro to granite. Finley[1] and Berry[2] have assigned the gabbros of the Kamiskotia area to the

[1]F. L. Finley, *Kamiskotia Gold Area*, Ont. Dept. Mines, Vol. XXXIV, 1925, pt. 6, pp. 46 and 50–56.

[2]L. G. Berry, *Geology of the Robb-Jamieson Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 4, pp. 9–11.

Haileyburian period, and the granitic intrusives to the Algoman. No evidence was found by the author that would either confirm or disprove this designation, which is commonly used for the basic and acid intrusives of the area. Detailed mapping has strongly suggested, however, that the granite of Godfrey township is a late differentiate of the same magma that gave rise to the gabbroic intrusives.

The granitic intrusives are later than the gabbros, but the nature of their contacts and the disposition of the two rock types suggest that the gabbro was probably still hot when intruded. There are relatively few exposures of typical gabbro or granite, compared with the large areas of hybrid and intermediate types. In most cases, the contacts between gabbro and granite are most abstruse. Berry[1] observed, in regard to the granites on the Robb-Jamieson township boundary, that, "The contacts are ill-defined, particularly with the gabbro, with which the granite has apparently formed a zone of uncertain hybrid rock." This statement is generally true of the contacts between gabbro and granite in Godfrey township but is not true of the contacts between granite and volcanic rocks, which are sharply defined or marked by narrow transitional zones.

The gabbro in Godfrey township is generally intersected by a network of narrow dikes and irregular masses of white-weathering aplitic granite. The contact zones are often characterized by the development of quartz-rich chloritic rock. Granite (or its aplitic equivalent) becomes darker close to the contact, with increased chlorite and prominent quartz, but without "chilling" or other textural changes typical of intrusive contacts. Gabbro close to the contact becomes finer in texture and has considerable quartz in the form of "eyes." Farther from the contact the gabbro often is characterized by small "knots" of granitic material, which give the weathered surface a knobby appearance. Outside this zone, the alteration of gabbro has often resulted in the development of hornblende in elongated acicular crystals up to an inch in length.

Contacts between granite and andesitic volcanics, exposed in lot 10, concession VI, are sharply defined. The andesite is silicified for some distance from the contact but does not exhibit the wide transitional zones described above. Samples Nos. 7, 8, and 9 in the table on page 16 illustrate the chemical changes that take place in the andesite approaching the granite contact. In the transitional zone, which is less than 10 feet wide, quartz and albite have been developed in the andesite at the expense of chlorite. In the chemical analysis (sample No. 8) this change is indicated by the decrease in magnesia and combined water, and the relative increase in silica and soda. Farther from the contact with granite, the andesite is silicified and sericitized with a resulting increase in silica, combined water, and potash.

A stock-like mass, about a mile long by a quarter of a mile wide, which extends from the middle of concession VI, on the line between lots 10 and 11 to the middle of lot 11, concession V, has been mapped as quartz diorite. It is thought by the author to represent an intermediate differentiate midway between gabbro and granite. Texturally it resembles some granophyric facies of the granite, except that albite is more often present in the form of phenocrysts. Granophyric intergrowths of quartz and albite form the groundmass; they radiate outward from the phenocrysts and often blend with the margins of phenocrysts. The similarity of this granophyric development with that of the granites suggests a similar primary origin. The quartz diorite contacts with the granitic rocks are similar to those described as being between gabbro and granite, being characterized by a transitional zone of quartz-chlorite rock. Contacts with gabbro are

[1]L. G. Berry, *op. cit.*, p. 12.

CHEMICAL ANALYSES[1] OF SOME ROCK TYPES FROM GODFREY TOWNSHIP AND VICINITY

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Silica (SiO_2)	72.03	72.80	74.30	63.12	59.66	49.56	47.81	57.29	57.69
Alumina (Al_2O_3)	9.67	12.06	11.69	12.22	11.26	10.76	14.90	12.21	14.17
Ferric oxide (Fe_2O_3)	0.50	0.80	0.03	3.52	5.81	4.81	2.25	1.67	1.19
Ferrous oxide (FeO)	7.77	3.94	3.56	5.99	7.05	10.49	9.10	8.23	7.75
Magnesia (MgO)	0.76	0.74	0.15	0.32	1.31	3.32	6.69	1.24	8.18
Lime (CaO)	0.39	1.57	1.82	3.44	2.96	8.48	6.04	5.56	1.46
Soda (NaO)	3.60	4.68	4.74	4.03	4.68	2.53	3.78	4.05	0.33
Potash (K_2O)	0.68	0.53	0.58	1.47	1.16	0.58	0.32	0.29	2.32
Water (>110°) (H_2O+)	0.31	1.45	1.13	1.44	1.85	2.83	3.42	2.50	5.46
Water (<110°) (H_2O-)	0.10	0.09	0.13	0.11	0.13	0.17	0.32	0.20	0.18
Carbon dioxide (CO_2)	4.80	1.48	1.64	2.59	2.62	0.15	3.70	3.69	0.25
Titanium dioxide (TiO_2)	0.27	0.31	0.28	1.02	1.65	3.90	1.71	1.74	1.43
Phosphorous pentoxide (P_2O_5)	0.03	0.10	0.03	0.30	0.58	1.58	0.20	0.41	0.12
Chromic oxide (Cr_2O_3)	0.002	0.002	0.002	0.002	0.003	0.002	0.006	0.003	0.012
Manganous oxide (MnO)	0.06	0.05	0.05	0.13	0.15	0.31	0.22	0.14	0.14
Vanadium trioxide (V_2O_3)	0.002	0.002	0.002	0.003	0.003	0.006	0.05	0.008	0.04
	100.97	100.60	100.13	99.70	100.87	99.47	100.51	99.23	100.72
Specific gravity	2.72	.....	2.71	2.79	2.80	2.91	2.83	.....	.....

Sample No. 1, Granophyric Facies of Granite.—South half of lot 11, concession VI; 1,600 feet north and 1,300 feet west of the southeast corner of Godfrey township.

Sample No. 2, Granophyric Facies of Granite.—North half of lot 10, concession VI; 1,400 feet south and 500 feet east of the northwest corner of Godfrey township.

Sample No. 3, Aplitic Facies of Granite.—North half of lot 11, concession VI; 1,000 feet south and 200 feet west of the northeast corner of Godfrey township.

Sample No. 4, Granophyric Quartz Diorite.—South half of lot 11, concession VI; 2,100 feet north and 100 feet west of the southeast corner of Godfrey township.

Sample No. 5, Granophyric Quartz Diorite.—North half of lot 11, concession V; 1,700 feet south and 1,000 feet west of the northeast corner of Godfrey township.

Sample No. 6, Saussuritized Gabbro.—South half of lot 11, concession V; 2,500 feet north and 1,400 feet west of the southeast corner of Godfrey township.

Sample No. 7, Pillowed Andesite.—South half of lot 10, concession I; 600 feet east and 400 feet north of the southwest corner of Jamieson township.

Sample No. 8, Contact Zone between Granite and Andesite.—North half of lot 10, concession VI; 1,300 feet south and 700 feet east of the northeast corner of Godfrey township.

Sample No. 9, Silicified Pillowed Andesite (150 feet from Granite Contact).—North half of lot 10, concession VI; 1,400 feet south, and 900 feet east of the northeast corner of Godfrey township.

[1]Analyses by the Provincial Assay Office.

also transitional and are poorly defined. Some facies of the hybrid gabbro in contact with granitic rocks resemble the quartz diorite. J. Walker (assistant to the author) has made a study of the gabbro-granite-quartz diorite complex as a thesis problem and has concluded that the quartz diorite is in fact a gabbro that has been altered by late solutions from the granite.

Samples Nos. 1 to 6 in the table show the relationship in chemical composition of the granite-quartz diorite and gabbro. Except for its potash content, the quartz diorite is intermediate in composition between granite and gabbro. Potash is present in both the granite and quartz diorite in the form of orthoclase and sericite. Orthoclase is present only in small amounts, but white mica is a common alteration product of the feldspars. It is possible that some sericite has been introduced into the quartz diorite just as it has been added to the silicified andesite. Judging by the low potash content of both granite and quartz diorite, much of the white mica observed in thin section must be the soda mica, paragonite.

Microscopic study of the basic and acid intrusives supports the theory of a common magmatic origin. Both the basic and acid intrusives have the mineral apatite as an accessory; it is particularly prominent in the gabbro, quartz diorite, and in the porphyritic and granophyric facies of the acid intrusives. In the more normal granitic rocks, apatite is less common and occurs as slender crystals. The quartz diorite, granite, and other acid intrusives are further characterized by the development of granophyric and graphic intergrowths of quartz and feldspar, which are thought to be of primary origin.

The gabbro, quartz diorite, granite, and related intrusives are all cut by narrow trap dikes, which in turn are cut by occasional narrow dikes of mica lamprophyre. Both the trap and lamprophyre have suffered considerable alteration and are older than the Matachewan diabase. The trap dikes are probably a final product of the cooling gabbro-granite magma, since they most commonly occur within the area of intrusive rocks.

Gabbroic Intrusives

Included with this group are the gabbroic intrusives exposed in the northwest corner of the township, and a basic intrusive exposed in two outcrops in lots 4, concessions II and III.

Most of the gabbro of the northwest corner is confined to lots 11 and 12 of concessions V and VI, although small bodies are exposed in lot 10. The majority of exposures are cut up by granitic dikes with the result that the gabbro is a highly altered, hybrid variety. Coarse-grained, uniform gabbro is best developed on the boundary between concessions IV and V in lots 12, where crystals of plagioclase and the mafic minerals are sometimes more than a quarter of an inch in length. The proportion of the mafic minerals to feldspar varies greatly. In some places the gabbro has light-weathering feldspathic segregations, with only sparse hornblende in long "needles." In other places hornblende is present almost exclusively, and the rock is a hornblendite. Magnetite is a common constituent and can be readily seen megascopically. Under the microscope, the coarse gabbro is seen to be a highly altered rock. The feldspars are saussuritized, and the pyroxenes altered to light-green hornblende. Magnetite, ilmenite, sphene, apatite, and quartz are characteristic accessory minerals. Pyroxenes are recognizable only by their stubby outline and occasional relic cleavage traces. They have been altered completely to hornblende, biotite, and chlorite. Feldspars have been altered to a cloudy mass of clinozoisite and albite.

The hybrid varieties of gabbro are too numerous to describe in detail, but the

general effect is a rock of more acid composition. Acicular hornblende, feldspar metacrysts, and diabasic texture are common developments.

The rock mapped as diorite in lots 4 of concessions II and III is probably related to the gabbroic intrusives of the northwest corner of the township. There are only two exposures, both of which are rather fine-grained "greenstones" highly altered by carbonatization and chloritization. Oxidation of the carbonate has produced a brown crust, which is an inch thick in places. On fresh surfaces the carbonate imparts a sugary appearance that obscures the original texture. Carbonate alteration is most intense along the margins of quartz-tourmaline veins and stringers, which are common on the outcrop in concession III.

Thin-section study confirms the extreme alteration of these rocks to a mass of carbonate, chlorite, and clinozoisite. The few remaining feldspars are albite clouded with clinozoisite and have probably resulted from the saussuritization of a lime feldspar. Apatite and leucoxene are the common accessory minerals.

A magnetometer survey, conducted by Minesta Gold Mines, Limited, indicates a zone of high magnetic readings, trending in a southeasterly direction from these outcrops towards a group of diamond-drill holes drilled by the same company, in lots 2 and 3, concession II. In several drill holes "diorite," intruding sediments, has been recorded. It is described in company logs as a fine-grained dark-green rock, alternating with coarser facies that have yellowish feldspars up to a quarter of an inch in length. Chilled margins against the sedimentary rocks have been recorded.

Intermediate Intrusives

The only rock included in this group is a granophyric quartz diorite, or micropegmatite, which occupies an area about a mile in length and a quarter of a mile in width. It extends in a crescent shape from the middle of lot 11, concession V, to the middle of concession VI at the boundary beteeen lots 10 and 11. At its south end, it contacts gabbro but otherwise is enveloped within the main stock of granitic rock. It exhibits transitional contacts with both the granite and the gabbro, but the transition with the latter is over a greater width, and is less distinct. In fact, many of the hybrid varieties of gabbro resemble the quartz diorite in appearance and composition except that they are subject to more variations and gradations.

On weathered surfaces the quartz diorite presents a smooth, pinkish-to-greyish, massive appearance, characterized by a mesh of hornblende needles and small tabular, pink-to-grey feldspar phenocrysts. Quartz is present in varying amounts, but is generally more prominent near granite contacts. The hornblende needles are a prominent feature, with individual crystals ranging from a quarter to one inch in length.

Under the microscope the texture is porphyritic, with tabular phenocrysts of clear albite, ranging from a half to three millimetres in length, in a groundmass consisting of quartz and acid feldspar. Much of the quartz and feldspar in the groundmass occur as a graphic or granophyric intergrowth, which may form a radial pattern around albite phenocrysts, or may form crudely spherical structures, which resemble spherulites when seen on the weathered surface. The hornblende "needles" that are so prominent on the weathered surface are altered to ragged masses of chlorite (*var.* penninite). Apatite and sphene are common accessory minerals. Apatite, which occurs in rod-like prisms, constitutes from two to five percent of the rock. Sphene is less common and is generally altered to an opaque white aggregate (leucoxene). Most of the albite phenocrysts are clear and untwinned, but some exhibit albite twinning. They are altered to white mica and,

to a lesser extent, epidote. Small grains of magnetite accompany chlorite, resulting from the alteration of mafic minerals.

In the transitional zone between quartz diorite and granite the dominant minerals are quartz, chlorite, magnetite, and apatite.

Both in mineral composition and in its occurrence the quartz diorite is intermediate between gabbro and granite. The granophyric texture and the proportions of quartz and feldspar are comparable to the granitic rocks, whereas the development of chlorite, prominent apatite, magnetite, and sphene are comparable to the gabbro. The development of granophyric structures around feldspar nuclei suggests that this peculiar texture is primary.

The origin of this intermediate rock presents an interesting problem. It may be a differentiate that nearly represents the average composition of the parent magma and was intruded somewhat later than the gabbro but before the granite.

Photomicrograph by P. A. Peach.



Photomicrograph of quartz diorite, illustrating the development of granophyric intergrowths around the margins of albite phenocrysts. Specimen from the southwest quarter of the south half of lot 11, concession IV. (Crossed nicols X 50.)

John Walker, who has studied the gabbro-granite complex as a thesis problem at Queen's University, believes that the quartz diorite is a product of thermal alteration of gabbroic rock being intruded by granite.

Granite, Granophyre

The granitic intrusives, including aplite, granophyre, quartz porphyry, and quartz-feldspar porphyry, form the bulk of the post-Keewatin intrusive rocks. This group includes a large variety of rock types, only the most important of which have been mapped as separate units. Nearly all the main rock types include varieties of quartz porphyry, which differ from one another only in minor features.

The main body of granitic rocks forms a stock-like mass in the northwest corner of the township. It crosses into Jamieson township to the north and Turnbull township to the west but is contained mostly within Godfrey township

where it has a length of one and a half miles and a width of almost a mile. It may be connected by a narrow neck to a stock of similar granite of almost the same dimension in Turnbull township. The rock is not a typical granite in either composition or in texture. It has a central core in which granophyric and graphic structures are prominent even on the weathered surface. The margins are more aplitic in appearance having a granular, white-weathering surface. Both the granophyric type and the apilitic type locally develop quartz "eyes" and can thus be classed as quartz porphyries.

The granophyric variety forms the central portion of the stock in lot 11, concession VI, and occurs also near the margin in lot 10. It has a pink-to-grey, weathered surface.

Rounded, spherulitic structures occur in bands that have a general strike

Photomicrograph by P. A. Peach.

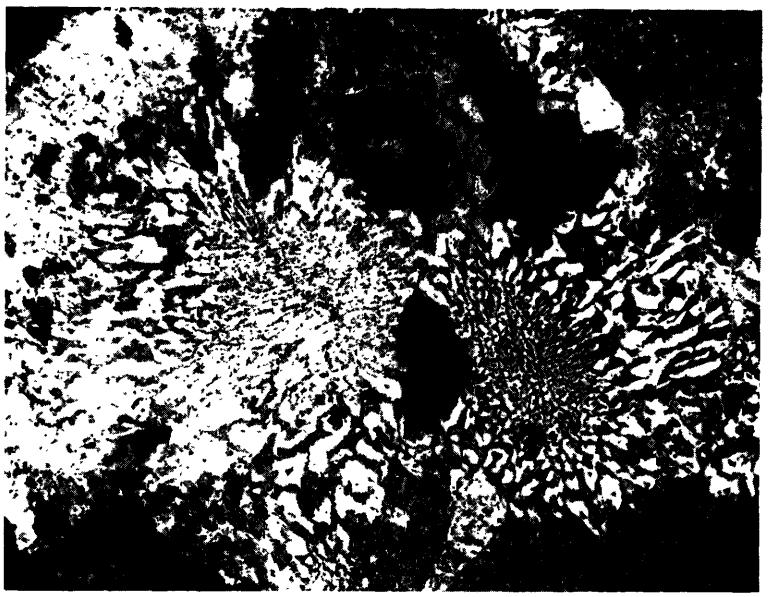


Photomicrograph of aplitic granite, illustrating the graphic intergrowth of quartz (white) and feldspar (grey). Specimen from the northeast quarter of the north half of lot 11, concession V. (Crossed nicols X 50.)

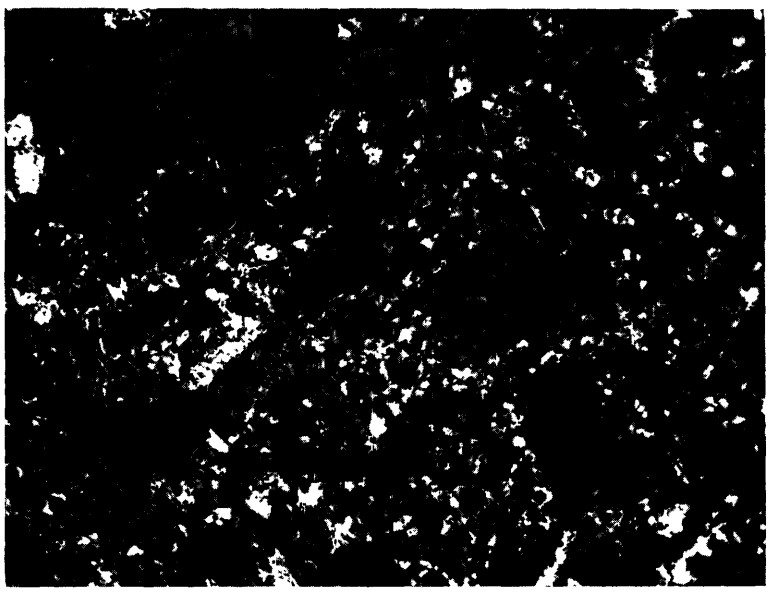
parallel to the margins of the stock. Narrow dikes of such "spherulites" on strike with bands in the granite have been traced into the surrounding volcanic rocks in lot 10, concession VI. Some of these waxy-yellow, sericitized dikes resemble the rhyolites of volcanic origin. One "dike" of spherulitic material has been traced for more than half a mile, in a northeasterly direction, from the south boundary of lot 11, concession VI. In the quartz diorite it forms a clearly defined dike, but in the granite its margins merge with the surrounding rock. It is indicated on the map as granophyre (7a), but is probably related directly to the granite (6a).

In thin section, the "spherulitic" structures are similar to the granophyric and graphic structures already described, of the quartz diorite. However, the granitic variety lacks the well-developed phenocrysts and has a more equigranular intergrowth of quartz and feldspar grains about a millimetre in diameter. Albite is the dominant feldspar, constituting about 40–50 percent of the rock. All the feldspars are highly altered to white mica. Quartz also constitutes 40–50 percent

Photomicrographs by P. A. Peach.



Photomicrograph of granophyric quartz porphyry, illustrating the granophyric texture and development of quartz "eyes" (black). Specimen from the southwest quarter of the north half of lot 11, concession V. (Crossed nicols X 25.)



Photomicrograph of quartz-albite porphyry from the stock southwest of Keeley Lake. Specimen from the northeast quarter of the north half of lot 11, concession III. (Crossed nicols X 50.)

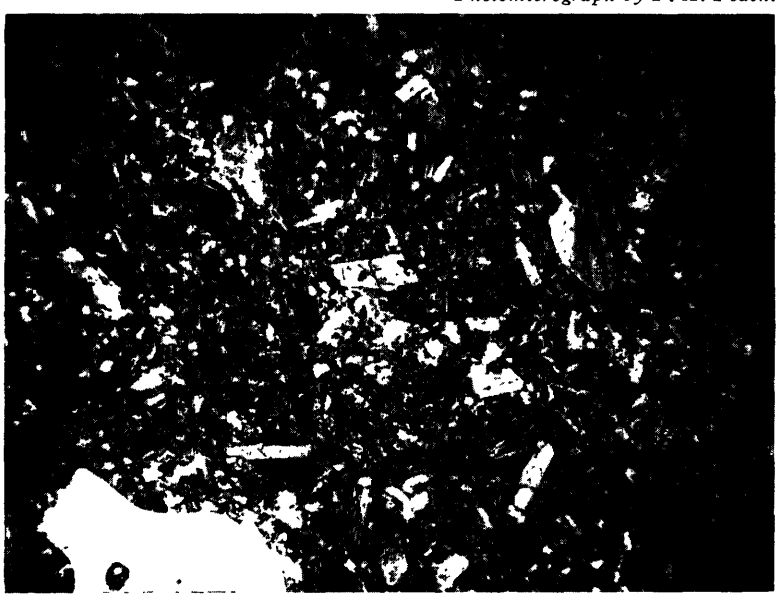
of the rock. The remainder consists of chlorite, sericite, and a small amount of accessory sphene and apatite.

The aplitic variety of granite, which forms the margins of the stock and most of the dikes around the perimeter of the stock, is a granular, white-weathering rock. It consists almost entirely of quartz and feldspar in equal proportions, with minor amounts of chlorite, magnetite, and accessory sphene. The feldspar is almost entirely albite, much of which is clear and untwinned. Granophyric structures are only rarely developed in the aplitic rocks.

Porphyritic Intrusives

Granophyric quartz porphyry (7a), which resembles the granite in most respects except grain size, forms a small stock in lot 11, concession IV, and in

Photomicrograph by P. A. Peach.



Photomicrograph of andesitic intrusive, illustrating the porphyritic texture with albite and quartz phenocrysts. Specimen from the north half of lot 11, concession II. (Crossed nicols X 25.)

lot 12, concession I. The fine-grained texture makes it difficult to distinguish from massive rhyolite except under the microscope where the granophyric intergrowth is well-developed.

The granophyric intrusive that underlies the area south and west of Keeley Lake and the extreme southwest corner of the township is a porphyritic type (7b) with prominent feldspar. It has many variations in colour, but the texture is generally granular to fine-grained. The most common variety is a pinkish, granular rock of syenitic appearance. The feldspar phenocrysts, which average a millimetre in length, are generally not a prominent feature of the weathered surface. In places the colour is greenish, in which case the white tabular feldspars give the rock a diabasic appearance. Close to its margins, the porphyritic granophyre in most places becomes fine-grained and chloritic, resembling andesite on its weathered surface. This is well illustrated on exposures along the southwest

shore of Keeley Lake, where dikes of quartz-feldspar porphyry intrude rhyolite. The andesitic variety is not, however, confined to the marginal facies of porphyry. Green, massive, andesitic-looking rocks occur in bodies, several hundred feet



Quartz-feldspar porphyry of andesitic appearance intruding rhyolite porphyry (light colour), concession II–concession III boundary line, 400 feet west of the lot 10–lot 11 boundary.



Contact between andesitic intrusive (right) and spherulitic granophyre (left), exhibiting peculiar contact phenomena. Large granophyric structures are developed in the andesitic intrusive for several feet from the contact. The granophyre has prominent banding for several feet from the contact. Northeast quarter of the north half of lot 11, concession II.

wide, in lots 10 and 11, concession II. It is only under the microscope that the porphyritic nature of these rocks is evident. Where they are exposed in the same area as andesites of Keewatin age, it is a difficult field problem to separate the two rock types.

All varieties of the porphyritic granophyre weather to a smooth, grey-to-

brown surface, in contrast to the blocky, white-weathering rhyolite. Quartz-feldspar porphyry, intruding sheared rhyolite in lot 12, 1,800 feet north of the boundary between concessions III and IV, truncates the shearing. This is true also of the quartz-feldspar porphyries along the southwest shore of Keeley Lake.

Porphyritic granophyre of andesitic appearance intrudes rhyolite on an outcrop on the boundary between concessions II and III, in the southeast corner of lot 11. The intrusive is well banded parallel to the contact for several feet. About 800 feet farther west, in concession II, the andesitic rock intrudes spherulitic granophyre. Both rocks exhibit unusual contact characteristics that can be seen on several small outcrops in the area. The granophyre, which is generally granular and massive, with a smooth-weathering surface, has well-developed flow banding for about 3 feet from the contact. The intrusive andesite, which is also

Photomicrograph by P. A. Peach.



Photomicrograph of spherulitic granophyre. Radiating spherulitic development can be seen in the upper right-hand corner of the picture. Specimen from the southwest quarter of the south half of lot 11, concession V. (Crossed nicols X 50.)

a massive, uniform, fine-grained rock, has large spherulitic structures up to ½ inch in diameter, confined to a zone about 3 feet wide on the contact.

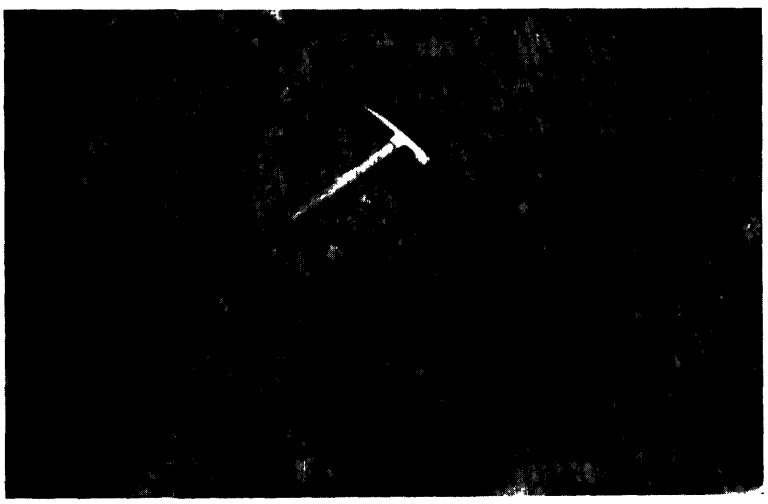
Under the microscope, these fine-grained, porphyritic intrusives exhibit considerable variation in composition and texture. Those varieties that appear andesitic in hand specimens may contain as much as 40 percent chlorite and as little as 5 percent quartz. Albite is the most abundant mineral, forming tabular phenocrysts, which, in the more highly altered phases, are obscured by chloritization and carbonatization. These more basic varieties of porphyry are comparable to the quartz diorite in composition and might properly be included with the intermediate intrusives except that they are inseparably associated with the more acid varieties of porphyry.

The normal porphyritic granophyre varies from quartz-albite porphyry to albite porphyry. Quartz constitutes 10–40 percent of the rock, but in some cases is confined to the groundmass, while in others it forms well-developed phenocrysts. Albite, in the form of small tabular phenocrysts, from a half to

two millimetres in length, is the most common mineral, making up 30–70 percent of the rock. It is generally untwinned and altered to white mica and clinozoisite. The groundmass of quartz and silicic feldspar is commonly intergrown to form granophyric structures, which radiate from the ends of albite phenocrysts, or develop crudely spherical structures.

In all the porphyritic granophyres, the common accessory minerals are leucoxene (after ilmenite) and apatite.

The acid intrusive exposed to the south and east of Steep Lake is a spherulitic granophyre. It seems to have been formed in part by the digestion of the intruded rocks, and has taken on some of their characteristics. Thus, where it is in contact with rhyolite, it has a light-grey or pinkish surface and is altered by sericitization, but where it is in contact with andesite, both rocks are altered by carbonatization, and the granophyre is dark and greenish in colour. A good contact between andesite and granophyre, more sharply defined than usual, is exposed about 400 feet west and 200 feet south of the northeast corner of lot 11, concession IV. Twelve hundred feet south and 800 feet east of the same corner is an outcrop of



Breccia consisting of andesitic fragments in a matrix of intrusive spherulitic granophyre, northwest quarter of the north half of lot 10, concession IV.

angular breccia with blocks of andesite in a matrix of granophyre. Outcrops of granitic quartz porphyry occur within the area of spherulitic granophyres but no good contacts were observed. Several rounded blocks of quartz porphyry, resembling inclusions, were observed in the granophyre just north of the boundary between concessions IV and V, near the centre of lot 10.

Towards the centre of the mass, this granophyre is a pink, granular, smooth-weathering rock with visible feldspar phenocrysts quite similar to the porphyritic granophyre exposed in lots 11 and 12 west of Keeley Lake.

The mineral composition is similar to that of the granophyres previously described. The texture differs in that the groundmass consists mainly of small spherulitic structures made up of clear, silicic feldspar arranged in a radial pattern and exhibiting undulatory extinction.

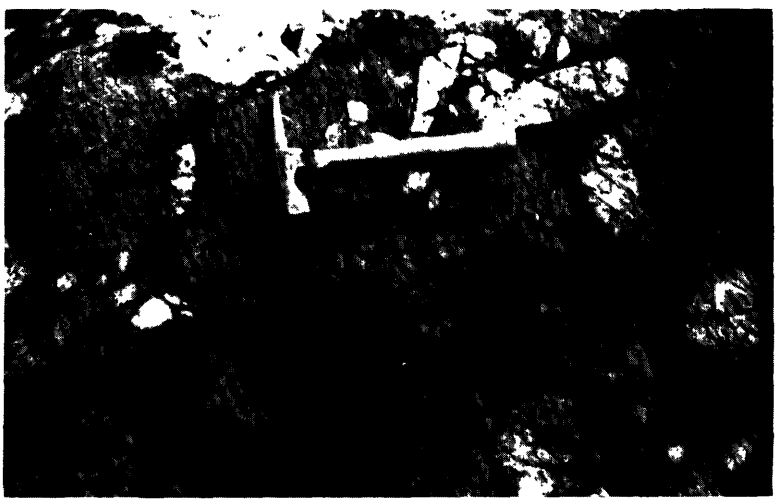
A single narrow dike of feldspar porphyry is exposed on the small andesite outcrop on Little Waterhen Creek, in lot 3, concession IV. It is a distinctive type unlike the other acid intrusives mapped but similar to narrow dikes of feldspar porphyry that intrude sediments at Sandy Falls in Mountjoy township. Pheno-

crysts of pink orthoclase, averaging half an inch in length, occur in a dense, aphanitic groundmass. This porphyry is relatively unaltered and may belong to a later period of intrusion than the acid intrusives exposed in the west half of the township.

Trap Dikes

Narrow basic dikes (see *8* on map), generally less than 20 feet in width, occur commonly in the granitic rocks, in the gabbro, and to a lesser extent, in the surrounding volcanics. They follow a pattern of intersecting fractures, which are probably joints that originated in the cooling intrusives. Chlorite, carbonate, and quartz constitute the bulk of the rocks, but ragged, highly altered feldspars can generally be seen. The accessory minerals, ilmenite and apatite, are common.

These trap dikes are probably the last products of the gabbro-granite intrusive complex. Their composition is quite similar to some of the basic facies of porphyry exposed south and west of Keeley Lake. An interesting breccia is exposed on a small outcrop 500 feet south of the northwest corner of the township.



Breccia consisting of granite and gabbro fragments in a trap matrix, 500 feet south of the northwest corner of the township.

Large blocks of gabbro and granite material are closely packed in a fine-grained groundmass of basic rock. This is thought to be an intrusive breccia of the same age as the trap dikes.

Lamprophyre

Dikes of highly carbonatized lamprophyre (9) intrude all rocks older than the Matachewan diabase. Only two narrow dikes were mapped, both in lot 11, concession VI. The most continuous, striking N.60°E., has a width up to 30 feet, and has been traced for 1,200 feet through granite. It weathers to a soft, greenish-brown surface, with a dissemination of rusted carbonate rhombs and flakes of pale-green chlorite up to a quarter of an inch in diameter.

MATACHEWAN

Dikes of quartz diabase intrude all other consolidated rocks and are considered to be of Matachewan age in keeping with the generally accepted classification of the area. At least twenty separate dikes were mapped, and there is little

doubt that others underlie the drift-covered area in the east half of the township. The majority of the diabase dikes trend N.10°W., but there are many local irregularities. In lots 10 and 11, concession V, a dike striking normal to the general trend was traced for 2,000 feet. Most of the dikes mapped range from a few feet to a maximum of 200 feet in width and have great continuity along their strike. Where they intrude Keewatin volcanics or acid intrusives, they can be readily detected magnetically and form prominent magnetic anomalies. With the assistance of magnetometer survey results, several of the larger dikes have been traced for the full length of the township. No detailed petrographic work was done on these rocks, which have been described in many previous reports of the Porcupine area.

Cenozoic

PLEISTOCENE

Glacial striae recorded in Godfrey township indicate that the Pleistocene ice sheet moved almost due south. In the west, rocky half of the township, glacial deposits consist of poorly stratified gravel, sand and boulders, and boulder clay. Accumulations of such poorly sorted material have been dumped on the south side of rocky hills and ridges, forming long "trains," which taper off to the south. These deposits appear to have been formed as the ice was advancing, probably in its final stages, when the release of pressure behind the bold outcrops permitted the glacial debris to be dumped, and the ice to override it. Some deposits of similar debris are probably moraines.

The large swamps in the southwest corner of the township and most of the east half of the township are covered with clay, deposited in an arm of former Lake Ojibway, which extended up the Mattagami River valley. In many places where streams have exposed fresh walls in the clay, it is varved. An esker deposit of fine sand follows the west bank of the Mattagami River from the north township boundary into concession IV. There it widens into an outwash deposit of sand that covers most of lots 1 and 2, concessions III and IV, and extends into Mountjoy township.

RECENT

Deposits of silt that overlie the varved clays in places along the Mattagami River and its tributaries are probably of Recent origin.

STRUCTURAL GEOLOGY

Folding

Direct evidence of folding is confined to the volcanic rocks in the west half of the township. The dearth of outcrop in the east half of the township causes any interpretation of structure to be highly speculative.

The interbedded rhyolites and andesites in the west half of the township strike north and face east. Although the rhyolites afford little evidence of attitude except in a very general way, the andesites have many pillowed flows that provide good evidence of their attitude. These flows are interrupted by intrusions to the extent that individual members can never be traced for a very great distance. As a result, much of the structural interpretation is based on the attitude of pillows.

The only place where field evidence indicates close folding on a local scale is in concession VI, between lots 8 and 10, in the vicinity of the Jamieson copper

property. Here, a series of isoclinal folds plunge and strike in a southeasterly direction and dip steeply to the northeast. Pillows in this area are elongated in the direction of shearing and, in many cases, distorted in outline.

The axial plane of the main syncline is marked by a zone of strong shearing that is probably also the locus of faulting. The best exposure of sulphides on the Jamieson property is in rhyolite on the north limb of an anticlinal fold where it is intersected by minor faults that strike and dip parallel to the fold axes.

Little is known, except by inference, of the structure of the volcanic and sedimentary rocks in the east half of the township. There are few outcrops of volcanic rock and no outcrops of sediment. Only a few drill holes, combined with information from outcrops in adjoining townships, indicate approximately the area underlain by sedimentary rocks. Sediments underlie most of Mountjoy township, and swing in a broad arc to the southwest into Ogden and Bristol townships. The sediments in southeast Godfrey are presumably a portion of the larger area in Mountjoy township. They may occupy a broad synclinal fold plunging to the east and striking about N.60°E., which is the strike of both sediments and pillow lavas in Mountjoy township, near the Godfrey township boundary.

Shearing

All the exposed rocks, with the exception of the Matachewan quartz diabase, show the effects of regional dynamic metamorphism. The volcanic rocks of Keewatin age have been most highly metamorphosed and are generally schistose to some extent. Where schistosity is best developed, as in lot 10, concession VI, the acid volcanics have been converted to quartz-sericite schists, and the andesitic volcanics to carbonate-chlorite schists. This regional schistosity is probably a result of folding that took place prior to the emplacement of the post-Keewatin intrusives.

Throughout most of the township the schistosity strikes east and dips steeply north at angles greater than 80 degrees. In lots 8 to 10, concession VI, where the volcanics have undergone isoclinal folding, the strike of schistosity is parallel to the strike of the folds, about S.50°E. Schistosity along this zone is probably intensified by faulting along the axis of the main synclinal fold.

In the intrusives of post-Keewatin age, shearing is confined to narrow zones generally less than 20 feet wide. These sheared zones have about the same strike and dip as the regional schistosity but were probably formed by later stresses that developed a series of east-striking faults. Alteration is mainly to sericite and carbonate in the acid intrusives, and to chlorite and carbonate in the basic intrusives. It is often accompanied by minor amounts of sulphide mineralization. Displacement of the walls was observed on several narrow shears in granite in concession VI. In one case a horizontal displacement of 200 feet was measured, the rocks on the south side having moved west relative to those on the north.

Faulting

Three main faults are indicated on the geological map that accompanies this report. Little direct field evidence was seen to support the existence or location of these faults, which have been introduced to account for the unusual termination or displacement of rock masses. The general easterly strike of these major faults is supported by the strike of shearing and by the strike of minor faults whose displacement could be measured.

The fault that crosses the north township boundary in the northeast corner of lot 10, concession VI, follows a zone of intense shearing that strikes N.50°W.

It presumably occupies the axial plane of a synclinal fold and has displaced the truncated north limb. A quartz porphyry flow, exposed in lots 6 and 7, seems to have been displaced about half a mile along this fault zone, the south side having moved west relative to the north side. Minor faults in the vicinity of the Jamieson copper occurrence follow the same strike and may be subsidiary to the main fault.

The second fault zone crosses the west township boundary just south of the fifth concession and strikes N.75°W. It marks the south limit of the gabbro mass in lot 12, and forms the dividing line between andesitic and rhyolitic volcanics in lots 8, 9, and 11. Relative displacement of the andesitic volcanics is to the east on the south side, but the flows are interrupted by acid intrusives to such an extent that the actual displacement cannot be measured.

The third fault zone, shown striking N.80°W. in concessions I and II, is introduced to account for the termination of the wide band of andesitic volcanics extending south from Godfrey Lake. Its location is a matter of speculation as it is in an area of spruce swamp with little outcrop.

The large drift-covered area that separates the volcanics of west Godfrey from the sediments of east Godfrey may mark the location of a regional fault striking in a northerly direction. It is in line with a pronounced topographic lineament following Kenogamissis Lake to the south and the Mattagami River to the north. A major fault in this area could account for the termination of the large area of sediments in the southeast corner of Godfrey township.

A large number of quartz diabase dikes, striking north, suggests that an important zone of weakness existed in this direction.

ECONOMIC GEOLOGY

In spite of the long period of active prospecting in Godfrey township, no production of metals has been achieved, and no property has reached the stage of underground development.

Prospecting work has been done on deposits of gold, copper-zinc, and zinc-lead-silver, in the Precambrian rocks. In the unconsolidated Pleistocene deposits, gravel, suitable for road material is abundant.

The early prospectors, searching for gold-quartz veins similar to those in the Porcupine area, did a thorough job of opening up the quartz exposures. Little work was done on sulphide deposits until the discovery and development of the Kam-Kotia copper-zinc orebody in 1926.

Gold

Quartz veins are found in all the exposed rocks with the exception of the Matachewan quartz diabase, but they are most common in the quartz porphyries and rhyolites. In the massive quartz porphyries the veins generally occupy two prominent sets of fractures striking about N.60°E. and N.10°W. Such veins are seldom more than two feet wide and have little continuity. In the more basic rocks quartz veining is less regular. Sulphide mineralization in the quartz is sparse, consisting of small grains of pyrite, generally concentrated close to the vein walls. Disseminated cubic pyrite is more common in the wall rocks close to the margins of the veins. Visible gold has been reported in quartz veins, but none was seen by the author. Prospecting for gold has met with little success, with the result that very little work has been done in recent years. Most of the old trenches and pits examined are overgrown with brush and partly filled with debris.

Copper-Zinc

The search for base metals in Godfrey township was stimulated in 1926 when Hollinger Consolidated Gold Mines, Limited, optioned the Kam-Kotia deposit in Robb township and began active development work.

Three occurrences of copper-zinc mineralization are given in the list of properties. They are the Jamieson property in lot 9, concession VI; the Phillips-O'Neill property in lot 11, concession V; and the occurrence on the adjoining properties of Mordey Copper Mines, Limited, and Phillips-O'Neill in lot 9, concession III, south of Godfrey Lake. These three deposits have certain features in common with one another and with the Kam-Kotia orebody in Robb township.

At all the localities mentioned, sulphide mineralization occurs in an interbedded series of rhyolitic and andesitic volcanics in which the rhyolite forms lenticular bodies exhibiting both intrusive and extrusive characteristics. Rhyolite is in all cases the principal host rock for sulphide mineralization.

Specimens of massive sulphide from the Godfrey Lake area and the Jamieson property closely resemble specimens of massive sulphide from the Kam-Kotia mine. Chalcopyrite, pyrite, pyrrhotite, and sphalerite occur in that order of abundance. Chalcopyrite, pyrrhotite, and sphalerite occur in sugary grains and narrow irregular veinlets. They are always accompanied by a small amount of quartz that forms a network interwoven throughout the sulphides. Pyrite is generally present in larger masses, often showing concentric and radiating structures. It is fractured and veined by quartz and other sulphides. Only low values in gold accompany the sulphides.

On the Jamieson property, and in the Godfrey Lake area, the intrusive most closely related in location to the sulphide deposits is Matachewan quartz diabase, which forms dikes striking parallel to the zones of mineralization. This close association between sulphide mineralization and diabase has naturally caused speculation as to their possible genetic relationship. In the Godfrey Lake area, the zone of sulphide mineralization parallels a diabase dike for more than half a mile. No stringers of massive sulphide occur in the lavas where they have been altered and baked by the diabase—a distance of about 100 feet from the dike. Although it is true that the zone of sulphide mineralization is parallel to the dike, individual lenses are generally oriented in the direction of regional shearing, almost at right angles to the strike of the diabase. It seems probable that the diabase was introduced into a zone of disseminated sulphide minerals, which were caused to melt and migrate away from the dike, forming a more concentrated deposit outside the area of baking and alteration.

On the Jamieson property, the best exposure of massive sulphide is within 50 feet of a narrow diabase dike, but little sulphide mineralization has been found close to a wider dike situated about 200 feet farther west.

There are in Godfrey township many diabase dikes of similar appearance and attitude and in a similar geologic setting, which are not accompanied by sulphide mineralization. In view of the large number of diabase dikes mapped, it is not surprising that some should occur in areas of sulphide mineralization.

Zinc-Lead-Silver

One narrow quartz vein, carrying sphalerite, galena, chalcopyrite, silver, and gold, is exposed in the extreme northwest corner of the township. It is the extension of a persistent vein that outcrops in Jamieson township.

Gravel

Deposits of poorly sorted sand and gravel are common throughout the west half of the township. No gravel suitable for concrete was seen, but most of the gravel is suitable for road building. Two pits have been opened up, one on each side of the Kamiskotia road in lot 8, concession VI. These are in a large deposit formed on the south slope of Mount Jamieson.

RECOMMENDATIONS FOR PROSPECTING

Godfrey township has been intensively prospected for over forty years, and as a result, most of the exposed rock has been thoroughly examined. Very few of the mineral occurrences examined by the writer have been discovered within the past fifteen years. In some cases the work dates back beyond the knowledge of those men now familiar with the area.

New discoveries may yet be made by prospectors working with conventional prospecting tools, but in general, the area has passed into the stage where more scientific methods are required.

The best possibility for geophysical prospecting is in locating copper-zinc replacement bodies. Electro-magnetic methods might be successful in picking up such sulphide deposits under some of the shallow swamps and drift-covered ground in the west half of the township.

The band of interbedded rhyolitic and andesitic volcanics which extends from lots 9 and 10, concession VI, to lots 8 and 9, concession II, contains all the known occurrences of copper-zinc mineralization in the township and deserves further investigation by geophysical methods.

The Jamieson copper-zinc deposit occurs within a zone of shearing, faulting, and folding that trends S.50°E. Little investigation has been carried out along this zone except where rock exposures are plentiful in the immediate vicinity of the Jamieson property.

No recommendation can be made concerning future prospecting in the east half of the township. The scarcity of outcrops makes it difficult to obtain even a general outline of the structure of the underlying Precambrian rocks. At the same time, the great depth of overburden presents a challenge to the useful employment of geophysical methods in their present state of development. Diamond-drilling, without the benefit of more detailed geological information, is a costly and unsatisfactory method of prospecting in an area such as this.

DESCRIPTION OF PROPERTIES

Armada Porcupine Mines, Limited

Armada Porcupine Mines, Limited, holds a group of 29 unpatented claims comprising the north half of lots 5, 6, and 7 in concession II; the northwest quarter of the south half of lot 4, concession III; all lot 5, concession III, except the northeast quarter of the north half; lot 6, concession III; and the southwest quarter of the south half of lot 5, concession IV.

Only one outcrop was found on this large group of claims. It is in the northeast quarter of the north half of lot 6, concession III.

The outcrop consists of andesitic lava cut by a dike of quartz diabase 120 feet wide. The andesite is moderately carbonatized and sheared, but some poorly

developed pillow structures are preserved. In the northeast corner the andesite is silicified, and it contains patches of cherty material. A diamond-drill hole, collared in the diabase dike, has been drilled to intersect this silicified zone, but the results are not known to the writer.

It may be that the fault, indicated farther west in concession IV, continues past the north end of this outcrop on the Armada property and is responsible for the shearing and alteration.

Brunette Porcupine Gold Mines, Limited

The property of Brunette Porcupine Gold Mines, Limited, consists of 15 unpatented claims. They are made up of the north half of lot 8, concession II; the southeast and southwest quarters of the north half of lot 9, concession II; the northwest, northeast, and southeast quarters of the north half of lot 10, concession II; the southeast and northeast quarters of the south half of lot 11, concession III; and the north half of lot 11, concession III.

The property in concession III is underlain largely by dense rhyolite intruded by porphyritic granophyre and quartz porphyry.

The strip of claims in concession II is located on the band of interbedded rhyolite and andesite that extends south from Godfrey Lake. The sulphide replacement deposits south of Godfrey Lake are in this band of rocks, which is covered with overburden on the Brunette Porcupine property.

Mrs. R. G. Burke

Mrs. R. G. Burke holds two groups of unpatented claims in Godfrey township.

Group I consists of seven unpatented claims, comprising all lot 7, concession III, except the southwest quarter of the north half.

Group II consists of 23 unpatented claims in concessions IV and V. It includes all lot 8, concession IV, except the southeast quarter of the south half; all lot 9, concession IV, except the southwest quarter of the south half; the northwest quarter of the south half of lot 10, concession IV; the southwest, southeast, and northeast quarters of the north half of lot 10, concession IV; the northeast quarter of the south half of lot 11, concession IV; the southeast quarter of the north half of lot 11, concession IV; the southeast quarter of the south half of lot 10, concession V; and the southeast and southwest quarters of the south half of lot 9, concession V.

GROUP I

Only one outcrop, in the south half of lot 7, concession III, was found on this group of claims. Sand, gravel, and boulders cover most of the property except for a strip along the east margin, which is covered with clay and spruce swamp.

The outcrop is of rhyolite porphyry intruded by a dike of quartz diabase.

GROUP II

Several mineral occurrences in widely separate areas on this claim group have been developed by surface-trenching and stripping.

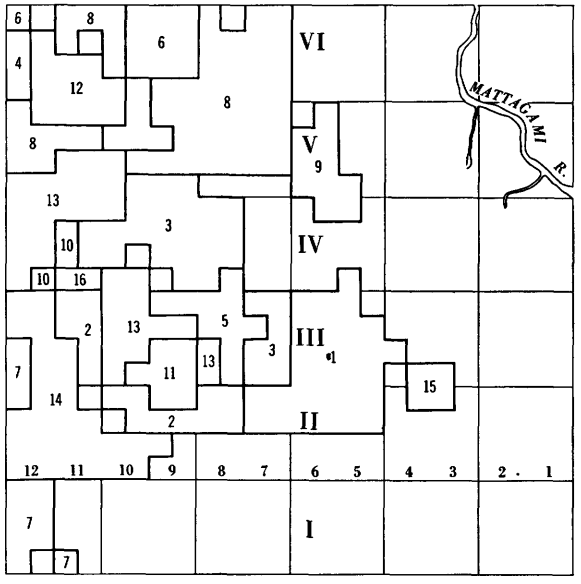
Claim P.34741

The only recent work has been done on claim P.34741, which occupies the southwest corner of the south half of lot 8, concession IV. During the summers of 1949 and 1950, surface-trenching and stripping was in progress on an outcrop area

that is underlain by andesite intruded by dikes of quartz porphyry. Fine-grained disseminated pyrite occurs in some places in the quartz porphyry where it has been sheared and converted to sericite-quartz schist. Prospectors Gus. Swanson and Tom Lyons panned gold from the weathered schist, but subsequent trenching failed to outline a continuous zone of mineralization. Character samples taken by the writer gave only a trace of gold.[1]

Claims P.28005 and P.28006

Several veins have been uncovered by surface-trenching on claims P.28005 and P.28006, which constitute the northeast quarter of the north half of lot 10.



Plan showing the boundaries of mining properties listed under "Description of Properties."

1. Armada Porcupine Mines, Ltd.
2. Brunette Porcupine Gold Mines, Ltd.
3. Mrs. R. G. Burke.
4. The Digby Dome Mines Co., Ltd.
5. A. Hubert.
6. G. Jamieson.
7. Kennco Explorations (Canada), Ltd.
8. P. A. Kindree.
9. H. Leblanc.
10. W. J. Magavern.
11. Mordey Copper Mines, Ltd.
12. New Walcoro Mines, Ltd.
13. Phillips-O'Neill.
14. Rual Porcupine Mines, Ltd.
15. P. Sheehan.
16. J. Smith.

concession IV; and the northwest quarter of the north half of lot 9, concession IV.

The area in which the veins occur is close to the west boundary of a large body of rhyolite that is in contact with a small stock of spherulitic granophyre to the west. The rhyolites are weakly sheared and sericitized. They are relatively uniform, lacking any flow characteristics. Within the rhyolite there are discontinuous lenses of andesite, which, like the rhyolite, is fine-grained and uniform without flow characteristics. Both andesite and rhyolite are intruded by narrow lenticular bodies of grey granite, elongated in the direction of shearing. A diabase dike, 150 feet wide, strikes N.°10E. through the east half of claim P.28005,

[1]All samples taken by the writer were assayed by the Provincial Assayer.

separating two of the chalcopyrite-bearing occurrences. (See accompanying geological plan.)

In claim P.28006, about 300 feet east of the southwest corner, a quartz vein has been exposed in a series of six pits and trenches for a length of 280 feet north from the south boundary. The vein strikes N.5°W., dips 80°–85°W., and ranges in width from 12 to 36 inches, with many branching stringers that diverge into the walls. It is in rhyolite throughout most of its length, but at the north end it intersects a small mass of granite and is dissipated into a stockwork of narrow quartz stringers. The vein, which has ribbon structure in the widest parts, is a milky quartz with a minor amount of carbonate and is almost barren of sulphide. The wall rock is highly carbonatized and oxidized. A character sample taken by the author assayed only a trace of gold.

In claim P.28006 a carbonate vein can be traced from a point 70 feet east of its southwest corner for about 400 feet to the north. It strikes almost due north, dips 85°E., and ranges in width from 3 to 18 inches. In most places it is a vein breccia, with angular fragments of rhyolite in a matrix of brown-weathering, grey carbonate cut by quartz stringers. The south end of the vein, exposed in two trenches near the claim boundary, is narrow and not well mineralized. At its northern extremity the vein breaks up into a fractured, carbonatized zone with stringers of quartz over a width of 4 feet. In four pits near its north end, the vein is well mineralized over widths of 12–18 inches with small masses of chalcopyrite and pyrite and a little galena. A character sample of the best mineralized material in this section of the vein assayed only a trace of gold.

About 70 feet west of the carbonate vein described above, stripping and trenching has exposed a narrow quartz vein that strikes north from the south margin of, and along the boundary between, claims P.28005 and P.28006. The vein is barren, milky quartz and reaches a maximum width of 31 inches. Its wall rocks are carbonatized spherulitic granophyre.

Shallow pits have been sunk on other veins of milky quartz that have little continuity and carry only sparse sulphides.

The best-mineralized vein on the property is on claim P.28005, about 500 feet north and 250 feet west of its southeast corner. The strike of this vein ranges from N.15°E. to N.15°W., and the dip is vertical. It is in rhyolite that is somewhat baked and altered to a dense, dark-grey rock by diabase, which occupies low ground to the west. The vein, which has been traced for 120 feet, passes into low swampy ground at both ends. Its width ranges from 5 to 24 inches; but there are narrow stringers which diverge into the walls, particularly in the pit near the north end of the exposure. The gangue material is milky quartz, with a minor amount of grey carbonate. Ribbons and fragments of chloritized wall rock are common. Sulphides constitute 5–20 percent of the vein material. Chalcopyrite, forming a network of lacy veinlets and small irregular masses, is the principal sulphide. A minor amount of black mineral in tiny grains, thought to be sphalerite, accompanies the chalcopyrite. Two character samples of the best mineralized vein material taken by the writer assayed 0.11 and 0.05 ounces of gold per ton.

West of the diabase dike and about 200 feet northwest of the vein described above, a long trench has been excavated on a narrow vein that strikes N.70°E. for a distance of 50 feet west from the diabase. This vein, which is the only east-striking vein in the area, is similar in character to the north-striking vein that lies along the east margin of the diabase. It is only 1–3 inches wide, but narrow stringers penetrate the wall rock, which is grey granite. At its west end the vein intersects a contact between granite and andesite and pinches out. The vein material is milky quartz carrying chalcopyrite in pods, which in some cases occupy the full width of the vein.

Digby Dome Mining Company, Limited

Digby Dome Mining Company, Limited, holds patented claims that adjoin a larger group held by the company in Turnbull township. The three claims, P.13073–P.13075, form a strip along the west boundary of the township in lot 12, concession VI.

Little development work has been done on the claims in Godfrey township. They are underlain mainly by gabbro, but the only outcrops are in claim P.13075, near the south boundary of the property.

A few trenches, near a diabase outcrop in P.13075, are in overburden, and the walls have caved.

A. Hubert

A. Hubert holds a group of ten claims in concessions III and IV. Five claims, P.12711–P.12713, P.22325, and P.22326, are patented. The property comprises the southwest quarter of the north half of lot 7, concession III; the northeast and southeast quarters of the south half of lot 8, concession III; the north half of lot 8, concession III; the northwest and northeast quarters of the north half of lot 9, concession III; and the southeast quarter of the south half of lot 8, concession IV.

These claims, which include the north and east shores of Godfrey Lake, are underlain by andesite intruded by lenticular bodies of rhyolite porphyry. Both andesite and rhyolite are sheared in a N.75°W. direction. The rhyolite is generally somewhat fragmental but has well-developed quartz-eyes in a waxy yellow sericitized matrix. The andesite is a massive, dark-green, chloritic type, except in a few areas where it is highly carbonatized. Contacts between andesite and rhyolite are characterized by interfingering and brecciation. Carbonate alteration is generally more intense near the contacts and is often accompanied by disseminated, granular pyrite.

Development work on the property has been confined to the excavation of surface pits and trenches. Most of the work has been done on the large outcrop area in the north half of lot 8, concession III.

At a point 720 feet east and 450 feet south of the northwest corner of lot 8, concession III, a pit, about 20 by 5 by 8 feet deep, has been sunk in rhyolite porphyry. The sheared rhyolite carries disseminated pyrite over a width of several feet. Character samples of the mineralized rhyolite assayed only a trace of gold. In the same outcrop area, several smaller trenches have been excavated in rhyolite porphyry, or on contacts between rhyolite and andesite where disseminations of pyrite are concentrated.

Close to the east margin of the outcrop area described above, a shallow pit has been sunk in overburden. It is located about 1,200 feet west and 240 feet south from the northeast corner of lot 8, concession III. The pit has exposed a small area of andesite cut by a narrow, east-striking lens of vein breccia. The breccia, which consists of angular fragments of andesite in quartz-calcite vein material, carries a small amount of galena. It has little continuity and does not appear on the outcrop about 50 feet to the west.

Several shallow pits have been sunk in highly carbonatized andesite located about 800 feet south and 700 feet west of the northeast corner of lot 9, concession III. The andesite in this area is carbonatized to such an extent that fresh surfaces have a yellowish, sugary appearance. The weathered surface has a crust of deep-brown oxidation up to an inch thick. The most westerly pit, on the side of the outcrop sloping down toward Godfrey Lake, has a narrow quartz vein exposed along a vertical rock face. The quartz is well mineralized with pyrite, chalco-

pyrite, and a minor amount of galena. The wall rock is oxidized for a width of about two feet. A character sample of well-mineralized vein material taken by the author assayed only a trace of gold and silver.

G. Jamieson (Zinc-Lead-Silver Property)

Claim P.10583 is a patented claim, which occupies the northwest quarter of the north half of lot 12, concession VI, in the extreme northwest corner of the township. It forms part of a large property held by George Jamieson in Jamieson and Robb townships.

Development work on claim P.10583 is on the extension of a very persistent quartz vein that is exposed for 400 feet in Jamieson township, where it is mineralized with galena, sphalerite, and chalcopyrite. L. G. Berry gives a complete description of this occurrence.[1]

Only one trench has been excavated on the vein in Godfrey township. In this large trench the vein is exposed for a length of 60 feet, striking N.65°E. along the south edge of a hill of gabbro. No well-defined fault, such as characterizes the vein in most places, can be seen in this trench. Sulphide mineralization occurs over several feet in a highly silicified zone with walls that grade into unaltered gabbro. Sulphides, which consist of disseminated sphalerite and pyrite, constitute less than five percent of the silicified zone.

G. Jamieson (Copper-Zinc Property)

INTRODUCTION

The Jamieson property has been described by S. A. Ferguson.[2]

Little additional work has been done since 1943 when Ferguson examined the property. However, in 1947 a forest fire swept over that part of Godfrey township and exposed a great deal of rock that had previously been covered with moss and other vegetation. This destructive fire provided an opportunity to map the Jamieson copper claims in greater detail than had been possible formerly.

PROPERTY

The property consists of nine patented claims in Godfrey township adjacent to the Jamieson township boundary, and three adjoining patented claims in Jamieson township. In Godfrey township they occupy the north half of lot 9, concession VI; the northeast and northwest quarters of the south half of 9, concession VI; the northeast quarter of the south half of lot 10, concession VI; and the northeast and southeast quarters of the north half of lot 10, concession VI. The copper "showings" are on claims P.27861 and P.27862, described as the northwest quarter of the north half of lot 9, concession VI and the northeast quarter of the north half of lot 10, concession VI.

ACCESS

The motor road from Timmins to Kamiskotia crosses the northeast corner of claim P.27861 less than a quarter mile from the principal mineral occurrence.

HISTORY AND OWNERSHIP

The northwest quarter of the north half of lot 9, concession VI, in which the best mineralized occurrence is located, was staked in November, 1926, as claim

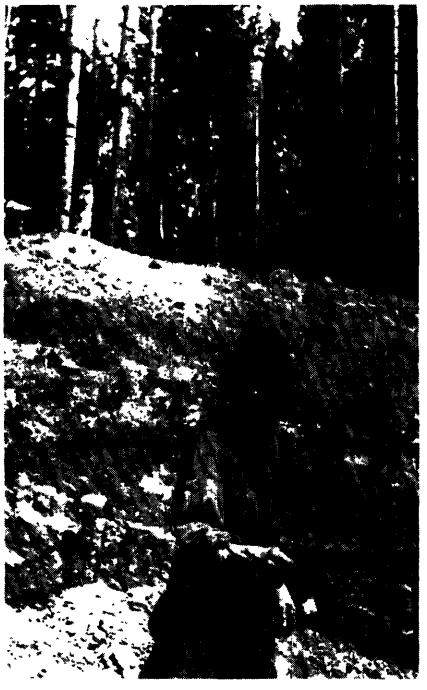
[1]L. G. Berry, *Geology of the Robb-Jamieson Area*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 4, pp. 15–16.

[2]S. A. Ferguson, *Some Copper Properties in Robb, Jamieson, and Godfrey Townships*, Ont. Dept. Mines, Vol. LIII, 1944, pt. 4, pp. 27–29.

P.12790 for John Shankman of Timmins. It was part of a group of claims optioned to Noranda Mines, Limited, at that time. Surface development by Noranda Mines was largely confined to a gold occurrence on the west boundary of the property.

In 1935 the claim was restaked as P.20533 by Gus. Swanson of Timmins. He held it until 1941. Mr. Swanson did most of his work on an exposure of disseminated sulphide located about 200 feet to the northeast of the massive sulphides later exposed by George Jamieson.

In December, 1941, Mr. Jamieson staked the ground as claim P.27861, and he has held it since that time. A great amount of trenching and excavation has been done, largely by Jamieson himself. With no outside financial assistance, Jamieson has also completed 2,500 feet of diamond-drilling.



George Jamieson, veteran prospector of Godfrey township.

GEOLOGY

Keewatin volcanic rocks, of acid to intermediate composition, underlie most of the Jamieson property. They are intruded by a few narrow aplitic and spherulitic dikes that are probably related to the stock of granophyric granite that outcrops about half a mile to the west. Dikes of Matachewan diabase, striking slightly west of north, cut the older rocks and the mineralized zone, truncating the shearing at about 40 degrees. (See geological plan of part of the Jamieson property in back pocket.)

The rhyolitic rocks of Keewatin age include flows, pyroclastics, sills, and dikes. The intermediate rocks of Keewatin age include massive and pillowed flows, pyroclastics, and narrow bands of tuff. Some of the rock classed as spherulitic rhyolite may be of post-Keewatin age, and genetically related to the granitic rocks that crop out farther west.

The fresh rhyolite is a dark-grey, siliceous rock with prominent "eyes" of glassy quartz, and a white-weathering surface. The fresh surface is, in some cases, darker in colour than the fresh surface of andesite, but the siliceous nature is apparent both on fresh and weathered surfaces. Alteration to sericite is widespread, especially in the spherulitic lavas. It produces a rock that is waxy yellow both on freshly broken and weathered surfaces.

The andesitic flows are dark-green and chloritic except in the zone of mineralization and close to contacts with rhyolite sills and dikes. Here they are silicified and develop "eyes" of quartz. Silicification can be seen extending along tuffaceous bands in andesite where it is intersected by rhyolitic dikes.

The rocks in the mineralized zone are so highly altered that it is difficult to be certain of their origin except that they fall within a band of rhyolite that can be traced from outside the area of intense alteration. Ferguson[1] examined the rock microscopically and described it as follows:

> In the mineralized portion of the shear zone the rock is very fine grained and black in colour. Examination of a thin section shows that it contains about equal amounts of quartz and chlorite. Most of the quartz is in extremely small crystals, but a few larger crystals are present, giving a porphyritic texture. The black colour is caused by minute flakes of graphite. A few small fragments appear which resemble the spherulitic rhyolite that is exposed in the vicinity. Probably some fragments have been deformed by shearing. Small veinlets of quartz and carbonate traverse the groundmass. Pyrite appears along these veinlets and has also replaced parts of the spherulitic fragments. This rock is a chlorite schist that has been silicified and mineralized.

STRUCTURE

The Keewatin volcanics on the Jamieson property have been tightly folded to form a series of steeply dipping isoclinal folds that strike N.50°W. Folding has been obscured and complicated by shearing and faulting, and by the intense alteration along the mineralized zone.

Regional shearing, striking N.50°W., has affected all the volcanic rocks, but it is best developed in the rhyolites. Narrow zones of more intense shearing are developed locally, striking parallel to the regional schistosity, and dipping vertically or steeply to the northeast. Faulting has taken place along some of the narrow sheared zones, which truncate tuffaceous bedding in a band of rhyolite exposed about 500 feet southeast of the main pit.

Apparently faulting has also taken place along the north-striking fractures that have been occupied later by diabase dikes. Andesitic and rhyolitic flows have great variations in width on the two sides of diabase dikes.

Sulphide mineralization is associated with shearing and faulting on the north limb of a minor anticlinal fold. The greatest concentration of sulphides exposed to date is located about 50 feet east of a dike of quartz diabase.

DESCRIPTION OF DEPOSIT

Development work has been concentrated in three areas on the property. Two of these are along the same strike in sheared rhyolite, being separated by the quartz diabase dike and by covered ground. The east copper "showing" is on claim P.27861, and the west copper "showing" on P.27862. The third is a gold "showing" that lies near the west boundary of claim P.27862, to the west of the copper "showings."

The most impressive "showing" on surface is on claim P.27861, near the southwest corner. It is exposed in an open pit, 125 feet long and 10–40 feet wide. The north half of this pit was filled with water at the time of the present examination. In the south half, massive sulphides reach a maximum width of 10 feet, but

[1] S. A. Ferguson, *op. cit.*, p. 28.

they pinch out towards the south edge of the pit. The west wall is heavily mineralized with disseminated sulphides that can be traced beyond the massive lens to the south. Ferguson[1] states that:

> The sulphide zone is exposed continuously for 90 feet in the main pit. The next 20 feet to the southeast is not so well exposed, but beyond this point another 20 feet of well-mineralized material is present. Throughout much of its length the massive sulphide zone is 4½ feet wide, but the south end is narrower. On the west side of the massive sulphides 3 to 4 feet of disseminated sulphides occur.

Disseminated sulphides with massive lenses and veinlets are exposed over a length of 270 feet. At the north end the sulphide zone passes into deep overburden, and on the south end it clings to the edge of the outcrop and may be present under covered ground to the west.

Seven diamond-drill holes were located over a length of 350 feet along the strike to test this zone at shallow depths. The most northerly hole (No. 3) intersected a diabase dike and was not continued through the dike to the projected location of the mineralized zone.

The accompanying table gives a summary of the values obtained in the best-mineralized sections of holes Nos. 1–7.[2]

Diamond-drill hole	Angle	From	To	Core length	Values[3]		Description
					Copper	Zinc	
		feet	feet	feet	percent	percent	
No. 1.....	46°	44.5	63.0	18.5	3.49	7.27	Two sections of massive sulphides separated by 5 feet of disseminated sulphide.
No. 2.....	45°	81.5	110.0	28.5	1.24	1.50	Includes two sections of massive sulphides, 9 and 3.5 feet in core length, and 9.7 feet of barren rock not assayed.
No. 4.....	60°	143.8	146.9	3.1	1.46	0.90	Disseminated sulphides.
No. 5.....	45°	54.7	62.0	7.3	3.56	3.87	80 percent massive sulphides.
No. 6.....	60°	57.8	70.2	12.4	0.27	(4)	Disseminated sulphides.
No. 7.....	60°	117.5	120.7	3.2	0.53	(4)	Disseminated sulphides.

Holes Nos. 2 and 4 were drilled at 45 and 60 degrees, respectively, to intersect the mineralized zone directly beneath the main pit. Hole No. 2 intersected the zone at a vertical depth of 30 feet, indicating a steep dip to the northeast on the massive sulphide lens. Disseminated sulphides were present throughout this hole from 60 to 178 feet, with massive sulphides occurring in three places over core-lengths of 9½ feet, 3½ feet, and 9 inches. Hole No. 4 intersected the zone at a vertical depth of 130 feet where 20 feet of core carried about 50 percent sulphides in massive form. In this case massive pyrite in radiating and concentric nodules made up most of the sulphide zone. Disseminated sulphides, including chalcopyrite and sphalerite, were encountered in quartz-carbonate stringers and veinlets throughout most of this hole.

Diamond-drill holes Nos. 5 and 6 were located 150 feet south of No. 2. They were both drilled from the same set-up at angles of 45 and 60 degrees, respectively. Hole No. 5 intersected 8 feet of massive sulphides at a vertical depth of 45 feet. This section carried about 80 percent sulphide minerals, including pyrite in coarse, fractured cubes, and both chalcopyrite and sphalerite as fracture fillings

[1] S. A. Ferguson, *op. cit.*, p. 28.

[2] Sampling and assaying by Goldale Mines, Limited.

[3] A small amount of silver, up to 9.5 ounces per ton over a core length of 3.5 feet, and low values in gold, up to 0.06 per ton over a core length of 0.8 feet, were also reported.

[4] Not assayed.

with minor amounts of quartz. Hole No. 6 encountered 20 feet of scattered disseminated sulphides, but only 6 inches of massive sulphides

Holes Nos. 1 and 7 were drilled on the same section, 40 feet apart and 90 feet southeast of No. 5 hole. Hole No. 1 is a 46-degree hole; and No. 7, located 40 feet behind it, is a 60-degree hole. Disseminated sulphides occurred throughout hole No. 1 in varying amounts, and three intersections of massive sulphides including chalcopyrite, sphalerite, and pyrite were also encountered in core lengths of 10½ feet, 1½ feet, and 6 inches. Thirty-two feet of core from 219 and 251 feet carried 50 percent sulphides consisting largely of massive pyrite in concentric and radiating concretions. Hole No. 7 was drilled to a depth of 150 feet, and encountered only disseminated sulphides; but it seems probable that it did not pass through the entire zone of sulphide mineralization.

Ferguson[1] gives a description of the mineral occurrence in the main pit:

> The weathered outcrop is dark blue-black in colour with occasional patches of green and a mottling of pyrite. This material is porous and crumbles to the touch. The green colour is given by malachite, and the blue is mainly covellite. Some fragments from the pit have a coating of white powder along schistosity planes, which probably is a sulphate. Pyrite is present as very fine cubes and also as rounded nodules as much as a quarter of an inch in diameter. Many of these concretions have a radial structure when broken.
>
> Where blasting has exposed fresher material, the massive zone is in places brecciated. In the disseminated zone the sulphides are largely restricted to veinlets, which enlarge in places to augen-like masses. These veinlets are mainly parallel to the schistosity, but smaller veinlets cut across it. In the massive zone, sulphides make up an estimated 80 per cent of the rock. Over the 4½-foot width where this zone is exposed in the main pit, half of the sulphides is estimated to be pyrite with the remainder equally divided between chalcopyrite and sphalerite. Rather than being present in equal proportions, one or other of these last two minerals tends to predominate.
>
> Quartz, carbonate, pyrite, chalcopyrite, and sphalerite were formed in the earliest period of mineralization, probably in the given order. This was followed by brecciation. After the brecciation a fibrous variety of quartz as well as concretionary pyrite, which contains chalcopyrite and sphalerite, formed. Supergene minerals, such as malachite, covellite, and sulphate(?) have formed in the zone of weathering.

About 1,200 feet northwest of the main pit, a second area of sulphide mineralization, which is exposed on surface, has been actively developed by trenching. This mineralized area lies along the projected strike of the same zone of shearing in which the main copper "showings" occur, and is in rhyolite interbedded with andesite and folded into a series of drag folds. Disseminated sulphides occur in the sheared rhyolite on both flanks of a minor anticline. The andesite forming the core of the anticline has fractured into a series of closely spaced, uniform fractures striking N.70°E. These fractures are filled with quartz-tourmaline vein material, which carries only small amounts of pyrite. They also occur in the rhyolite but are much less common than in the andesite.

Disseminated sulphides occur in the rhyolite over a zone roughly 300 feet in diameter and, to a lesser extent, in andesite near the contacts. No massive sulphide lenses of importance have been uncovered in this area, and most of the disseminated type of sulphide is pyrite. Chalcopyrite is also present, and malachite alteration was observed in some of the pits. In diamond-drill hole No. 10, which penetrated part of this mineralized zone, a section of core, 5.6 feet in length, assayed 0.14 percent copper

The third area which has been developed by trenching and rock excavation is near the west boundary of claim P.27862. Development work on this "showing" was first begun by Noranda Mines, Limited, and has been continued by George Jamieson. A pit has been sunk on a vein breccia consisting of quartz with angular fragments of andesitic wall rock and a little carbonate, the vein having a maximum width of 18 inches. Pyrite occurs in coarse crystals and in seams

[1]S. A. Ferguson, *op. cit.*, pp. 28–29.

and masses. A small amount of chalcopyrite accompanied by dark-grey sphalerite is also present.

To the north and west of the large pit, which is on an outcrop of andesitic lava, a stockwork of quartz stringers is exposed. Two small pits have been sunk on small lenses of massive sulphide with minor amounts of quartz.

Low values in gold are reported by various prospectors who have worked on this outcrop. A character sample of vein material including chalcopyrite and sphalerite, taken by the writer, assayed 0.02 ounces of gold per ton.

Kennco Explorations (Canada), Limited

In the fall of 1951 Kennco Explorations (Canada), Limited, acquired, by staking, a large group of claims in the southwest corner of Godfrey township and the southeast corner of Turnbull township.

The group was staked around an occurrence of gold in quartz in Turnbull township. Only eleven claims were staked in Godfrey township on the east edge of the property. They comprise the northwest and southwest quarters of the south half of lot 12, concession III; the northwest quarter of the north half of lot 12, concession II; all lot 12, concession I, except the southeast quarter of the south half; and the southwest quarter of the south half of lot 11, concession I.

The property is underlain mostly by rhyolite intruded by granophyre and quartz porphyry.

Geological mapping and surface prospecting were carried out during the summer of 1952, but work on the claims was suspended in the fall.

Work has been done by former owners on a quartz-carbonate vein, located about 75 feet east of the boundary between Godfrey and Turnbull townships at a point 750 feet south of the centre line of concession III. Here a timbered shaft of unknown depth has been sunk through overburden. Judging by material on the dump it was sunk on a vein of quartz-carbonate. A few pieces of broken quartz are mineralized with chalcopyrite in the form of small grains and irregular masses up to half an inch in diameter. A pit, 10 feet deep, is located thirty feet to the south of the shaft on a quartz stringer zone in sheared, sericitized rhyolite. Only one small grain of chalcopyrite was seen in quartz on the dump. Thirty feet west of this pit, a quartz vein, 10 feet wide, is exposed in a trench. It strikes N.65°E., towards the timbered shaft. Vein material is white quartz-carbonate with a little pink calcite. No sulphides were observed.

P. A. Kindree

P. A. Kindree holds three groups of claims in the north half of Godfrey township. The three groups are made up of a total of 48 unpatented claims. Group I has six claims which include the northwest quarter of the south half of lot 10, concession VI; the northwest and southwest quarters of the north half of lot 10, concession VI; and the north half of lot 11, concession VI, except the southeast quarter. Group II has seven claims that occupy the northwest, southwest and southeast quarter of the north half of lot 12, concession V; the northeast and northwest quarters of the south half of lot 12, concession V; and the southeast and southwest quarters of the north half of lot 11, concession V. Group III is made up of 35 claims which occupy all lot 7, concession VI; all lot 8, concession VI, except the northeast quarter of the north half; the southeast and southwest quarters of the south half of lot 9, concession VI; the north half

of lot 7, concession V; the northwest and northeast quarters of the south half of lot 7, concession V; the north half of lot 8, concession V; the northwest and northeast quarters of the south half of lot 8, concession V; the northwest, northeast and southeast quarters of the north half of lot 9, concession V; the northwest and northeast quarters of the south half of lot 9, concession V; and the northeast quarter of the south half of lot 10, concession V.

Group I is underlain entirely by the granite stock that occupies most of lot 11, concession VI. A few shallow trenches have been excavated on narrow quartz-stringer zones carrying sparse pyrite.

Group II is underlain by a complex of granitic and gabbroic intrusives. In the northeast quarter of the south half of lot 12, concession V, a little surface work has been done on a quartz vein in aplitic granite. The vein strikes N.35°W., dips 50°NE., and ranges in width from less than one foot near the south end of the exposure to four feet at the north end. It is exposed across a granite outcrop for a length of 280 feet. The vein is quartz with minor carbonate and has well-developed ribbon structure. Only a few specks of pyrite were observed.

Group III is immediately south and east of the Jamieson copper property. It is underlain chiefly by rhyolite with some interbedded andesite. The zone of shearing, faulting, and folding exposed on the Jamieson copper property strikes on to the Kindree claims, but there are few outcrops along the direction of strike. No drilling or geophysical work has been done along this zone on the Kindree property.

In the southwest quarter of the north half of lot 7, concession V, alongside Feldman's road to Keeley Lake, two pits have been sunk in an outcrop of rhyolite. Narrow stringers of quartz carbonate occur in sheared rhyolite. A few small masses, up to a quarter of an inch in diameter, of brassy pyrite were observed in the wall rock adjacent to quartz stringers. No work has been done in recent years.

H. Leblanc

H. Leblanc holds 10 unpatented claims consisting of the northeast quarter of the north half of lot 6, concession IV; the northwest quarter of the north half of lot 5, concession IV; the southwest quarter of the south half of lot 5, concession V; and all lot 6, concession V, except the northwest quarter of the north half.

The central part of the claim group is underlain by a mass of conglomerate whose attitude and dimensions are not known. A diabase dike, 120 feet wide, strikes N.20°W. across the conglomerate outcrop. Rhyolite is exposed in the southwest quarter of the south half of lot 5, concession V. The rest of the property is covered with clay, sand, and boulders.

Near the south end, the conglomerate outcrop has numerous quartz-filled tension cracks up to 12 inches wide. At a point 1,300 feet west and 1,800 feet north of the southeast corner of lot 6, concession V, a pit, about 30 feet in diameter by 5 feet in depth, has been sunk on a quartz vein; the wall rock shows brecciation and chloritization. A little pyrite and a few grains of chalcopyrite occur in the wall rocks close to the vein. Mr. Leblanc has drilled an X-ray diamond-drill hole under this exposure.

A pit has been sunk also on the rhyolite outcrop to the southeast. The wall rock is sparsely mineralized with pyrite and chalcopyrite adjacent to narrow quartz stringers.

In view of the sparse sulphide mineralization, no samples were taken for assay.

W. J. Magavern

W. J. Magavern holds three patented claims, P.2285, P.2286, and P.2401, which are described as the northwest quarter of the south half of lot 11, concession IV; the southwest quarter of the north half of lot 11, concession IV; and the southeast quarter of the south half of lot 12, concession IV.

The claims are underlain by granophyric quartz porphyry, which forms a small stock barely larger than the area of the claims. Quartz veins cut the granophyre in several places on the property. A few surface trenches and pits have been excavated, but no recent work has been done.

Near the southwest corner of claim P.2286, a pit has been sunk on a quartz vein that is exposed for a length of 200 feet. The vein strikes N.25°E., dips steeply, and has a width of about 18 inches. It is of milky quartz accompanied by a little carbonate and a few grains of pyrite.

Near the southwest corner of P.2285, several shallow pits have been sunk on lenticular quartz veins that strike N.30°–45°W. Dips range from 75°NE. to 85°SW. The veins are of milky quartz that carries a little carbonate and a few small grains of pyrite. The walls are sericitized and weakly sheared.

Mordey Copper Mines, Limited

PROPERTY

The property consists of seven patented claims, numbered P.19290, P.19292, P.27215, P.27216, P.27677, P.28252, and P.28253. They comprise the south half of lot 9, concession III; the northwest and northeast quarters of the north half of lot 9, concession II; and the southeast quarter of the south half of lot 10, concession III.

Surface development work is largely confined to claims P.27215 and P.27216, which are situated less than a quarter of a mile south of Godfrey Lake. The property can be reached from the Timmins-Kamiskotia road either by way of the Lally trail or by way of Feldman's road. The distance by either route is about 3½ miles.

OWNERSHIP

The property is owned by Mordey Copper Mines, Limited, which is controlled by Hoyle Mining Company, Limited.

HISTORY

Sulphide mineralization was observed south of Godfrey Lake by Fred Steep when he was trapping in Godfrey township. In 1926, when public interest in base metals in the area was aroused by the development at the Hollinger Kam-Kotia property, Steep and Phillip Sheehan staked the ground covering these surface "showings" as claims 12049 and 12050 on March 12 of that year. This was not the first occasion on which these claims had been staked, but it was the first time that active development followed staking. The claims were disputed by M. J. Tinkess who acquired an interest with several others. In October, 1927, the ground was optioned to Aconda Mines, Limited. During the following year, a very thorough development program, including surface-trenching and diamond-drilling, was carried out under the direction of Alderson, McKay, and Armstrong. The option was then dropped. Later the claims were allowed to lapse and were restaked as claims P.18559 and P.18560 by M. J. Tinkess in April, 1933.

In March, 1937, the property was transferred to Charles McCaughey and

became part of the property of Alameda Mines, Limited. During the winter and spring of 1937 a program of surface diamond-drilling was carried out by this company under the direction of H. B. Hatch.

Following the work by Alameda Mines, Limited, the ground once more became open for staking, and was restaked by A. H. Graham in October, 1940. In November, 1944, it was transferred to Mordey Copper Mines, Limited, and is still owned by that company.

The adjoining claims to the south were staked by Ralph Dipaolo in April, 1934, transferred to Frobisher Exploration Company, Limited, in May, 1943, and finally to Mordey Copper Mines, Limited.

DEVELOPMENT

The property has been very thoroughly developed on surface. More than 40 pits and trenches have been excavated to depths from 5 to 15 feet on almost every surface "showing" of sulphide mineralization. Most of this work, together with fourteen diamond-drill holes and an electrical geophysical survey, was completed under the direction of Aconda Mines, Limited. None of the logs of diamond-drill holes are available today. Some of the trenches and pits are filled with water, but they have been cleaned out by later operators so that it is still possible to examine the walls and, in most cases, the floors.

Alameda Mines, Limited, which confined its development work to diamond-drilling, completed six holes in the spring of 1937.

Mordey Copper Mines, Limited, in 1945 reviewed the surface work and made a geological study of the property. In 1946 the company drilled five holes totalling 2,513 feet. Since that time the property has been dormant.

GEOLOGY

The consolidated rocks on the Mordey copper property, within the area covered by the geological plan (in back pocket), have been classified as follows:

MATACHEWAN:	Quartz diabase.
KEEWATIN:	Rhyolite and rhyolite porphyry, occurring as pyroclastics, flows, sills and dikes.
	Andesite; agglomerate, flow breccia, and flows.

The andesitic rocks exposed on the property are normal intermediate volcanics, including two pillowed flows, interbedded with massive, fine-grained andesitic lava and agglomerate. The pillowed member that occupies the east half of claim P.27215 provides the best structural marker. It indicates that the volcanic rocks are striking almost due north through the property and facing east. This pillowed flow is underlain by a grey carbonatized, sugary-textured andesite, which also provides a consistent horizon marker from north to south through the property. West of the diabase dike the andesite formation includes a fragmental pillow lava, an amygdaloidal lava characterized by numerous quartz-filled amygdules, and a band of agglomerate. These all have a north-south trend, but they have been so intensely altered locally by the rhyolite porphyry that it has not been possible to trace any individual band throughout the map area. The quartz-filled amygdules are concentrated around the rhyolite porphyry rather than in bands parallel to the strike of the andesitic lavas.

The rhyolite formation includes one lava-flow member with interbedded tuff and breccia, and several dike-like bodies. The flows and tuffs strike parallel to the andesitic pillow lavas; but the dikes crosscut the andesitic flows and are considered to be channels through which the rhyolite flows rose to the surface. The same complex assortment of rhyolitic rocks was found on the Jamieson copper property.

The separation of the rhyolites into extrusive and intrusive types is done on the basis of structural evidence. The rhyolite, which strikes north through the centre of claim P.27215, conforms in strike to the andesitic flows. Its upper surface (east side) has bedded pyroclastic material, including a lenticular bed of ash-type material and a pebbly-textured breccia. Both the rhyolite porphyry, which occurs in dike-like bodies, and the massive flow rock are somewhat brecciated, particularly near the margins. Alteration of the surrounding andesite is much more pronounced around the dikes than around the flows.

Petrographically, the fresh, massive rhyolite and the rhyolite porphyry are inseparable. Both are dark-grey on fresh surfaces with abundant eyes of clear quartz, and both weather to a white, rough, broken surface. Microscopically, the rock is seen to consist almost entirely of quartz, which makes up more than 75 percent of the mineral composition. Some quartz is in the form of large sub-rounded to angular fragments that have ragged edges and show evidence of fracturing. The matrix is made up largely of a fine mosaic of quartz grains. The only other minerals identified are the secondary minerals, sericite and chlorite. Sericite occurs throughout the matrix as scattered flakes and in concentrations along minute fillings around the grains in the quartz mosaic. Chlorite is rare except in the rhyolite breccia, which has fragments of more basic material altered to chlorite.

Several dikes of quartz diabase strike in a direction slightly west of north through the property. One of these dikes lying to the east of the mineralized zone has a parallel strike. For a distance of 50 feet the andesite on both sides of this dike has been soaked by the diabase and altered to a dense trap-like material, so that it is often difficult to locate the chilled margin of the dike itself. It is noteworthy that the mineralized zone follows the same strike throughout the property as this diabase dike and lies always within 300 feet of it; yet no veinlets of massive sulphide mineralization are found in these dense altered lavas at the margin of the diabase. Disseminated grains of both pyrite and chalcopyrite occur sparingly in the altered lava. The disposition of the sulphide veins and stringers is such that they might be expected to continue into the area occupied by these dense altered lavas if the sulphides were introduced earlier than the diabase. It is possible that sulphides were originally present in these rocks in massive form and were later redistributed at the time of the diabase intrusion.

DESCRIPTION OF THE DEPOSIT

In a zone bearing 10 degrees west of north, mineralization occurs throughout a length of more than a quarter of a mile on the Mordey copper property. On the south the zone passes into low ground, and on the north it passes off the company's claims.

Although the zone of mineralization has a north-south trend, individual veinlets and lenses within the zone do not, as a rule, conform to this general strike. Heavily disseminated pyrite replacements, which in some cases include massive pyrite, occur in lenses that strike east-west, parallel to the direction of weak regional shearing. Stringers and veinlets of massive sulphides, including chalcopyrite, sphalerite, and pyrite, generally strike in a northwesterly direction; although one of the most persistent massive sulphide bands in trench No. 28 (see plan) strikes N.10°W. along the direction of the mineralized zone. Narrow stringers that pinch out in a short distance branch from this band to the northwest and southwest. Both the andesitic lava and rhyolite porphyry have been brecciated to some extent within the zone of mineralization. Grey, cherty quartz, carrying disseminated chalcopyrite, sphalerite, and pyrite, has filled some of the

spaces between breccia fragments. A good example of this type of mineralization is exposed on the west wall of trench No. 32.

A set of narrow quartz veins, striking N.50°E., occurs throughout the mineralized zone. These veins do not carry any sulphides.

Two tongues of rhyolite porphyry extend into the mineralized zone from the west, one in the area of the No. 1 post and one in the area of the No. 2 post of P.27216. Sulphide mineralization is widest in these two areas in the rhyolite porphyry and in the andesites that have been altered by porphyry.

Pits and trenches Nos. 1, 2, 13, 16, and 18[1] are in brecciated rhyolite porphyry. Barren quartz veins striking N.50°E. cut the porphyry. Pyrite, in disseminated grains and narrow fractures, is the principal sulphide, constituting less than 2 percent of the rock. Chalcopyrite occurs sparingly in narrow fractures.

Trench No. 6 is on an isolated tongue of rhyolite porphyry intruding amygdaloidal andesite. The contact zone, particularly in the rhyolite, carries about 5 percent sulphides in disseminated form. Pyrite is most common, but black sphalerite occurs in narrow fractures. In the rhyolite, a band about two feet wide, striking N.65°W., carries more than 50 percent sulphide minerals, which are mainly pyrite, and minor amounts of sphalerite and chalcopyrite.

Trenches Nos. 3, 4, 5, 7, 8, 9, 10, 14, 15, and 17 are in andesite around the nose of rhyolite porphyry. Most of these trenches are on zones of silicification and leaching, which trend easterly. A few fractures, filled with grey quartz accompanied by sulphides, trend west of north. Sulphide mineralization constitutes less than 5 percent of the silicified, leached andesite. Pyrite, in disseminated grains and massive fracture-fillings, predominates. Chalcopyrite is generally present in narrow fractures, but it seldom exceeds 2 percent of the mineralized material. Black sphalerite, in narrow stringers that do not exceed a foot in length, accompanies brassy pyrite in trenches Nos. 3 and 7.

Trenches Nos. 31, 32, 33, and 34 are located around a tongue of brecciated rhyolite porphyry extending into amygdaloidal andesite near the northeast corner of claim P.27216. Fragments in the porphyry are silicified to a cherty material, and the spaces between fragments are filled with white quartz carrying a heavy dissemination of sulphides. Chalcopyrite is in massive seams branching through the quartz, sphalerite is in lenticular masses, and pyrite occurs as a heavy dissemination of small nodules. Pyrite is largely confined to certain bands that carry little of the other sulphides, whereas bands that have good chalcopyrite and sphalerite carry little pyrite. The elongation of sulphide-rich bands is in the direction of shearing—N.70°W. A 10-foot sample, taken on the west wall of trench No. 32 by Mordey Copper Mines, Limited, is reported to have assayed 1.26 percent copper, 2.61 percent zinc, and 0.01 ounces of gold per ton.

The best mineralization is within the quartz porphyry in trench No. 32. Trenches Nos. 31 and 33, in andesite, carry only pyrite.

Where the mineralized zone is in andesite it becomes narrower, but chalcopyrite and sphalerite make up a greater proportion of the sulphide minerals. In trenches Nos. 11 and 12, sphalerite, chalcopyrite, and pyrite—in that order of abundance—occur in lenses of quartz vein breccia that range in width from one to three feet. Sulphides constitute 10–20 percent of the veins, which strike in an easterly direction. In trench No. 22 the zone of mineralization has been exposed for a length of 220 feet. At the south end, a few weak fractures, striking N.55°W., carry seams of massive pyrite with a little chalcopyrite. In the central portion a

[1]Numbers refer to property plan.

sulphide replacement, 5–10 feet wide, strikes N.55°W. Pyrite in rounded nodules and massive seams is the most abundant sulphide. It is accompanied by lesser amounts of chalcopyrite and sphalerite, which occur as massive fracture fillings. Combined sulphides make up 5–10 percent of the mineralized material.

To the north of this long trench, two smaller trenches, Nos. 25 and 26, have exposed a lenticular body of massive brassy pyrite that has a width of 20 feet in trench No. 25. A network of narrow quartz stringers cuts the pyrite and forms a cellular mass of quartz in places where surface-weathering has removed the pyrite.

Trenches Nos. 27, 28, 29, and 30 are in andesite, along a zone of fracturing and alteration that trends west of north. In trenches Nos. 27 and 29 the altered zone is about three feet wide. It carries seams and lenses of pale, brassy pyrite. Sphalerite is the most abundant sulphide in trench No. 28, whereas chalcopyrite and pyrite are present only in small amounts. Sulphides occur in a narrow zone of fracturing, about 18 inches wide, and in massive stringers that branch off in a northwesterly and southwesterly direction.

A few trenches have been excavated farther south along the mineralized zone in claim P. 19290 where there are fewer outcrops. Disseminated pyrite mineralization in quartz porphyry and andesite was noted in the trenches examined.

It is unfortunate that the records of diamond-drilling done by Aconda Mines, Limited, have not been preserved, since sufficient drilling was done to permit an appraisal of the size and grade of the deposit. Drilling by Mordey Copper Mines, Limited, has been directed towards prospecting the zone to the south and probing other possibilities on the property.

New Walcoro Mines, Limited

The property of New Walcoro Mines, Limited, is made up of 12 patented claims numbered P.28043 to P.28054, inclusive. They occupy the southeast quarter of the north half of lot 12, concession VI; the northeast and southeast quarters of the south half of lot 12, concession VI; the northeast quarter of the north half of lot 12, concession V; the south half of lot 11, concession VI; the northwest and northeast quarters of the north half of lot 11, concession V; the southwest quarter of the south half of lot 10, concession VI; and the northwest quarter of the north half of lot 10, concession V.

Development work includes about 5,000 feet of diamond-drilling and a combined magnetometer and geological survey. Diamond-drilling was carried out in 1947 under the direction of L. Whitman. The geological and geophysical work was done in 1949 under the direction of W. H. Gross. A small amount of trenching and rock excavation has also been done.

The property is underlain almost entirely by intrusive rocks of the granite-gabbro complex, except in the southeast corner where andesitic volcanics are exposed.

In the south half of lot 11, concession VI, diamond-drilling was concentrated on a sericitic sheared zone in granite. The zone ranges in width from 10 to 20 feet, and it is exposed for a length of nearly 700 feet, striking N.75°W. It is characterized by a waxy, yellow sericitic schist that contains a few narrow lenses of quartz. Pyrite occurs sparingly in the schist near quartz stringers. Pits have been sunk at both extremities of the sheared zone. A character sample of sheared material with a little pyrite carried no gold values. Low gold values are reported from diamond-drill holes.

In the northeast corner of claim P.28050 (southeast quarter of north half of

lot 12, concession VI) several trenches have been excavated on a zone of fracturing and quartz stringers in granite. The wall rock adjacent to quartz stringers carries a little pyrite and chalcopyrite. A character sample gave no gold on assay. Two diamond-drill holes have been drilled under this exposure.

Crossing the property boundary in the northeast corner of claim P.28049 (northeast quarter of south half of lot 11, concession VI) is a persistent quartz vein striking N.20°E. and dipping to the east at 75 degrees. The vein is in granophyric quartz diorite, which is somewhat sheared and sericitized close to the vein. A little pyrite occurs in the sericitized wall rock.

In claim P.28047 (northwest quarter of north half of lot 10, concession V) a quartz vein striking almost due east is exposed for a length of more than 400 feet across an outcrop of andesite. It varies in width up to 10 feet with additional narrow stringers in the walls in some places. A few grains of pyrite were observed along the margins of this vein.

Phillips-O'Neill Property

A. E. Phillips and P. J. O'Neill hold 31 claims jointly in Godfrey township. The claims are in two separate groups of 18 and 13 claims. Group No. 1 has one patented claim, P.27830, and 17 unpatented claims. They comprise the northwest quarter of the north half of lot 10, concession IV; the northwest and southwest quarters of the south half of lot 10, concession V; the south half of lot 11, concession V; the northeast and northwest quarters of the north half of lot 11, concession IV; the southeast and southwest quarters of the south half of lot 12, concession V; and all lot 12, concession IV, except the southeast quarter of the south half.

Group No. 2 is made up of 13 unpatented claims that comprise the southwest and northwest quarters of the south half of lot 8, concession III; the southeast and southwest quarters of the north half of lot 9, concession III; the southeast and southwest quarters of the south half of lot 10, concession IV; and all lot 10, concession III, except the southeast quarter of the south half.

GROUP NO. 1

Most of group 1 is underlain by rhyolite, which is interbedded with andesite in the east half of the property. A small gabbro stock intruded by aplite dikes occupies the northwest corner of the property.

Claim P.27830

The principal mineral occurrence is in patented claim P.27830 that occupies the southwest quarter of the south half of lot 11, concession V. (See accompanying geological plan.) Most of the claim is underlain by rhyolitic volcanics including fragmental rhyolite, cherty rhyolite and rhyolite tuff. The rhyolite is intruded by a fine-grained, brown-weathering andesitic intrusive that has numerous blocks and angular fragments of rhyolite which give it the appearance of a coarse breccia. A flow of pillowed andesite contacts the rhyolite on the east, forming a band that strikes almost due north along the east boundary of the claim.

Sulphide mineralization is exposed over a length of 250 feet along the contact between rhyolite and andesitic pillow lava. This contact is well exposed; and throughout its length is mineralized over a width from one to three feet with a heavy dissemination of pyrite and chalcopyrite. The walls for several feet carry minor amounts of pyrite and chalcopyrite. Pods of sulphide mineralization occur also in the rhyolite and in the andesite. These lenticular pods have an easterly

elongation parallel to the regional shearing, but they are distributed along the strike of the contact zone.

In other places on the claim it was observed that disseminated sulphides occur in the intrusive breccia at points where it fingers out into rhyolite.

In all cases sulphide mineralization is a replacement type accompanied by only minor amounts of quartz. Chalcopyrite, in tiny fractures and small irregular masses, is the dominant sulphide in heavily mineralized sections; whereas pyrite, in the form of cubes and grains, predominates in the more sparsely disseminated sulphides along the walls. Pyrrhotite is present locally, forming narrow fracture fillings and irregular masses. The sulphide mineralization carries only a trace of gold.

Three shallow pits have been sunk near the north end of the exposure on concentrations of sulphide. O. W. Rusk, a former owner of the claim, drilled four X-ray diamond-drill holes under the zone from various angles. A fifth hole, drilled by Verity Porcupine Gold Mines, Limited, is directed to intersect the north end of the zone. None of the core was saved, and results of assays, if any, were not available to the author. A character sample of the best material from trench No. 1 (see plan) taken by the author assayed 1.66 percent copper, a trace in gold, and no nickel. A character sample from trench No. 5 assayed 1.02 percent copper and 0.01 ounces of gold per ton.

About 100 feet southwest of the contact zone described above, a trench has been excavated on a lens of sulphide mineralization in andesitic breccia near the contact with rhyolite. A length of 12 feet along the wall of the trench carries about 10 percent combined sulphides. Near the contact between andesitic breccia and rhyolite, chalcopyrite and pyrrhotite are present in equal amounts over a width of 4 feet. Pyrite predominates towards the margins.

Claim P.27829

In the southeast quarter of the south half of lot 11, concession V, three pits have been excavated in lenticular bodies of disseminated and massive pyrite. Two separate lenses occur about 100 feet apart in a narrow tongue of quartz porphyry intruding andesite. Two pits have been sunk close together on the most southerly lens, which carries a heavy dissemination of pyrite over a width of 12 feet. Most of the pyrite is in coarse grains and cubes, but some of it is in a very fine, powdery state where it occurs with quartz veinlets. A sample of massive pyrite, taken by the author, carried a trace of gold.

About 100 feet farther north, a pit has been sunk on a lens of quartz that reaches a maximum width of 18 inches, and pinches out in both directions. It carries heavy granular pyrite.

Claim P.35643

In the northeast quarter of the south half of lot 11, concession V, a quartz vein is exposed on a small gabbro outcrop near the north boundary. A stringer zone of quartz, three to four feet wide, strikes N.30°E., and it is exposed for a length of about 50 feet across the outcrop. The gabbro in the vicinity of the vein is silicified and carbonatized. No sulphides were observed, but there is considerable rust in inclusions and ribbons of wall rock. A character sample taken by the author assayed 0.01 ounces of gold per ton.

Claim P.36778

In the northwest quarter of the north half of lot 10, concession IV, a little surface-trenching has been done along the south boundary of the claim on a

stockwork of quartz stringers in granite. No recent work has been done, and the trenches and pits are caved and overgrown with vegetation. Very little sulphide mineralization was observed.

Claim P.36654

Claim P.36654 occupies the southwest quarter of the south half of lot 12, concession IV. In the northeast corner of the claim a pit has been sunk to a depth of 15 feet on a quartz vein in sheared, sericitized, fine-grained rhyolite. The vein strikes N.25°E., dips east at 65 degrees, and is exposed only in the pit. No recent work has been done in the pit, which was full of water at the time of examination. The quartz is accompanied by a little carbonate and a few cubes of pyrite. A character sample of quartz, well mineralized with cubic pyrite, assayed 0.02 ounces of gold per ton.

GROUP NO. 2

Group No. 2 occupies roughly the triangular block of ground between Keeley, Godfrey, and Forbes lakes. Most of the west half, in lot 10, is swampy with few outcrops. It is underlain by rhyolite intruded by granular quartz-albite porphyry and porphyritic granophyre. The east half of the property, south of Godfrey Lake, is more rugged and rocky. It is underlain by andesite and rhyolite in the form of flows, sills, and dikes. The flows strike north and face east, whereas dikes of similar rhyolite and andesite cut the flows in an easterly direction.

Claims P.34896 and P.34897

Development work has been concentrated in the area south of Godfrey Lake on the same zone of sulphide mineralization that is exposed on the property of Mordey Copper Mines, Limited, adjoining to the south.

These two claims, occupying the southwest and southeast quarters of the north half of lot 9, concession III, contain the main exposures of sulphide mineralization. They formed part of the property optioned to Aconda Mines, Limited, and later to Alameda Mines, Limited. Most of the surface-trenching on the property was done by Aconda Mines, Limited. Very little was done by Alameda Mines, Limited, who carried out a diamond-drilling program on the claims adjoining to the south.

In 1948 the property was optioned by Millbren Copper Mines, Limited. After three diamond-drill holes, totalling 1,375 feet, were drilled, the option was permitted to lapse.

In 1951 the property was optioned by New Walcoro Porcupine Mines, Limited, and 4,042 feet of diamond-drilling in 12 holes was completed.

The geological plan of parts of the Mordey Copper and Phillips-O'Neill properties (in back pocket) shows the geology and principal mineral occurrences of the Godfrey Lake area in detail.

The main zone of sulphide mineralization, which lies west of, and parallel to, the diabase dike on the property of Mordey Copper Mines, Limited, weakens on the Phillips-O'Neill property. Only a few isolated lenses of disseminated sulphides, consisting principally of pyrite, occur in this area. About 200 feet south of the lake shore and 150 feet west of the diabase dike, a long trench has been excavated on a contact between quartz porphyry and silicified andesite. The contact zone, which trends N.35°W., carries disseminated pyrite. Four holes were drilled by New Walcoro Mines, Limited, to explore this zone. Two holes drilled under the surface trench encountered fragmental rhyolite porphyry carrying disseminated pyrite. Low gold values up to 0.12 ounces per ton over a core length of five feet are reported.

Surface development and diamond-drilling have been concentrated along a zone of mineralization about 250 feet east of the diabase dike. This zone strikes N.10°W. along the east side of a sill-like body of rhyolite porphyry. Seven pits have been excavated in a length of 350 feet, and eight diamond-drill holes have been drilled; one by Aconda Mines, Limited; two by Millbren Copper Mines, Limited; and five by New Walcoro Mines, Limited. Disseminated sulphide mineralization is exposed in all seven pits, but it does not form a continuous deposit. A few stringers of massive pyrite occur in random fractures along the zone. A seam of massive chalcopyrite, having a maximum width of 12 inches, angles obliquely across the strike of the zone in trench No. 1. Drilling under the zone of mineralization encountered sulphide mineralization comparable to that exposed in the pits on surface. New Walcoro hole No. 3, drilled north along the strike of the mineralized zone from the north end of trench No. 1, from 63–80 feet followed a zone of stringers and irregular masses of chalcopyrite and pyrite in andesite. Eighteen feet of core in this section assayed 3.1 percent copper and 0.01 ounces of gold per ton. A similar mineralized section of andesite in hole No. 4 carried 5.7 percent copper and 0.02 ounces of gold per ton over a core length of four feet. This hole also follows the strike of the mineralized zone. Other diamond-drill holes encountered only narrow sections of disseminated and massive pyrite with minor amounts of chalcopyrite.

Rual Porcupine Mines, Limited

Rual Porcupine Mines, Limited, holds a group of 27 unpatented claims in the west half of Godfrey township. The group is made up of the north half of lot 12, concession III; the northeast and southeast quarters of the south half of lot 12, concession III, all lot 12, concession II, except the northwest quarter of the north half; the northwest and southwest quarters of the south half of lot 11, concession III; all lot 11, concession II, except the northeast quarter of the north half; the south half of lot 10, concession II; and the northwest quarter of the south half of lot 9, concession II.

Most of the property is covered with spruce swamp. The few rock exposures are of rhyolite, granular-textured intrusive including porphyritic granophyre and quartz-albite porphyry, and quartz diabase.

In 1945 the company carried out a combined geological and geomagnetic survey of the property. No development work has been done since that time.

P. Sheehan

P. Sheehan holds four unpatented claims, which occupy the northwest quarter of the north half of lot 3, concession II; the northeast quarter of the north half of lot 4, concession II; the southeast quarter of the south half of lot 4, concession III; and the southwest quarter of the south half of lot 3, concession III.

Two outcrops of greenstone are exposed on the claims in lot 4, one in concession II, and one in concession III. The greenstone is a fine-grained, massive, highly carbonatized type, thought to be intrusive, and related to the gabbroic intrusives, which crop out in the northwest corner of the township. A narrow dike of white-weathering aplite cuts the greenstone outcrop in concession III. This outcrop is also transected by several veins of quartz-tourmaline bordered by strong carbonate alteration. The veins occupy two sets of fractures, one striking N.50°E. and dipping to the southeast at 60 degrees, the other striking N.50°W. and dipping 20°SW. They are generally less than eight inches wide, and carry

only a few grains of pyrite. The carbonatized wall rock carries more pyrite than the veins. Several pits have been excavated on the quartz-tourmaline veins.

In lot 4, concession III, a quartz vein is exposed in a shallow pit near the north end of the greenstone outcrop. It strikes N.80°E. and dips 50°S. No sulphides were observed. Several smaller pits are located on narrow barren veins in the carbonatized greenstone.

J. Smith

J. Smith holds two patented claims, P.13941 and P.13942, which occupy the southwest and southeast quarters of the south half of lot 11, concession IV.

Most of the property is underlain by rhyolite, except in the northwest corner where the margin of a small stock of granophyre occupies a small area of claim P.13941. A small mass of albitite intrudes cherty rhyolite along the north edge of the large outcrop bordering Keeley Lake on the west.

A quartz vein, which reaches a maximum width of three feet cuts the albitite, striking N.20°E. A pit has been sunk close to the lake shore on this vein where it enters low ground at its north end. No sulphide minerals were observed in the quartz.

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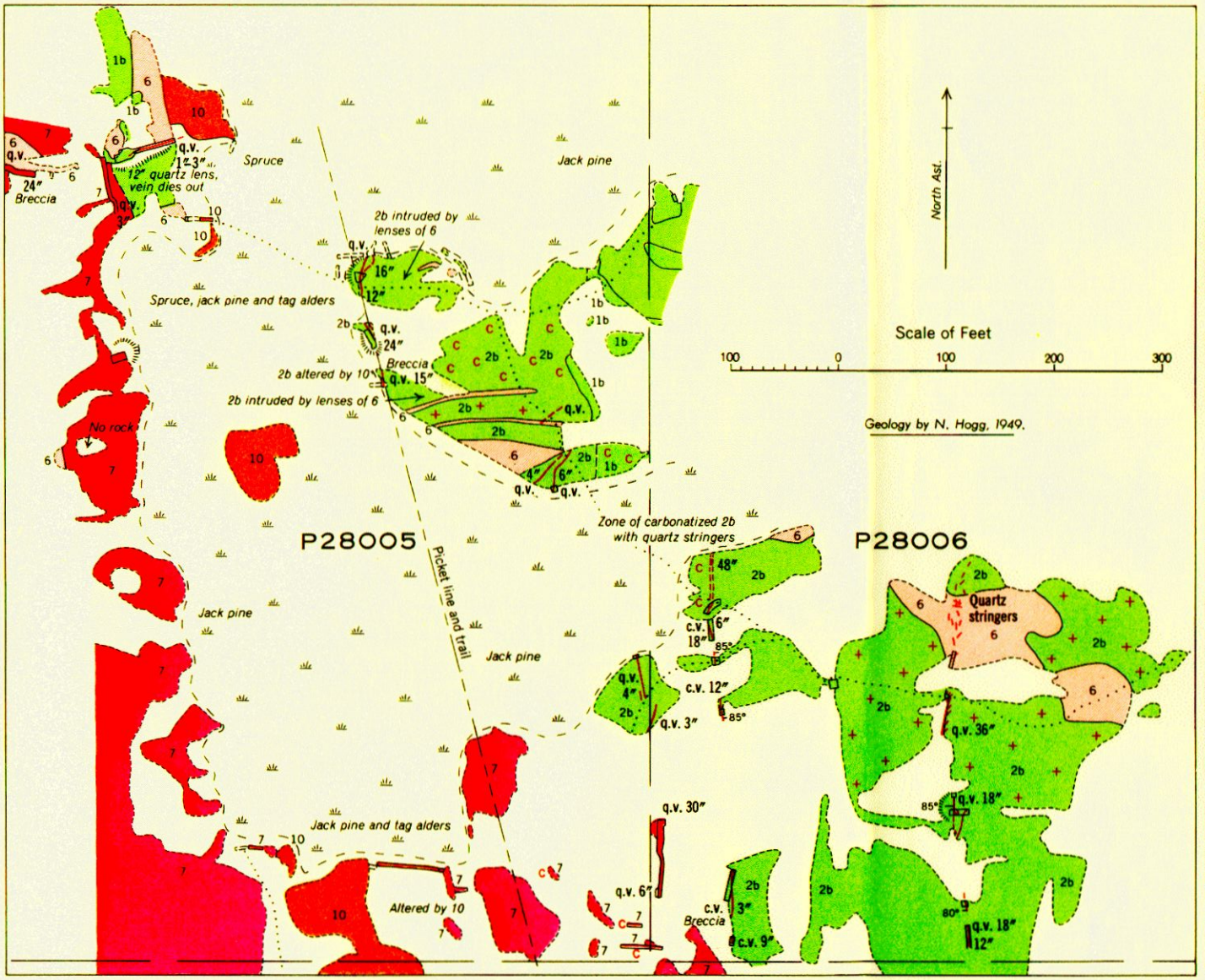
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To accompany Ontario Department of Mines report, Vol. LXIII, part 7, 1954.



Legend

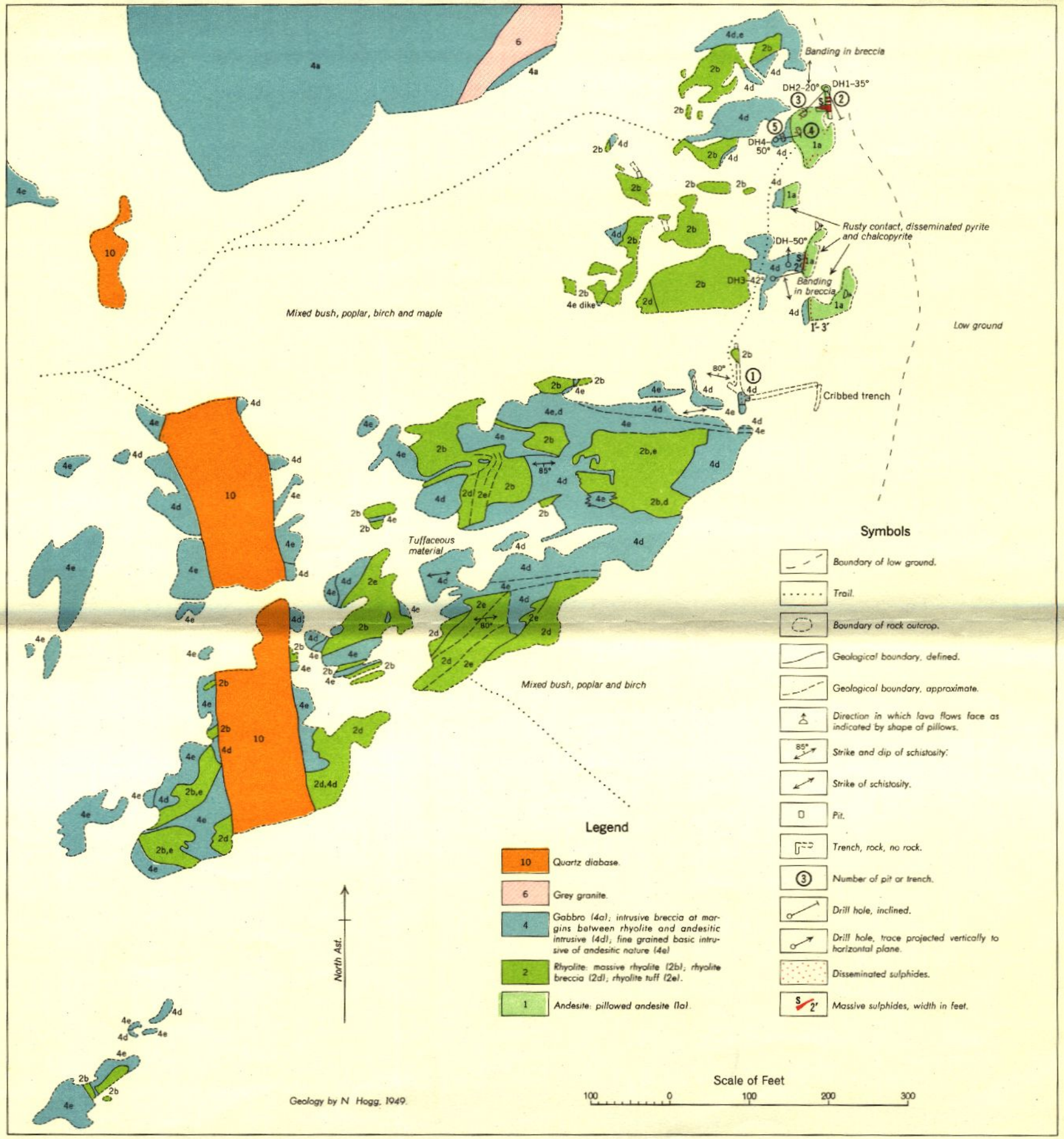
- 10 — Quartz diabase.
- 7 — Spherulitic granophyre.
- 6 — Granite.
- 2 — Rhyolite: massive rhyolite (2b).
- 1 — Andesite: massive andesite (1b); amygdaloidal andesite (1d).
- C C C C C — Carbonatized rock.
- + + + + + — Sericitized rock.

Symbols

- Open muskeg with boundary.
- Trail.
- Boundary of rock outcrop.
- Geological boundary, defined.
- Geological boundary, approximate.
- Claim boundaries, shown only in approximate position.
- Pit.
- Trench, rock, no rock.
- Dump.
- q.v. 2" — Quartz vein, width in inches.
- c.v. 12" — Carbonate vein, width in inches.

GEOLOGICAL PLAN OF PART OF THE MRS. R. G. BURKE PROPERTY IN LOTS 9 AND 10, CON. IV, GODFREY TOWNSHIP

To accompany Ontario Department of Mines report, Vol. LXIII, part 7, 1954.



Legend

- 10 Quartz diabase.
- 6 Grey granite.
- 4 Gabbro (4a); intrusive breccia at margins between rhyolite and andesitic intrusive (4d); fine grained basic intrusive of andesitic nature (4e)
- 2 Rhyolite: massive rhyolite (2b); rhyolite breccia (2d); rhyolite tuff (2e).
- 1 Andesite: pillowed andesite (1a).

Symbols

- Boundary of low ground.
- Trail.
- Boundary of rock outcrop.
- Geological boundary, defined.
- Geological boundary, approximate.
- Direction in which lava flows face as indicated by shape of pillows.
- 85° Strike and dip of schistosity.
- Strike of schistosity.
- Pit.
- Trench, rock, no rock.
- ③ Number of pit or trench.
- Drill hole, inclined.
- Drill hole, trace projected vertically to horizontal plane.
- Disseminated sulphides.
- S 2' Massive sulphides, width in feet.

GEOLOGICAL PLAN OF PART OF THE PHILLIPS-O'NEILL PROPERTY IN LOT 11, CON. V, GODFREY TOWNSHIP



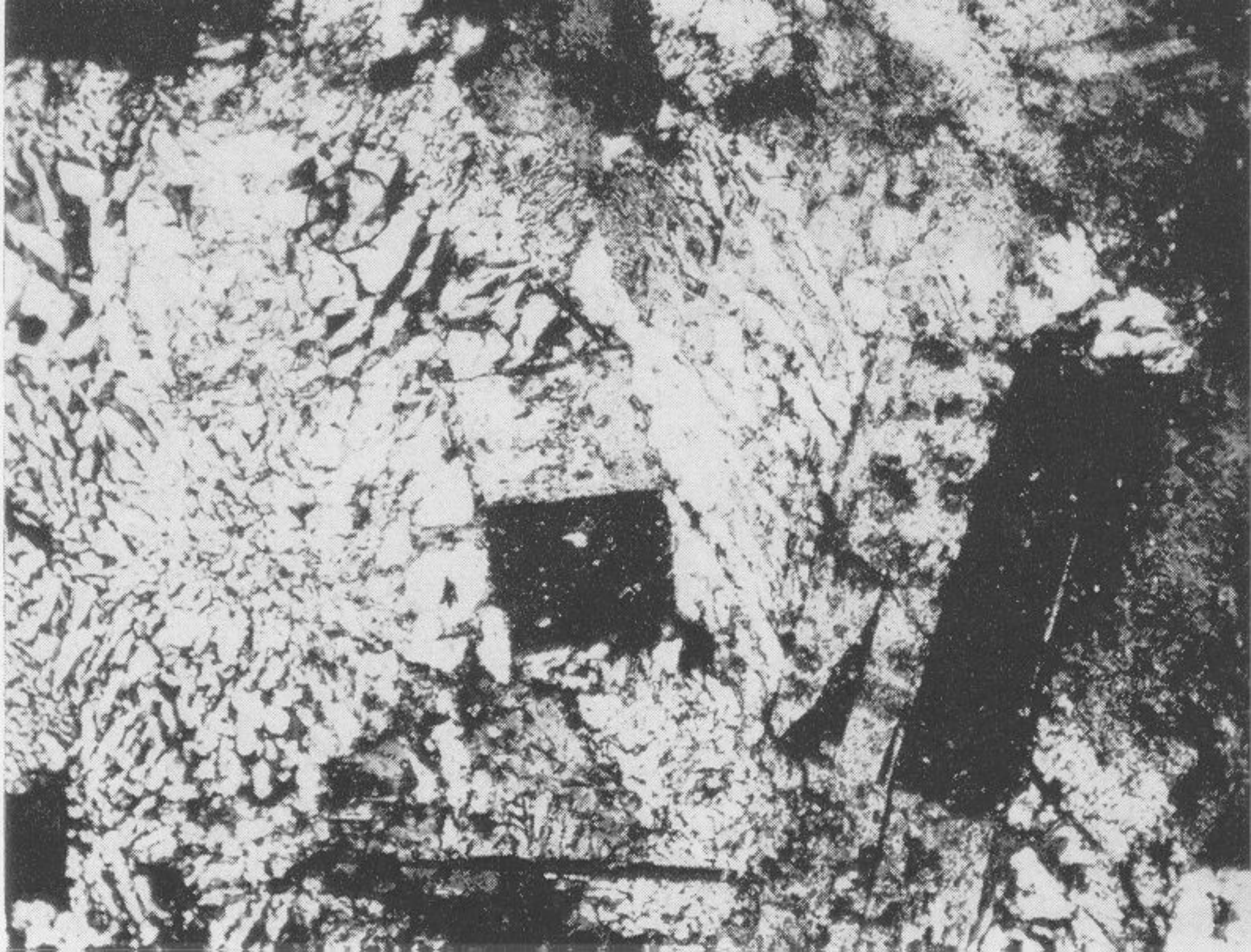


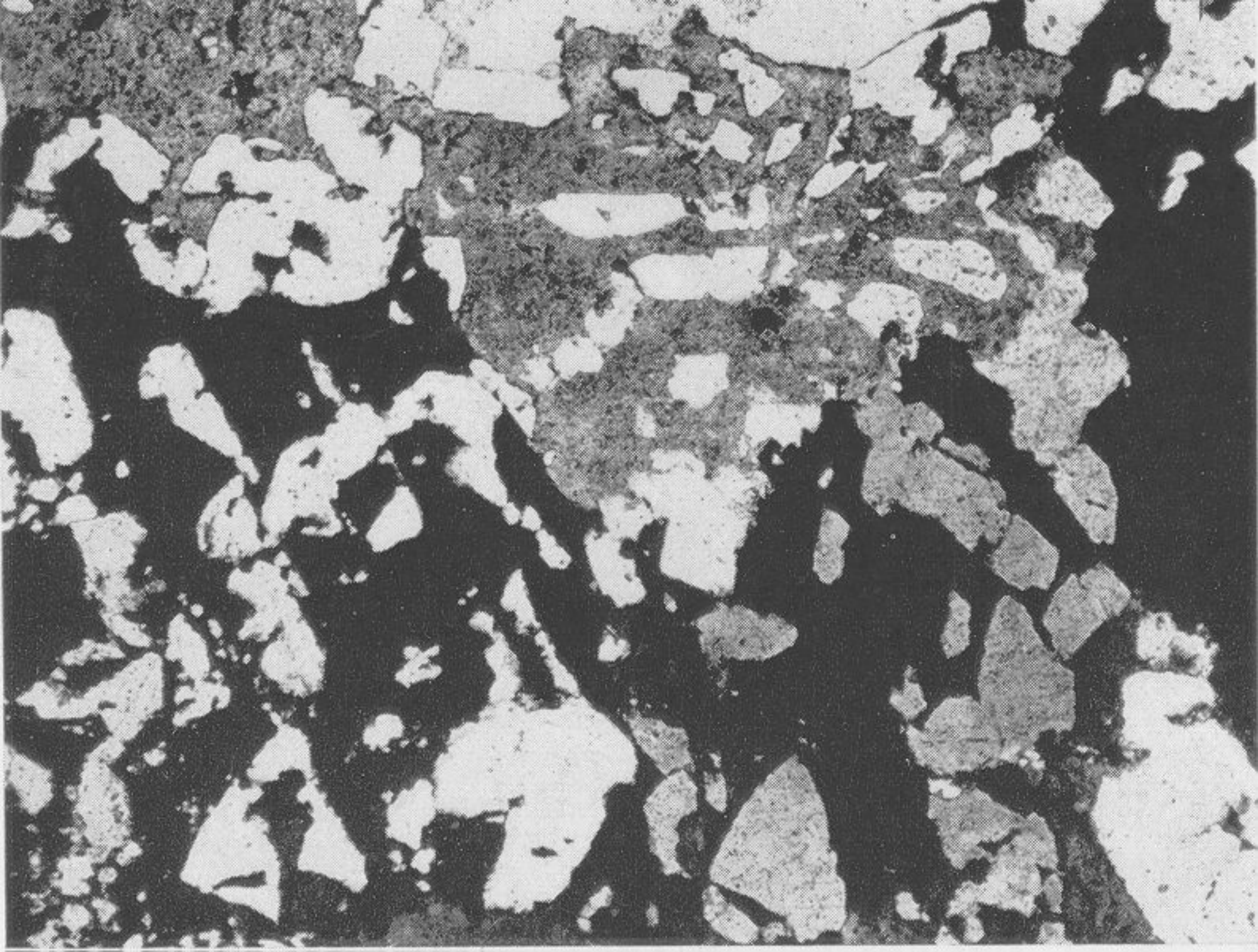


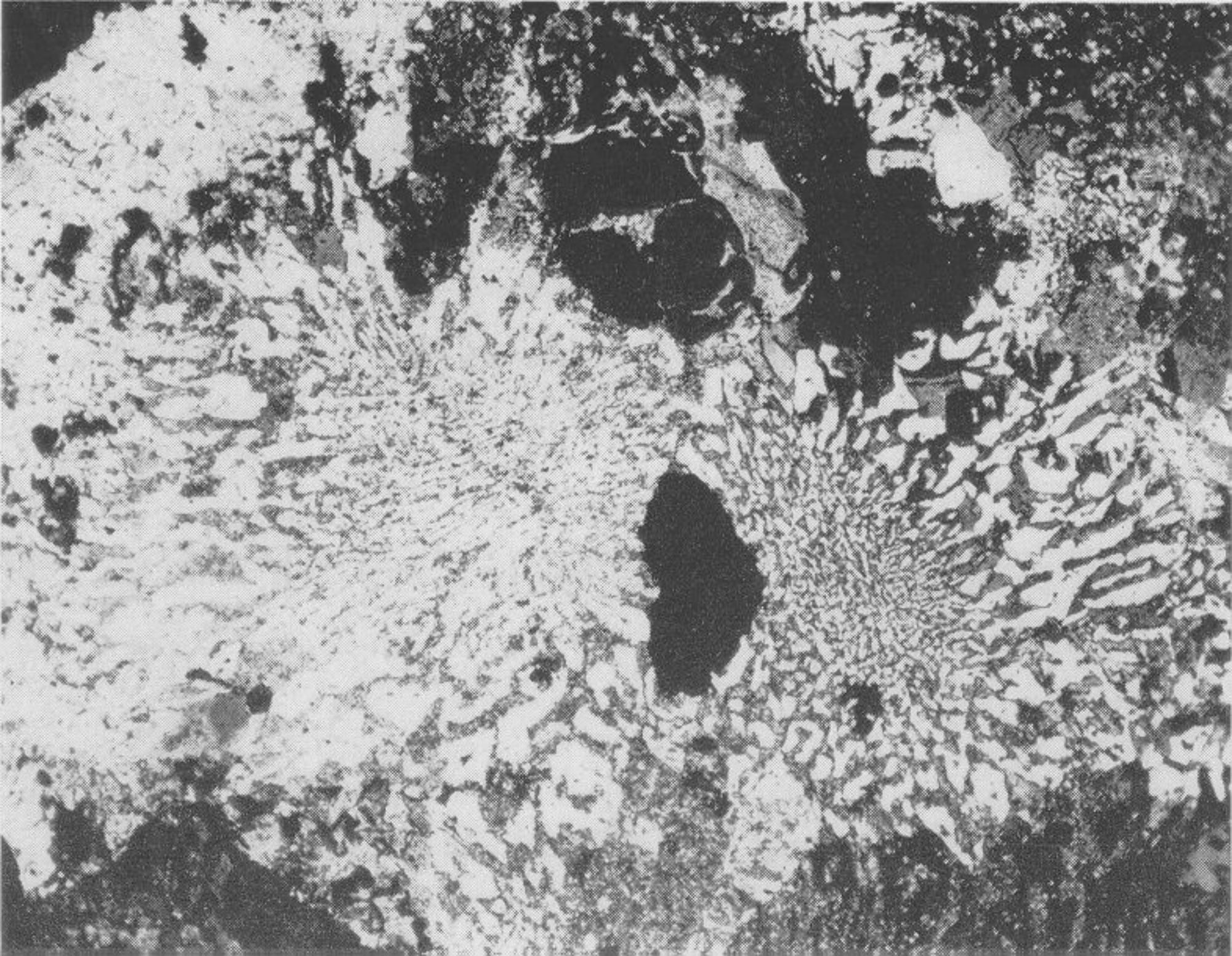


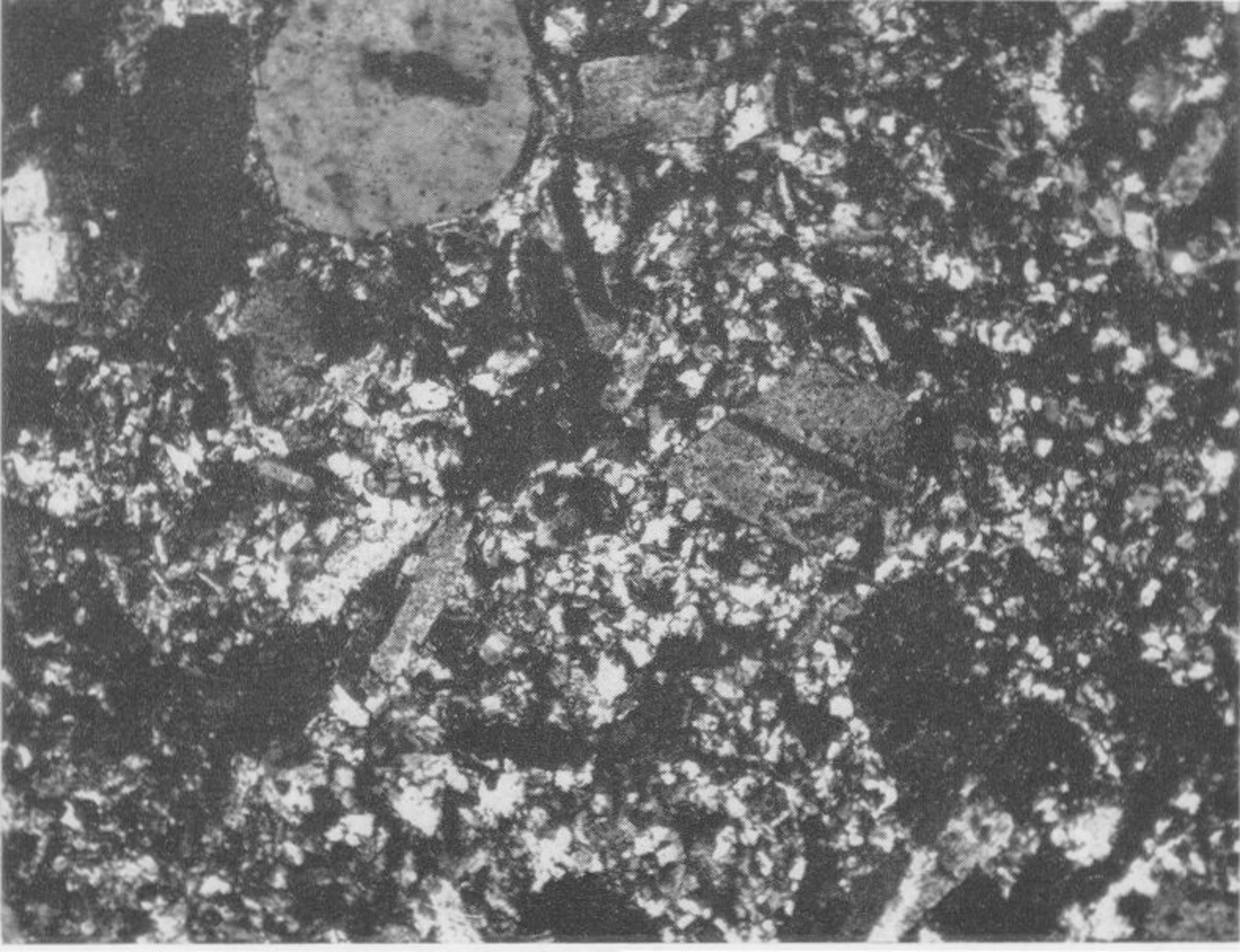


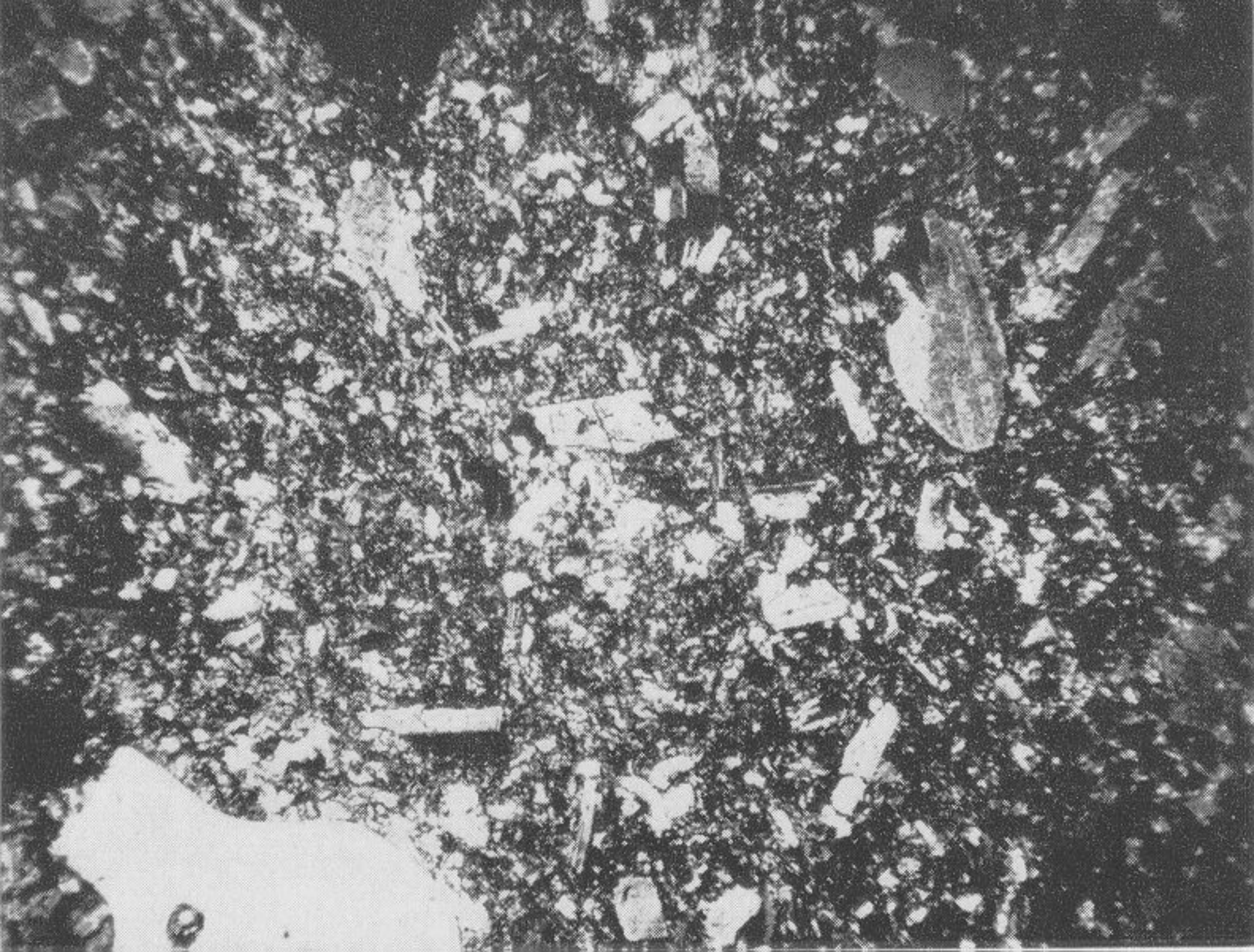


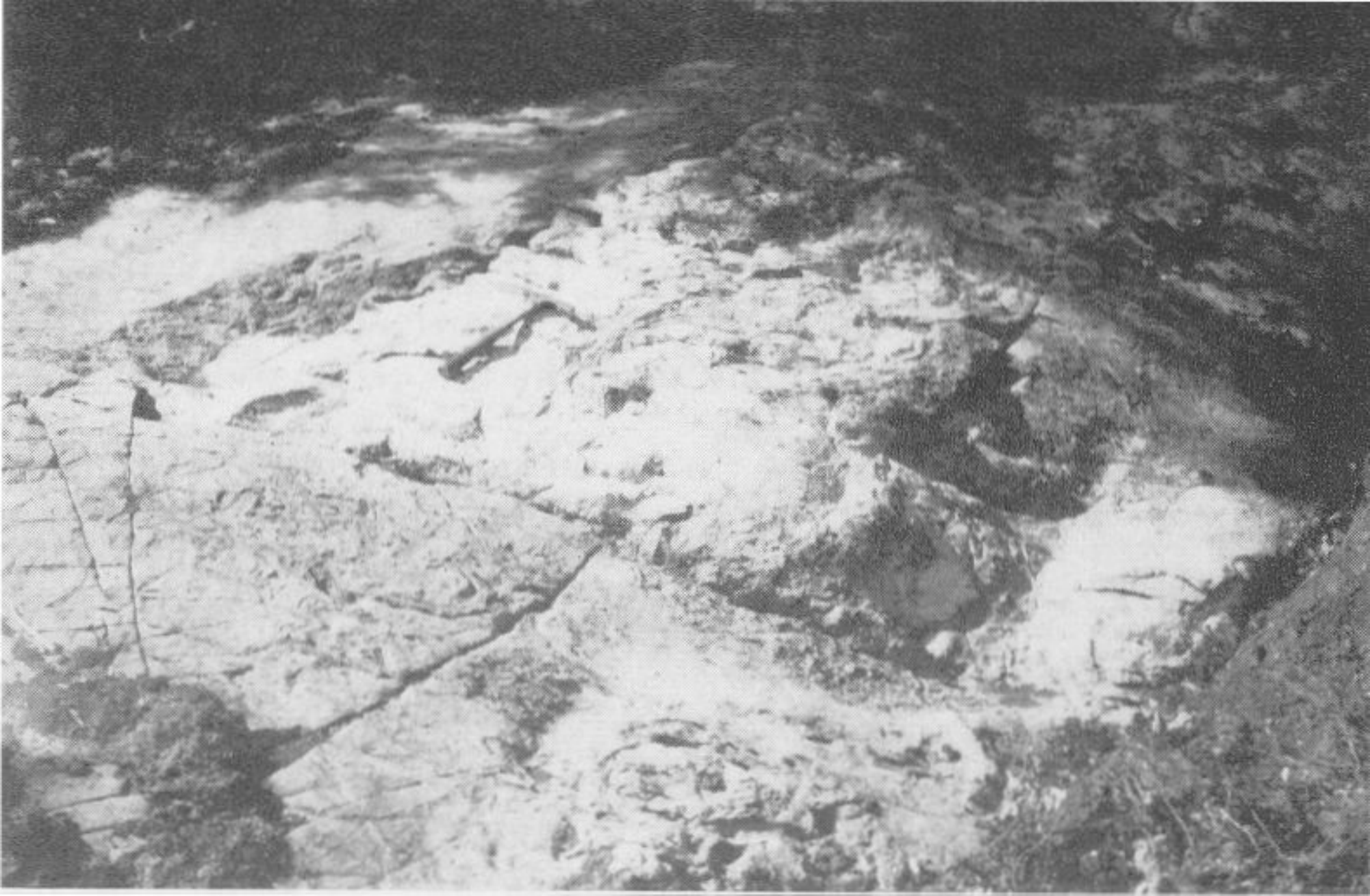




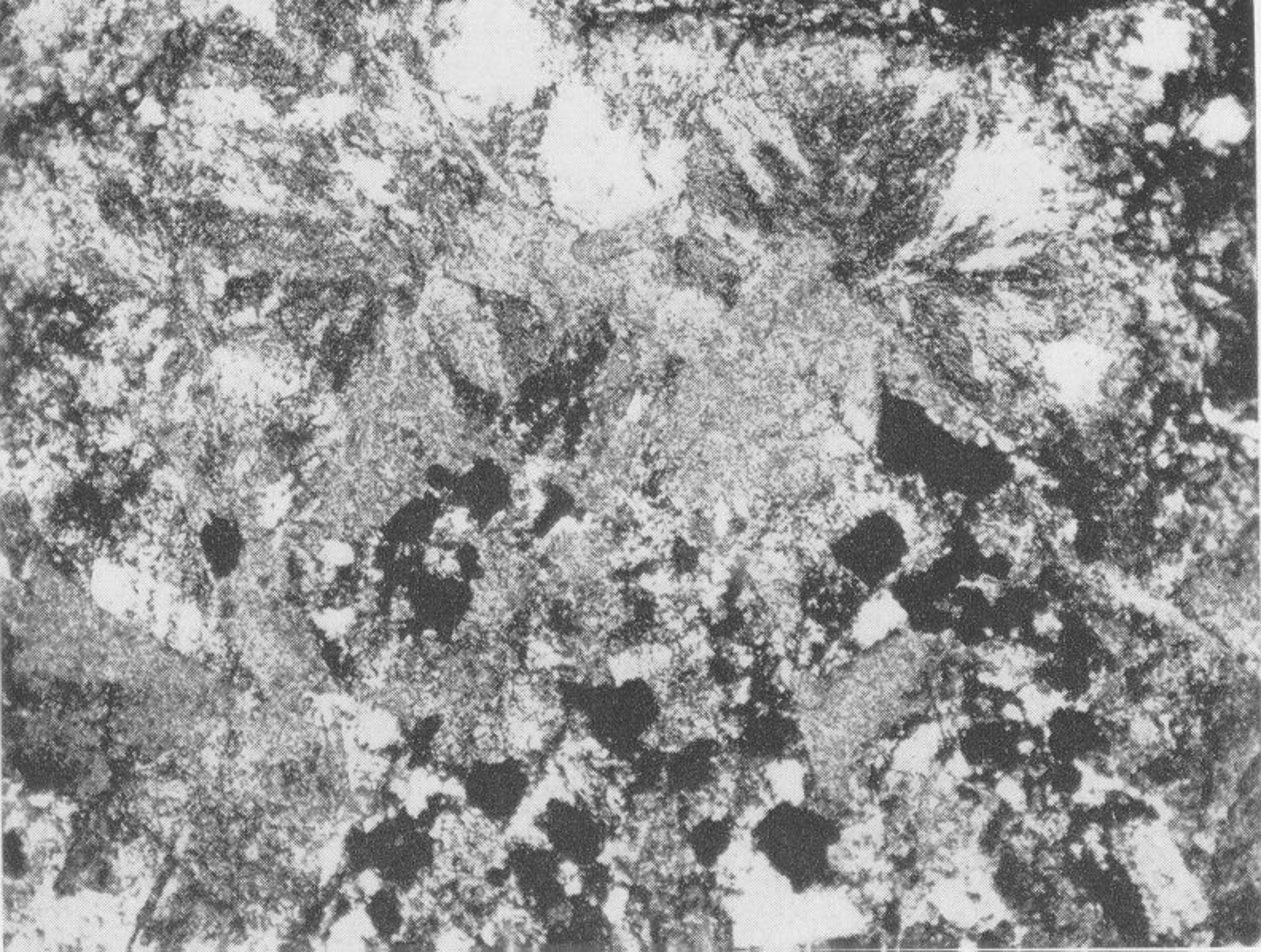














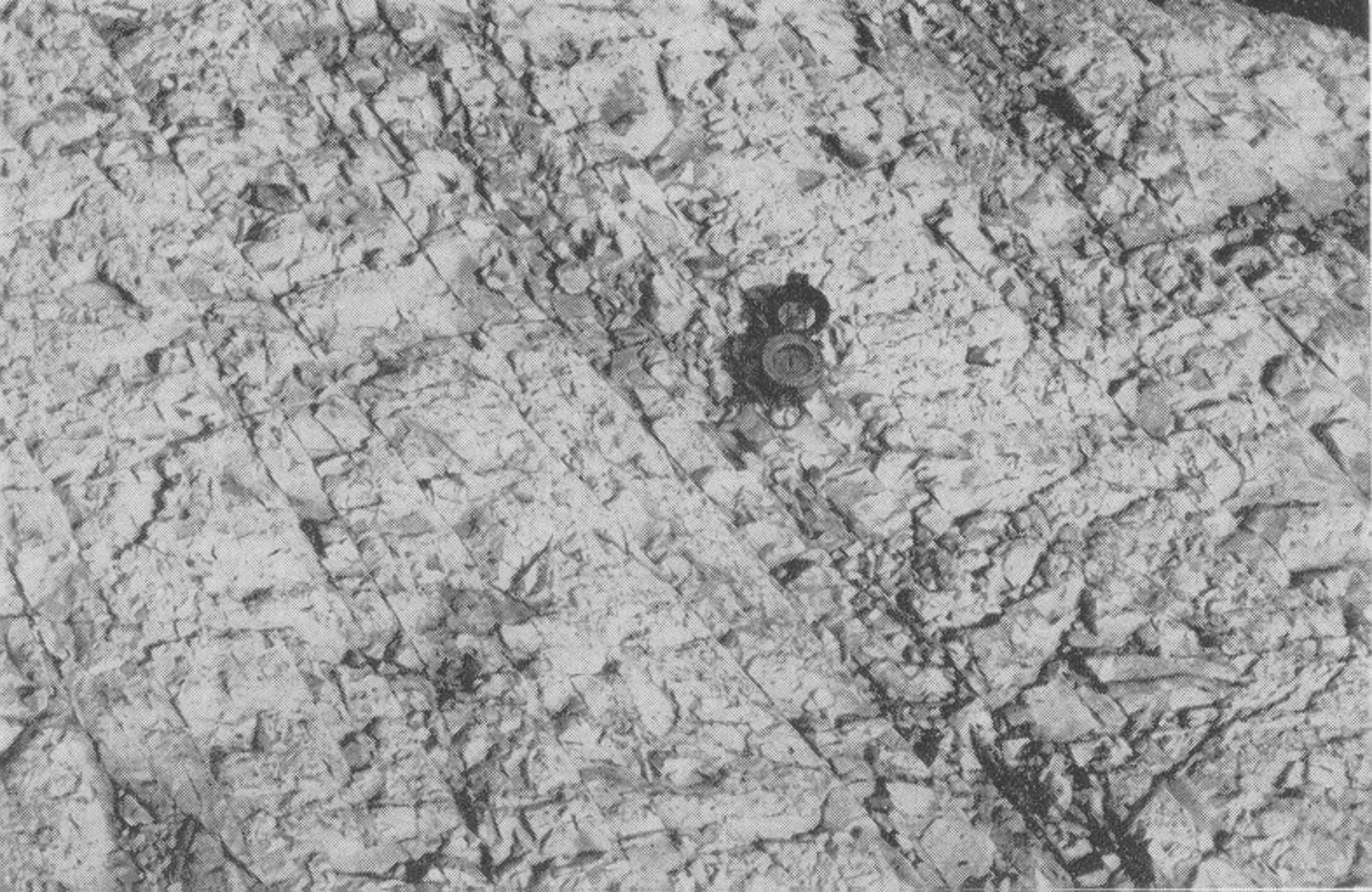














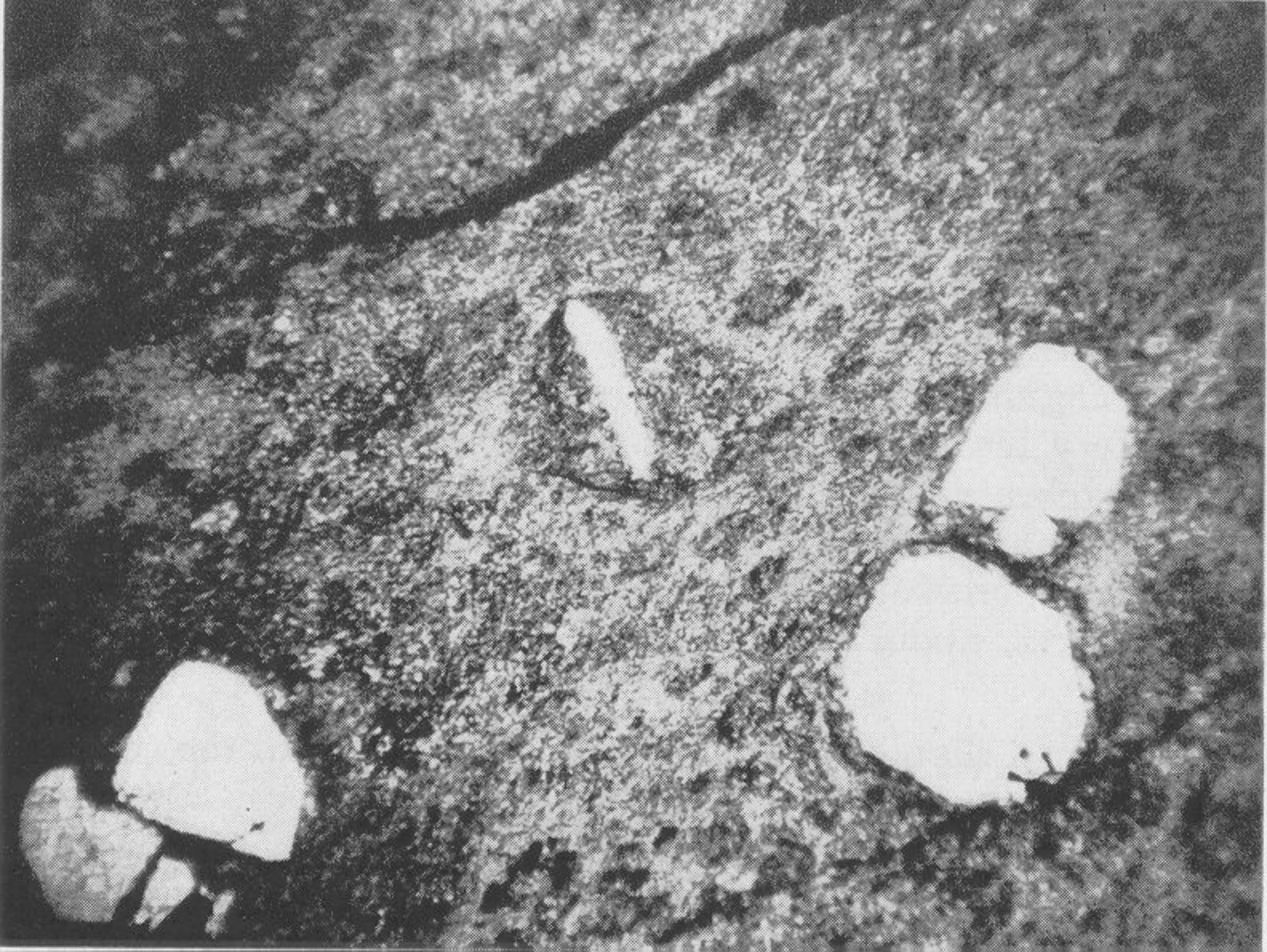


Table I

LARDER LAKE GOLD AREA

ANNUAL PRODUCTION STATISTICS BY MINES, 1911–1948

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

Year	Omega[1]		Argonaut[2]		Kerr-Addison		Barry-Hollinger		Raven River		Chesterville		Cathroy Larder (Yama[3])		Miscellaneous		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
Prior to 1918	.....	[4]10,000	[5]480	9,209	[6]125	314	.....	.....	.....	.....	.....	.....	.....	.....	[7]100	1,100	705	20,623
1918	.....	.....	.....	.....	.....	.....	[8]1,502	10,051	.....	.....	.....	.....	.....	.....	.....	[9]1,283	1,502	11,334
1919	.....	.....	735	2,631	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	735	2,631
1920	.....	.....	4,637	29,888	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,637	29,888
1921	.....	.....	.....	549	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	549
1922	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1923	.....	.....	4,818	73,262	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,818	73,262
1924	.....	.....	24,178	152,072	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24,178	152,072
1925	.....	.....	28,515	214,183	.....	.....	8,136	56,978	.....	.....	.....	.....	.....	.....	.....	.....	36,651	271,161
1926	.....	.....	35,081	143,387	.....	.....	13,680	86,263	.....	.....	.....	.....	.....	.....	.....	.....	48,761	229,650
1927	11,966	34,595	27,873	127,448	.....	.....	25,714	175,692	.....	.....	.....	.....	.....	.....	[10]39	865	65,592	338,600
1928	10,619	17,700	5,219	32,430	.....	.....	23,060	111,767	.....	.....	.....	.....	.....	.....	[10]4,377	12,784	43,275	174,681
1929	.....	.....	.....	9,959	.....	.....	22,343	151,758	.....	.....	.....	.....	.....	.....	.....	.....	22,343	161,717
1930	.....	.....	13	1,891	.....	.....	31,725	217,835	.....	.....	.....	.....	.....	.....	.....	.....	31,738	219,726
1931	.....	.....	.....	.....	.....	.....	31,958	234,512	.....	.....	.....	.....	.....	.....	[11]80	835	32,038	235,347
1932	.....	.....	.....	.....	.....	.....	34,977	181,585	.....	.....	.....	.....	.....	.....	[11]24	468	35,001	182,053
1933	.....	.....	.....	.....	.....	.....	5,459	71,766	.....	.....	.....	.....	.....	.....	.....	.....	5,459	71,766
1934	.....	.....	12	1,872	.....	.....	33,445	152,076	.....	.....	.....	.....	.....	.....	.....	.....	33,457	153,948
1935	.....	.....	24	978	.....	.....	35,172	143,698	.....	.....	.....	.....	.....	.....	[9]31	3,590	35,227	148,266
1936	113,897	461,934	.....	.....	.....	.....	570	8,311	.....	.....	.....	.....	.....	.....	[9]5	262	114,472	470,507
1937	160,272	740,555	.....	.....	.....	.....	.....	.....	2,425	12,731	.....	.....	.....	.....	[12]43	740	162,740	754,026
1938	176,852	865,968	.....	.....	148,642	980,713	.....	.....	23,964	200,302	.....	.....	.....	.....	.....	.....	349,458	2,046,983
1939	176,796	881,064	.....	.....	268,409	1,983,783	.....	.....	14,125	53,408	97,060	493,559	.....	.....	.....	.....	556,390	3,411,814
1940	172,595	878,208	.....	.....	445,864	3,554,460	.....	.....	.....	.....	220,816	1,282,840	.....	.....	.....	[11]619	839,275	5,706,127
1941	173,688	873,721	.....	3,521	694,894	5,626,389	.....	.....	.....	.....	252,056	1,403,441	3,583	22,636	.....	.....	1,124,221	7,929,708
1942	149,274	805,805	.....	4,198	756,453	6,232,794	.....	.....	.....	.....	241,815	1,155,167	18,667	79,152	.....	.....	1,166,209	8,277,116
1943	109,846	595,417	.....	433	674,487	5,015,128	.....	.....	.....	.....	196,687	896,148	.....	14,655	.....	.....	981,020	6,521,781
1944	115,675	598,564	.....	169	484,583	3,109,606	.....	6,181	.....	.....	152,696	716,174	.....	711	.....	.....	752,954	4,431,405
1945	104,724	448,258	.....	.....	430,065	3,107,715	.....	5,383	.....	.....	153,416	651,563	.....	.....	.....	.....	688,205	4,212,919
1946	104,925	436,084	.....	.....	531,695	3,855,258	.....	8,262	.....	.....	225,458	1,029,230	.....	.....	.....	.....	862,078	5,328,834
1947	33,952	139,235	.....	.....	780,153	5,257,179	.....	.....	.....	.....	295,408	1,195,098	.....	1,596	.....	.....	1,109,513	6,593,108
1948	.....	1,498	.....	.....	889,711	5,838,584	.....	.....	.....	.....	310,564	1,313,134	.....	.....	.....	[13]1,199	1,200,275	7,154,415
Total	1,615,081	7,788,606	131,585	808,080	6,105,081	44,551,923	267,741	1,622,118	40,514	266,441	2,145,976	10,136,354	22,250	118,750	4,699	23,745	10,332,927	65,316,017

[1]Canadian Associated Goldfields (production of which is shown in the figures for 1927 and 1928) went into bankruptcy in 1928 and the property was acquired by Proprietary Mines, Limited, in 1930. In 1934, Canadian Reserve Mines, Limited, acquired the 3 Costello claims and the Raven Falls power plant from Proprietary and transferred them to Omega Gold Mines, Limited.

[2]Acquired by Beaverhouse Lake Gold Mines, Limited, in 1935. [3]Acquired by Cathroy Larder Mines, Limited, in 1943.

[4]Production for 1913 by Associated Goldfields, which was acquired by Canadian Associated Goldfields in 1921.

[5]Production for 1913 and 1914 from La Mine D'Or Huronia, which has been known as the Argonaut since 1919. The values shown are exclusive of copper.

[6]Reddick mine, which was bought by Associated Goldfields in 1914 and acquired from Proprietary Mines, Ltd., by Kerr-Addison Gold Mines, Limited, in 1936.

[7]American Eagle, 50 tons, $900; Detroit Syndicate, 50 tons, $200.

[8]Patricia mine, afterwards called Barry-Hollinger. [9]Miller Independence. [10]Gold Hill. [11]Telluride.

[12]Britcana, 21 tons, $702; Telluride (which was acquired on a 99-year lease by Minaura Mines, Limited, from Smelters Corporation of Canada, Limited, in November, 1935), 22 tons. $38.

[13]Briscoe Bryce, $45; Caramora Porcupine, $1,154.

Table II

KIRKLAND LAKE GOLD BELT

ANNUAL PRODUCTION STATISTICS BY MINES, 1910–1948

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

Year	Toburn (Tough-Oakes Burnside[1])		Kirkland Golden Gate[2]		Wright-Hargreaves		Teck-Hughes		Lake Shore		Kirkland Lake Gold		Sylvanite		Macassa		Bidgood		Morris Kirkland		Upper Canada		Miscellaneous[3]		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
1910	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30	286	30	286
1911	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	675	4,650	675	4,650
1912	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1913	2,220	66,632	2,500	14,006	3	1,127	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,660	7,171	6,383	88,936
1914	3,734	117,644	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,734	117,644
1915	26,196	555,539	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26,196	555,539
1916	39,865	711,626	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39,865	711,626
1917	38,695	342,830	.....	.....	.....	.....	11,257	66,722	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49,952	409,552
1918	22,000	139,683	.....	.....	.....	.....	14,774	80,570	16,749	416,414	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	1,113	53,526	637,780
1919	.....	.....	.....	.....	.....	.....	18,387	169,590	11,081	263,354	11,324	56,263	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40,792	489,207
1920	.....	.....	.....	.....	.....	.....	30,646	277,878	19,779	545,311	40,812	322,533	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	91,237	1,145,722
1921	.....	.....	.....	.....	36,053	481,892	34,693	359,844	21,817	540,450	43,966	268,566	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	136,529	1,650,752
1922	16,108	107,617	.....	.....	66,181	767,445	41,194	604,006	24,279	476,461	37,489	226,527	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,496	10,082	191,747	2,192,138
1923	1,803	12,174	.....	.....	79,242	762,761	38,314	1,137,523	23,203	557,186	45,449	223,990	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	188,011	2,693,634
1924	8,438	47,548	.....	.....	84,487	1,094,462	44,209	1,035,338	56,168	1,104,550	8,091	46,513	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	201,393	3,328,411
1925	34,152	263,064	.....	.....	147,939	1,913,468	55,220	996,645	109,273	1,958,720	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,526	346,584	5,133,423
1926	43,871	309,709	.....	.....	153,392	2,150,844	87,074	1,600,613	171,197	2,775,000	10,829	126,999	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	466,363	6,963,165
1927	38,999	153,215	.....	.....	209,164	2,151,916	153,881	2,781,962	236,818	3,375,053	52,648	473,673	40,479	429,424	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	731,989	9,365,243
1928	14,396	82,316	.....	.....	256,331	1,838,510	317,213	4,951,707	279,661	4,073,965	57,883	414,596	69,791	738,146	.....	.....	.....	.....	.....	.....	.....	.....	.....	32,805	995,275	12,132,045
1929	.....	.....	.....	.....	188,238	1,734,728	330,340	5,081,078	430,170	6,126,688	53,595	353,915	74,523	689,465	.....	.....	.....	.....	.....	.....	.....	.....	11	12,328	1,076,877	13,998,202
1930	.....	.....	.....	.....	220,430	2,432,888	338,555	5,403,030	550,501	7,847,508	52,106	534,154	81,213	794,459	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,242,805	17,012,039
1931	.....	.....	.....	.....	266,352	3,078,754	444,410	6,286,668	816,580	11,650,281	52,628	615,882	91,621	921,216	.....	.....	.....	.....	.....	.....	.....	.....	1	1,662	1,671,592	22,554,463
1932	14,689	227,956	.....	.....	295,525	3,384,125	475,700	6,631,755	818,698	14,317,113	56,492	592,451	96,891	930,305	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,757,995	26,683,705
1933	36,913	666,894	35	865	285,465	4,955,960	474,700	6,166,619	808,917	14,377,716	49,487	400,622	96,937	1,072,977	8,101	110,172	.....	.....	.....	.....	.....	.....	.....	5,546	1,760,555	27,757,371
1934	36,230	708,119	.....	.....	354,418	7,572,292	442,745	5,801,691	836,023	16,305,819	64,952	703,300	111,767	1,740,384	66,557	1,111,098	2,433	6,804	.....	.....	.....	.....	8,476	100,221	1,923,601	34,049,728
1935	35,360	714,261	1	10	361,149	7,528,563	417,917	4,901,862	836,322	16,259,720	71,920	777,430	152,281	1,917,606	68,627	1,067,196	11,148	43,870	.....	.....	.....	.....	7,912	79,498	1,962,637	33,290,016
1936	34,440	723,295	25	1,499	400,310	7,588,550	403,712	4,747,833	887,571	15,882,078	84,679	746,189	162,185	2,099,128	70,878	1,260,414	26,518	362,318	3,130	18,044	.....	.....	749	3,112	2,074,197	33,432,460
1937	37,465	920,351	225	5,144	436,500	7,855,856	412,430	4,381,676	900,321	15,546,656	84,886	1,249,724	174,566	2,222,815	90,617	1,464,561	44,732	431,847	35,970	202,687	.....	.....	90	20,747	2,217,802	34,302,064
1938	52,434	1,112,385	11,090	167,759	434,650	7,800,875	380,215	3,625,284	921,837	15,149,635	92,665	1,483,769	190,714	2,419,734	110,718	1,769,951	52,636	617,581	22,929	113,770	6,270	53,547	1,263	7,506	2,277,421	34,321,796
1939	55,272	1,225,340	23,753	267,335	438,710	8,219,961	379,175	3,444,668	856,586	13,318,622	99,401	1,729,237	201,331	2,486,848	148,085	2,317,985	53,191	483,520	.....	.....	47,014	685,755	.....	.....	2,302,518	34,179,271
1940	59,524	1,296,428	25,481	261,861	442,920	8,688,806	317,560	3,577,194	647,426	10,930,962	137,986	2,051,790	212,519	2,658,723	150,674	2,680,188	50,437	404,546	39,579	164,995	66,656	1,079,453	.....	.....	2,150,762	33,794,946
1941	60,715	1,095,779	23,781	214,347	411,760	8,061,343	258,100	2,534,139	530,368	7,925,692	136,613	1,879,727	197,293	2,589,635	142,332	2,521,389	40,460	467,890	25,645	121,601	73,414	1,259,730	.....	18,926	1,900,481	28,690,198
1942	43,635	730,350	8,324	73,489	283,580	5,669,063	93,335	1,365,513	347,951	5,560,188	100,854	1,458,823	175,745	2,021,506	120,400	2,144,501	47,960	507,219	.....	447	86,523	1,359,021	.....	5,730	1,308,307	20,895,850
1943	40,905	609,517	.....	1,859	225,710	4,372,734	100,705	1,251,047	293,398	5,166,738	83,987	1,189,478	148,190	2,025,005	103,259	1,652,643	49,835	556,537	.....	.....	68,829	1,154,438	.....	3,460	1,114,818	17,983,456
1944	39,940	493,270	.....	481	184,520	3,494,958	102,920	989,004	258,544	4,223,731	77,457	1,053,156	137,822	1,722,722	83,392	1,398,011	48,594	347,105	.....	.....	78,036	1,062,214	.....	1,812	1,011,225	14,786,464
1945	41,655	488,624	.....	.....	156,320	3,069,368	106,006	1,098,532	291,854	4,524,101	85,358	1,086,212	114,227	1,452,360	71,988	1,086,302	32,608	419,016	.....	.....	83,708	1,038,950	.....	11,570	983,724	14,275,035
1946	40,753	483,496	.....	.....	174,314	3,147,009	91,302	1,093,701	310,968	4,744,166	91,443	1,094,837	154,562	1,693,581	87,383	1,325,491	27,634	274,214	.....	.....	99,431	1,054,925	.....	5,550	1,077,790	14,916,970
1947	41,849	512,484	6,288	42,507	183,059	3,007,888	71,360	1,049,025	309,717	4,745,200	91,171	1,613,857	151,140	1,450,334	97,507	1,381,202	30,669	412,999	.....	.....	109,556	1,215,028	.....	.....	1,092,316	15,430,524
1948	45,809	500,670	.....	.....	187,790	3,077,238	73,885	1,010,737	344,542	5,111,049	93,882	1,378,354	167,440	1,565,036	103,650	1,432,427	43,767	395,756	.....	.....	119,279	1,288,654	.....	.....	1,180,044	15,759,921
Total	1,008,065	15,418,816	101,503	1,051,162	6,964,512	116,503,384	6,561,934	84,503,454	12,968,319	215,800,127	1,970,053	24,152,567	3,103,237	35,641,409	1,524,168	24,723,531	562,622	5,731,222	127,253	621,544	838,716	11,251,715	27,366	335,301	35,657,748	535,734,232

[1]Acquired by Toburn Gold Mines, Limited, in 1931.

[2]Mine acquired from Golden Gate Mining Company, Limited, in 1946, which had previously acquired properties of Kirkland Gateway Gold Mines, Limited, and Crescent Kirkland Gold Mines, Limited.

[3]See table of "Miscellaneous Production" to the right.

MISCELLANEOUS PRODUCTION, KIRKLAND LAKE GOLD BELT

Mine	Year	Quantity	Value
		tons	$
Gold Pyramid	1911	175	650
Golden Summit	1936, 1937, 1945	737	3,738
Baldwin-Kirkland[1]	1929, 1938	81	1,247
Mesabi (Bourkes[2])	1918, 1936-1938	1,298	8,935
Moffatt-Hall	1934, 1935	16,388	166,569
Ontario-Kirkland	1922	6,496	10,082
Swastika	1910, 1911, 1913	2,190	11,457
Trout Creek	1931	1	1,662
Miscellaneous[3]	1925, 1928, 1929, 1933, 1934, 1937, 1938, 1941-1946	.....	130,961
Total		27,366	335,301

[1]Under lease by Lucky Kirkland Gold Mines, Limited, in 1938.

[2]The property of the Bourkes Syndicate was acquired by Mesabi Gold Mines Limited, in 1937.

[3]This includes gold recovered from scrapped machinery, origin unknown, and high-grade.

Table III

PORCUPINE GOLD BELT

ANNUAL PRODUCTION STATISTICS BY MINES, 1910–1948

(Value includes gold and silver, and exchange premium and equalization fee and equalization have been added since 1920)

Year	Hollinger		Dome		Vipond[1]		McIntyre Porcupine		Porcupine Crown (Northerown[2])		Coniaurum (Newray[3])		Dome Lake and West Dome Lake[4]		Munro Croesus		Schumacher[5]		Porcupine Peninsular (Night Hawk Peninsular[6])		Buffalo Ankerite[8]		Marbuan (March[9])		De Santis		Gillies Lake-Porcupine (Rochester[10])		Naybob (Hayden[11])		Paymaster Consolidated[12]		Pamour		Rouyn[13]		Hallnor		Moneta		Preston East Dome		Broulan		Aunor		Paymar		Nakhodas		Bonetal		Hoyle		Porcupine Reef		Miscellaneous[14]		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
1910		31,194		4,355																																																	35,549
1911		6,000		4,277	432	5,160																																														432	15,437
1912	45,195	909,181	75,088	737,499	5,168	16,259	14,500	77,657																																											139,951	1,740,596
1913	138,291	2,488,022	131,149	1,242,625			29,660	336,299	19,715	326,803	2,456	18,858																																							25	4,300	321,305	4,316,807
1914	208,936	2,719,355	221,390	1,059,238	9,700	73,628	62,281	549,166	40,357	685,135	11,607	122,355																																						20,212	554,774	5,231,989
1915	334,730	4,206,015	317,740	1,530,372	35,939	346,653	101,955	750,812	45,419	602,436		36,925	11,727	102,880	100	73,215	9,940	48,236																															139	9,134	857,989	7,993,953
1916	401,854	5,073,401	440,900	2,153,820	43,041	176,688	126,480	1,218,073	51,273	578,322			6,543	16,814	477	51,722	46,463	225,301																																			1,327,039	9,494,139
1917	514,301	4,261,938	359,570	1,480,174	34,971	209,788	175,893	1,710,304	30,111	377,964	340	1,447	16,388	44,434	1,541	60,046	37,323	198,605																																			977	1,170,469	9,345,367
1918	578,755	5,752,571	187,580	1,290,301			142,329	1,384,966	10,907	124,474	401	1,516	12,229	103,745	692	64,780	19,098	92,642																																			31	2,562	16,214	816,754	7,899,381
1919	711,882	6,722,266	197,580	1,290,301			185,018	1,975,014					4,433	25,910																																					3,831	27,085	1,092,744	10,041,579
1920	690,205	6,509,629	253,220	2,243,926			172,267	2,005,443					4,707	52,531																																					3,003	11,247	1,162,065	11,953,907
1921	1,072,493	10,015,712	335,680	2,286,357			217,208	2,042,351																											2,800																1,580,460	14,415,455
1922	1,491,281	12,436,393	368,490	4,178,936			291,428	2,583,336							518	37,375																																			1,664	2,076,989	18,862,724
1923	1,366,352	10,622,262	399,800	4,405,199	2,623	24,532	291,428	2,583,336					8,114	60,765					38,326	265,518																															11,845	2,060,721	17,674,549
1924	1,659,776	13,574,778	490,400	4,307,051	52,427	605,234	390,453	3,625,493					35,278	255,051					39,715	196,947																															5,270	2,842,922	24,445,690
1925	1,659,776	13,574,778	530,200	4,365,923	61,203	565,213	419,640	3,721,499					49,546	220,758					21,604	111,154	23,060	140,588	4,655	11,055	146				28,049	63,551																			9,452	3,015,607	21,834,793
1926	1,929,526	15,746,666	555,700	3,940,553	79,717	631,436	495,653	3,962,074					16,982	87,919							69,963	395,005	4,566	19,839					62,129	135,025																			854	3,180,993	23,311,204
1927	2,178,329	14,539,538	549,300	4,031,575	90,863	667,724	522,893	3,965,210													66,008	360,960	32,627	183,979					94,050	183,271																			60	223,245	3,581,604	25,511,304
1928	1,778,470	10,706,233	548,000	3,915,051	88,896	694,426	550,100	4,314,803			102,293	635,485	35,142	155,797							12,912	71,684	48,484	256,303			4,848	44,285																			255	39,740	3,185,604	20,384,904
1929	1,549,157	9,510,992	452,900	3,590,527	107,994	824,726	550,100	4,700,726			122,272	738,941		15,662								878	53,053	306,262			7,815	56,913																				47,702	2,882,224	19,460,413
1930	1,625,868	10,276,546	67,600	774,943	114,667	910,881	565,510	4,700,726			130,585	783,023	550	4,171									58,462	228,507			1,396	5,439																				61,940	2,553,385	17,843,392
1931	1,640,705	10,532,380	542,800	3,636,906	100,223	886,304	617,425	4,962,211			144,554	977,907		6,520							55,267	247,536	26,812	89,566					2,580	1,497																			33,587	3,091,946	20,772,501
1931	1,754,863	11,685,512	536,450	4,581,131	107,197	813,504	723,285	6,155,757			144,657	945,765									111,402	650,591	2,800	5,288	5,630	18,386			1,593	3,188																			155	31,944	3,351,263	24,289,974
1932	1,727,102	13,831,173	546,500	6,103,340	107,562	700,354	754,360	7,589,845			138,114	979,156			205	10,467					131,720	715,898	26,030	113,422					13,824	60,622																			38	30,918	3,402,632	29,928,810
1933	1,900,490	15,108,883	547,600	6,177,087	101,806	839,243	851,345	8,289,262			151,005	1,134,596	1,237	25,313							159,383	1,035,987	59,380	290,642			5,122	56,033	10,681	23,666	3,945	567,076																	580	2,839	3,711,714	33,002,770
1934	1,837,153	14,700,511	549,100	7,286,606	106,393	418,962	869,000	8,105,612			168,715	1,390,261	13	2,904							271,736	1,888,829					18,410	166,531					140,962	976,605	138,187	909,933	27,540	225,775															830	9,062	3,829,279	34,202,950
1935	1,755,768	14,539,414	553,000	7,315,166	95,457	463,391	869,000	8,105,612			166,980	1,462,212									343,005	2,823,513					16,911	132,381			10,615	169,658	276,168	2,044,049	31,336	351,746	38,750	228,427													68	45,522	4,049,786	35,260,945
1936	1,719,199	14,877,898	576,300	7,485,321	94,240	406,668	870,160	8,176,793			188,975	1,675,230									362,838	2,971,464							10,339	41,584	190,107	1,402,304	515,193	3,313,830	44,399	467,767	85,816	662,870	60,979	1,373,141	54,577	1,016,153							252	23,888	4,303,047	39,305,160
1937	1,734,647	18,950,804	601,700	7,382,289	92,070	429,272	872,745	8,288,669			187,405	1,753,902									369,014	3,455,952			35,539	247,888			44,271	266,356	291,775	1,545,431	583,299	2,561,086	55,727	521,201	111,305	825,045	129,955	1,906,340	138,853	2,116,708	14,911	105,020					4,714	44,084	4,218,689	44,398,639
1938	1,700,355	15,484,394	615,000	7,462,379	37,515	187,218	877,830	8,406,958			185,435	1,670,570									378,337	2,508,556			56,444	433,341			53,524	560,351	207,168	1,742,283	575,728	2,729,365	94,522	836,412	127,741	853,511	140,529	2,049,275	64,439	1,141,751	175,773	2,341,357	110,637	1,190,489	127,111	1,373,285	50,666	381,944	3,968	25,091							1,123	4,800	5,133,186	47,791,659
1939	1,780,377	16,844,035	631,600	7,934,391		50,068	865,670	9,187,814			186,885	1,873,391									448,621	2,790,985			60,405	410,605			53,827	531,152	215,113	1,811,579	559,329	2,577,374	100,787	949,733	166,596	1,183,053	132,267	2,227,328	61,416	1,169,846	194,817	2,399,270	138,888	1,067,657	159,341	1,658,955	55,626	333,551	23,782	142,299	6,865	40,580	159,470	644,765			7,265	19,719	5,672,214	55,000,984
1940	1,755,923	16,411,110	627,700	7,769,368			865,670	9,187,814			182,392	1,864,496									358,419	2,444,285			38,910	256,341			58,870	345,891	207,566	1,707,484	574,653	2,342,426	101,469	816,683	172,727	1,220,053	137,701	1,938,956	137,291	1,758,239	12,380	137,797	16,278	83,662	40,318	234,142	187,620	766,813					6,374,447	55,586,187
1942	1,530,712	14,296,498	559,700	6,579,536			668,700	7,439,863			111,455	1,189,629									260,271	1,894,052									33,938	138,531	1,139,290	525,357	2,084,530	85,221	581,337	125,887	819,562	105,544	1,460,953	14,088	228,520	247,026	2,282,318	118,007	1,102,514	159,436	1,915,846					5,730	5,624,554	50,480,026
1943	1,678,946	19,897,411	525,000	5,772,500			589,940	6,588,753			98,540	1,037,676									233,442	1,582,581											132,063	1,110,414	470,532	1,615,502	77,544	552,855	93,112	570,327	102,742	1,585,267					249,268	2,218,751	100,481	770,810	137,521	1,692,564			1,740	26,081	150,778		6,746	3,788,313	33,678,991
1944	955,447	8,735,306	519,800	5,177,405			565,320	6,214,418			98,210	1,013,678									224,370	1,388,974											130,793	1,055,259	417,914	1,465,107	73,538	458,676	66,120	363,033	85,436	1,724,505					222,359	2,171,301	89,392	653,929	143,390	2,163,291					93,992	168,826			9,530	3,385,093	32,061,352
1945	933,745	8,458,697	527,100	4,987,353			613,200	6,110,561			114,385	1,040,181									210,045	1,284,528											140,015	1,152,103	388,686	1,318,202	70,309	509,992	92,721	609,371	112,357	1,655,928					240,899	1,819,129	75,791	578,553	167,705	2,079,300					26,698	172,419	65,639	194,604			6,607	3,352,840	33,303,325
1946	1,048,645	9,224,462	573,400	5,448,935			630,270	6,563,221			116,220	983,325									210,115	1,289,744											138,131	1,198,196	412,352	1,330,830	106,658	718,997	124,833	1,184,125	127,059	1,585,075					225,812	1,825,703	85,693	533,555	172,489	2,091,693					26,698	149,679	103,026	371,507	11,006	54,058	636	1,962	3,925,731	32,922,648
1947	1,021,955	8,469,907	595,200	5,401,304			673,950	6,851,517			129,175	1,189,741									181,429	1,179,729											142,919	1,272,109	412,919	1,330,830	106,658	718,997	124,833	1,184,125	127,059	1,585,075					237,405	1,863,733	93,808	527,417	176,564	2,001,122					42,919	172,435	103,101	290,836	47,817	367,370			1,962	4,356,812	35,135,980
1948	1,137,523	9,277,749	620,300	5,463,596																																																							
Total	47,372,641	390,244,393	16,563,967	160,700,863	1,565,218	9,827,448	18,823,161	181,426,508	226,180	2,893,730	2,917,929	24,743,373	188,488	1,120,306	5,333	326,894	112,124	564,984	99,688	580,462	4,477,734	30,042,140	317,769	1,454,663	196,928	1,366,707	54,502	462,482	247,146	1,843,422	2,447,856	18,298,482	5,737,530	25,149,540	933,787	7,457,045	1,307,637	9,540,226	1,241,026	21,222,027	314,829	5,589,356	2,208,899	21,662,837	939,255	7,549,637	1,416,726	17,013,283	119,181	853,292	44,028	252,792	232,750	1,254,512	724,462	2,686,032	58,823	416,428	26,762	799,257	110,922,359	947,343,224

[1]Acquired by Anglo-Huronian, Limited, in 1933 and by Mace Gold Mines, Limited, in 1937, together with properties of Inspiration Gold Mines, Limited.

[2]The Porcupine Crown was acquired by Northcrown Porcupine Mines, Limited, on May 15, 1920, and by Vipond Consolidated Mines, Limited (or Mace Gold Mines, Limited), in 1926.

[3]The Rea mine (production of which is shown in the figures for 1915, 1914, and 1915) was operated by Newray Mines, Limited, in 1915. In 1922 the properties were amalgamated as Consolidated West Dome Lake Mines, Limited, and in 1930 acquired by Paymaster Consolidated Mines, Limited.

[4]From 1915 to 1920, the production shown was from the Dome Lake mine, except 300 tons with a value of $2,462 from the West Dome Lake in 19.. In 1922 the properties were amalgamated as Consolidated West Dome

[5]Purchased by the Hollinger in 1922.

[6]Now owned by Paymaster Consolidated Mines, Limited.

[7]Acquired by Porcupine Peninsular Gold Mines, Limited, in 1933.

[8]The production shown from 1926 to 1930 is from the Ankerite mine before it was acquired by Buffalo Ankerite Gold Mines, Limited, in 1932. The Marbuan was acquired in 1936, and the figures from 1936 on include production from both mines.

[9]The March was taken over by Marbuan Gold Mines, Limited, in 1933; the Buffalo Ankerite operated the Marbuan mill in 1933, treating 2,800 to from the dump of New York Porcupine Gold Mines, Limited. The Marbuan was taken over by Buffalo Ankerite Gold Mines, Limited, in 1936; its production since that date is shown under Buffalo Ankerite.

[10]The Rochester mine and other property was acquired from Porcupine United Gold Mines, Limited, in 1933.

[11]The Hayden mine was acquired by Naybob Gold Mines, Limited, in 1934 and by Naybob Mines, Limited, in 1943.

[12]Paymaster Consolidated Mines, Limited, incorporated in 1930, is a merger of West Dome Lake Gold Mines, Limited, and United Mineral Lac Corporation (which owned the Paymaster mine). Practically all the production has come from the old Dome Lake and West Dome Lake shafts.

[13]The Ross mine in Hislop township is owned by Hollinger Consolidated Gold Mines, Limited.

[14]See table of "Miscellaneous Production" to the right.

MISCELLANEOUS PRODUCTION, PORCUPINE GOLD BELT

Mine	Year	Quantity	Value
		tons	$
Amos	1937		1,205
Blue Quartz (Amal. Goldfields)	1933, 1935, 1936		1,205
	1934	200	903
Jacuse (Scottish-Ontario)	1927, 1931	315	12,050
	1932, 1933		2,152
Jellicoe Porcupine (Preston)	1913, 1914		15,313
	1922-1924		15,363
Concordia (Jones-Porter)	1914	230	860
Cohen (Dewar)	1915	2,000	7,000
Davidson Consolidated	1916-1920	9,321	53,574
Gold Reef	1915, 1917	128	2,130
Goldhawk Porcupine	1947	636	1,982
Hermiston, N. A.	1910		1,050
	Total		26,762

Mine	Year	Quantity	Value
		tons	$
Hill Gold (Beatty tp.)	1918	25	633
Hollingsworth and F. Clyne	1925, 1935		3,257
Hyperion	1933	1	30
Hugh Pam	1946	1,000	4,172
McLaren-Porcupine	1933, 1934, 1935, 1937	876	5,119
Northern Tweed	1934	20	172
Porcupine Lake	1937-1940, 1944	10,821	60,100
Porcupine Peri	1914, 1915, 1916		10,551
Porphyry (Hyde)	1913, 1915	46	6,236
Tannery (Porcupine Lake)		151	2,738
Tannery Burns	1918	21	889
Miscellaneous	1925, 1927-1938, 1942-1946, 1948	68	606,895
	Total	26,762	799,257

[1]The Preston claim in Deloro township was acquired in 1919 by Clifton Porcupine Mines, Limited, from Preston East Dome Mines, Limited.

[2]J. M. McLaren shipped to Noranda 26 tons, $326.

[3]This is high-grading and recoveries from scrapped machinery.

Table IV

ALGOMA DISTRICT

Annual Production Statistics of Gold Mines, 1893–1948

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

Year	Darwin (Grace[1])		Algold (New Goudreau[2])		Minto, Jubilee, and Cooper[3]		Parkhill[4]		Algoma Summit[5] (McCarthy-Webb)		Alden-Goudreau		Cline Lake		Miscellaneous[6]		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
Prior to 1910	10,297	69,922					[7]9	347							5,812	22,375	16,118	92,644
1910	60	2,020													1,600	5,070	1,660	7,090
1911																627		627
1923		153																153
1925		41																41
1926			415	1,847													415	1,847
1929						6,184	33	2,057								14	33	8,255
1930	750	588			1,074	2,559											1,824	3,147
1931					9,448	80,269	9,082	75,543									18,530	155,812
1932			117	474	18,765	185,171	16,822	166,009									35,704	351,654
1933					23,671	182,376	11,565	246,580							106	752	35,342	429,708
1934					22,189	169,301	19,431	310,647	421	4,926							42,041	484,874
1935	2,103	17,750			34,890	196,252	20,871	338,388	205	3,008					7,946	49,027	66,015	604,425
1936	17,598	231,401	3,073	14,948	39,385	150,596	22,441	330,886	2,711	8,516					5,660	64,786	90,868	801,133
1937	14,720	214,707	11,064	41,613	15,577	35,325	25,209	200,048	44,869	68,130		988			1,951	25,322	113,390	586,133
1938			8,542	24,862	7,831	74,519	315	7,149	66,670	204,875			32,344	259,781		445	115,702	571,631
1939					11,770	55,099			1,751	8,009			86,085	812,620	11,314	29,438	110,920	905,166
1940		7,614		[8]832				9,299			[9]1,582	26,361	81,981	594,895		5,195	83,563	644,196
1941											[9]4,109	32,034	85,313	413,831		210	89,422	446,075
1942						2,325		1,540		1,289	[9]6,006	53,885	46,119	284,584			52,125	343,623
1943		2,175						2,821			[9]1,782	10,932				586	1,782	16,514
1944		481				481		481										1,443
1945												[9]153				1,383		1,536
1946																		
1947														2,700				2,700
1948														642				642
Total	45,528	546,852	23,211	84,576	184,600	1,140,457	125,778	1,691,795	116,627	298,753	13,479	124,353	331,842	2,369,053	34,389	205,230	875,454	6,461,069

[1]Acquired by Darwin Gold Mines, Limited, in 1934 and by New Darwin Gold Mines, Limited, in 1938. Operated by the Algoma Commercial Company in 1902 and 1903, who produced 6,097 tons, $48,708; and by Le Page Gold Mining Company from 1907 to 1910, who produced 4,260 tons, $23,235.

[2]Acquired by Algold Mines, Limited, in 1934 and by Amherst Gold Mines, Limited, in 1939.

[3]Minto Gold Mines, Limited, owns three adjoining mines in Algoma district. Production shown from 1930 to 1933 was from the Minto; in 1934, 11,946 tons came from the Jubilee; from 1935 to 1937 the whole production was from the Jubilee; in 1938 the production came from the Jubilee and the Cooper; in 1939 from the Jubilee.

[4]Acquired by Ward Lake Gold Mines, Limited, in 1938.

[5]Acquired by Magino Gold Mines, Limited, in September, 1939.

[6]See table of "Miscellaneous Production" to the right.

[7]Production for 1904 from the Mariposa mine, which was acquired by Parkhill Gold Mines, Limited, in 1929.

[8]Under option to Norgold Mines, Limited.

[9]Under option to Regnery Metals.

Miscellaneous Production, Algoma District

Mine	Year	Quantity	Value
		tons	$
Centennial (Agawa)	1939, 1940	8,612	22,397
Deep Lake	1936–1938, 1943	2,790	57,180
P. Edward	1929, 1933, 1941	46	694
Edwards (mine)	1937	1,573	16,977
Golden Reed	1908	3	125
Havilah (Ophir)[1]	1893, 1894, 1900, 1910, 1911	6,589	26,535
Hiawatha (Louittit)	1937, 1939, 1940	1,931	6,826
Kremzar	1940		96
Norwalk (Manxman)	1904, 1910	820	1,412
Ranson	1939	774	5,938
Shenango	1936, 1937, 1945		2,457
S. B. Smith (Van Sickle)	1935, 1936	9,228	60,251
Soo Mg. and Prosp. Synd.	1933	60	282
Stanley	1936	1,963	2,936
G. L. White	1936		1,124
Total		34,389	205,230

[1]Galbraith Township.

Table V

THUNDER BAY DISTRICT

ANNUAL PRODUCTION STATISTICS OF GOLD MINES, 1905–1948

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

Year	St. Anthony[1]		North Shores (McKellar-Longworth[2])		Tashota[3]		Ardeen (Moss[4])		Northern Empire		Little Long Lac		Sturgeon River		Leitch		Bankfield		Sand River		MacLeod-Cockshutt		Hard Rock		Tombill		Magnet		Jellicoe		Miscellaneous[5]		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
Prior to 1910	13,100	58,304																													1,100	2,378	14,200	60,682
1911	540	4,318																															540	4,318
1912	11,500	61,327																															11,500	61,327
1913	6,432	20,408																															6,432	20,408
1917		1,967																																1,967
1918	3,603	18,340																															3,603	18,340
1920		8,771																													1	63	1	8,834
1921	320	5,069																													30	1,122	350	6,191
1923				1,707																														1,707
1924																																114		114
1929	678	2,388		226																											1	71	679	2,685
1930	8	458																															8	458
1931					34	315																											34	315
1932			179	15,480			25,363	196,473																							32	1,474	25,574	213,427
1933			11	288			34,789	270,077																									34,800	270,365
1934	21,618	123,198					38,143	216,094	22,507	195,647	5,485	85,480																			230	37,638	87,983	658,057
1935	44,550	303,152	1,404	29,358	12,827	76,627	5,884	32,531	45,736	645,296	62,073	1,108,269																			3,346	51,820	175,820	2,247,053
1936	28,408	160,394	2,214	26,212	23,590	224,183	39,545	234,134	64,645	1,002,521	83,555	1,500,792	1,290	20,711		[2]2,048															27	2,019	243,274	3,173,014
1937	17,896	156,225		202	14,454	122,960			65,026	706,179	104,931	1,638,545	17,978	310,102	23,058	449,260	26,437	390,212	2,537	11,932											183	6,147	272,500	3,791,764
1938	28,945	220,001			329	16,137			59,332	804,044	97,320	1,544,990	28,157	509,011	30,584	709,799	47,500	648,074	35,670	459,466	126,291	900,582	76,074	648,075	26,486	387,554	2,946	61,640			190	544	559,524	6,909,917
1939	23,792	293,502							67,914	928,616	106,775	1,698,766	26,282	441,309	31,206	784,784	47,566	593,636	36,518	437,450	208,095	1,649,469	107,086	803,607	38,704	613,789	17,493	457,247	3,015	45,748			714,446	8,747,923
1940	59,039	423,563				51			61,691	672,427	113,065	1,761,820	27,790	513,306	31,118	874,122	42,699	428,783	34,726	403,027	238,780	2,108,966	119,255	1,197,693	45,228	645,882	41,485	1,103,149	10,116	150,810	20	500	825,012	10,284,099
1941	70,640	303,907		243		1,371			39,015	419,719	118,332	1,634,811	25,869	458,589	30,493	894,926	39,175	238,408	31,824	383,124	237,076	2,324,324	135,337	1,174,510	46,956	513,263	45,609	976,859	1,591	19,930		4,646	821,917	9,348,630
1942								13,017			115,790	1,517,548	17,757	475,877	30,076	973,111	27,632	109,419	16,595	168,841	233,036	2,619,030	134,122	1,238,828	33,248	429,496	50,613	865,161			3,947	42,017	662,816	8,452,315
1943											88,890	1,008,830			27,438	842,680					181,761	2,103,641	97,373	926,544			43,060	573,408				1,083	438,522	5,456,186
1944											67,538	877,902			21,727	624,283		6,181			124,964	1,536,383	91,047	838,489									305,276	3,883,238
1945											72,117	815,183			20,089	683,452		731			30,000	367,785	6,337	51,565								832	128,543	1,919,548
1946											67,850	728,518			28,692	894,563		8,262			158,434	1,194,689	102,766	717,557			26,018	340,757			761	20,917	384,521	3,905,263
1947											78,216	745,539			30,417	848,156		839			207,260	1,517,054	98,818	675,084			22,224	303,610	2,226	12,613	757	7,162	439,918	4,110,057
1948											95,830	889,595			31,822	958,416					176,221	1,411,610	82,036	373,580			21,140	286,741		1,913	2,687	14,276	409,736	3,936,131
Total	331,069	2,165,292	3,808	73,716	51,234	441,644	143,724	962,326	425,866	5,374,449	1,277,767	17,556,588	145,123	2,728,905	336,720	9,539,600	231,009	2,424,545	157,870	1,863,840	1,921,918	17,733,533	1,050,251	8,645,532	190,622	2,589,984	270,588	4,968,572	16,948	231,014	13,312	194,823	6,567,829	77,494,363

[1]Records are incomplete; operations were reported from 1905 to 1907. This property was formerly owned by Northern Gold Reef, Limited.
[2]Acquired from Schreiber Gold Mines, Limited, by North Shores Gold Mines, Limited, in 1933, which was succeeded in 1936 by North Shores Mines (1936), Limited.
[3]In addition to gold values shown, this mine produced large quantities of copper (see detailed gold table in previous reports).
[4]Originally known as the Huronian; this mine produced in the seventies, but no records are available; acquired by Ardeen Gold Mines, Limited, in 1933, and by Kerry Gold Mines, Limited, in 1937.
[5]See table of "Miscellaneous Production" to the right.
[6]Surface ore.

MISCELLANEOUS PRODUCTION, THUNDER BAY DISTRICT

Mine	Year	Quantity	Value
		tons	$
Anderson, R.	1943		116
Breugold	1941		3,551
Canuette claims	[1]1935, [2]1938, [3]1941, [2]1943, [3]1915	224	3,220
Cook Lake[4]	1937	32	918
Mary J. Coveney	1924		114
Dikdik[4]	1934, 1935	3,525	86,756
Elmos	1942	3,947	39,168
Empress[5]	1897	1,100	2,378
Gold Range	1941		668
Harkness-Hays	[6]1920, 1929, 1932, 1935, 1936	78	5,879
Maloney Sturgeon	1937	1	2,549
Maylac	1916, 1947	1,518	28,079
A. Pilon & M. Richards	1921	30	1,122
Schreiber Pyramid	1937	150	2,680
Talmora Longlac	1948	2,687	14,000
M. C. Williams	1940	20	500
Miscellaneous	[7]1942, 1948		3,125
Total		13,312	194,823

[1]Afton.
[2]Theress.
[3]Milled by Little Long Lac.
[4]Owned by J. Bruce McMartin.
[5]No statistics available; data taken from report of J. H. Chewett April 22, 1897.
[6]W. S. Jackson claims; acquired by Harkness-Hays in 1925.
[7]Mint sundries and high-grading

Table VI

PATRICIA PORTION OF KENORA DISTRICT

ANNUAL PRODUCTION STATISTICS OF GOLD MINES, 1911–1948

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

Year	Howey		Central Patricia		J-M Consolidated (Jackson Manion)		Jason (Argosy[1])		Pickle Crow		McKenzie Red Lake		Red Lake Gold Shore		Gold Eagle		Sachigo River		Madsen Red Lake		Hasaga		Uchi		Berens River		Cochenour Willans		McMarmac Red Lake		Dickenson Red Lake		Starratt Olsen		Miscellaneous[2]		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
1911																																	30	57	30	57
1923																																		124		124
1924																																		126		126
1929																																		14,617		14,617
1930	110,438	460,857																																	110,438	460,857
1931	211,552	914,291																																	211,552	914,291
1932	284,664	1,268,780																																	284,664	1,268,780
1933	344,135	1,161,436																															175	4,205	344,310	1,165,641
1934	481,757	1,594,223	11,536	219,562	3,443	35,389	4,094	30,673																									130	2,551	500,960	1,882,398
1935	484,966	1,332,950	35,192	777,570	1,381	12,851			37,277	878,745	36,117	533,223																					293	6,097	595,226	3,541,436
1936	528,528	1,251,588	58,466	1,144,154	12,160	119,603	9,872	130,027	63,758	1,612,451	52,465	747,795	14,918	138,706																			8,986	69,370	749,153	5,213,694
1937	447,344	1,095,508	77,119	1,392,840	31,225	334,475	31,741	353,981	98,063	2,270,113	58,001	860,214	47,557	451,147	6,599	73,005																	3,000	10,232	800,649	6,841,515
1938	448,115	1,210,032	101,376	1,607,140	17,005	141,532	1,636	35,370	115,915	2,769,291	63,321	892,404	23,858	157,724	43,811	363,516	6,084	376,993	44,663	327,827	3,206	24,993													868,990	7,906,822
1939	449,488	1,138,713	108,091	1,764,651	35,549	277,100			126,959	2,902,154	70,445	1,111,339			45,374	351,730	10,699	536,626	136,929	954,302	58,184	457,724	103,122	686,942	19,217	277,114	9,070	127,430							1,173,127	10,585,825
1940	454,183	968,486	118,803	1,888,637	4,594	50,733	23,964	394,681	141,992	2,879,222	76,572	1,012,548			46,116	420,628	13,030	482,200	141,625	1,129,725	88,077	637,445	227,294	1,299,788	82,346	1,279,928	53,921	817,269	4,561	67,305					1,477,078	13,328,595
1941	385,609	849,642	142,516	1,950,549			48,362	768,826	146,375	2,736,169	84,146	1,000,436			38,195	287,965	16,603	545,153	145,995	1,203,311	134,816	1,000,684	249,417	1,424,370	86,373	1,528,840	61,415	945,444	29,794	586,300					1,569,616	14,827,689
1942			138,790	1,720,634			32,992	538,416	107,951	1,976,684	85,547	1,039,210						16,112	146,226	1,473,029	133,885	891,610	162,627	858,385	86,850	1,517,709	60,240	1,244,546	32,589	424,458					987,697	11,700,793
1943			104,451	1,425,771					70,575	1,328,548	85,973	952,247							144,792	1,321,889	120,318	709,572	14,614	122,248	53,255	854,202	55,663	1,105,078	32,073	277,809					681,714	8,097,364
1944			91,512	1,139,476					63,388	1,453,312	78,279	733,913							132,759	1,448,533	118,249	648,890			40,436	526,995	44,928	767,649	31,890	194,905					601,441	6,913,673
1945		2,590	89,301	1,071,246					60,227	1,291,181	63,460	492,583							101,663	1,001,661	105,068	453,731			72,880	1,007,036	31,445	351,992							524,044	5,672,020
1946			97,808	1,205,651			9,956	77,931	73,209	1,390,576	69,201	595,398							121,649	1,088,533	82,427	299,101			41,925	784,098	59,570	802,750							555,745	6,244,038
1947			96,971	1,000,745		516	18,532	199,920	87,227	1,356,687	76,867	693,499							142,136	1,135,793	61,171	303,801			27,395	364,099	60,747	739,450	8,917	69,782					579,963	5,864,292
1948			141,028	1,485,273		76			107,319	1,631,195	75,967	713,112							151,686	1,239,131	135,212	780,853			49,930	661,824	75,581	1,193,813	13,154	142,201	1,465	5,194	33,501	148,545	784,843	8,001,217
Total	4,630,779	13,249,096	1,412,960	19,793,899	105,357	972,275	181,149	2,529,825	1,300,235	26,476,328	976,361	11,377,921	86,333	747,577	180,095	1,496,844	46,416	1,957,084	1,410,123	12,323,734	1,040,613	6,208,404	757,074	4,391,733	560,607	8,801,845	512,580	8,095,421	152,978	1,762,760	1,465	5,194	33,501	148,545	12,614	107,379	13,401,240	120,445,864

[1]The Casey Summit mine was acquired by Argosy Gold Mines, Limited, in 1935 and by Jason Mines, Limited, in November, 1938.
[2]See table of "Miscellaneous Production" to the right.

MISCELLANEOUS PRODUCTION, PATRICIA PORTION OF KENORA DISTRICT

Mine	Year	Quantity	Value
		tons	$
Bathurst	[1]1929, [2]1936	307	5,809
Bobjo	[1]1929		11,510
W. D. Cooper and P. A. Barry[3]	1935, 1936		5,591
Hudson-Patricia	1936, 1937	11,228	65,166
N. McDonald	1924		126
R. McDonald	1923		124
Red Crest (Rowan Discovery)	1935, 1936	591	9,721
Geo. A. Rowan	1933		368
Geo. Singleton	1933		137
Sol D'Or[4]	1933–1936	458	8,770
J. Tingley	1911	30	57
Total		12,614	107,379

[1]High-grade.
[2]Under option to Car Lake Syndicate.
[3]Produced from the McIntyre Birch Lake property in 1934, reported in 1936.
[4]This property was operated in 1933 by the Highgrade Syndicate and in 1934 by J. Hendrick, when it was acquired by Sol D'Or Gold Mines, Limited.

Table VII

ONTARIO'S GOLD MINING INDUSTRY

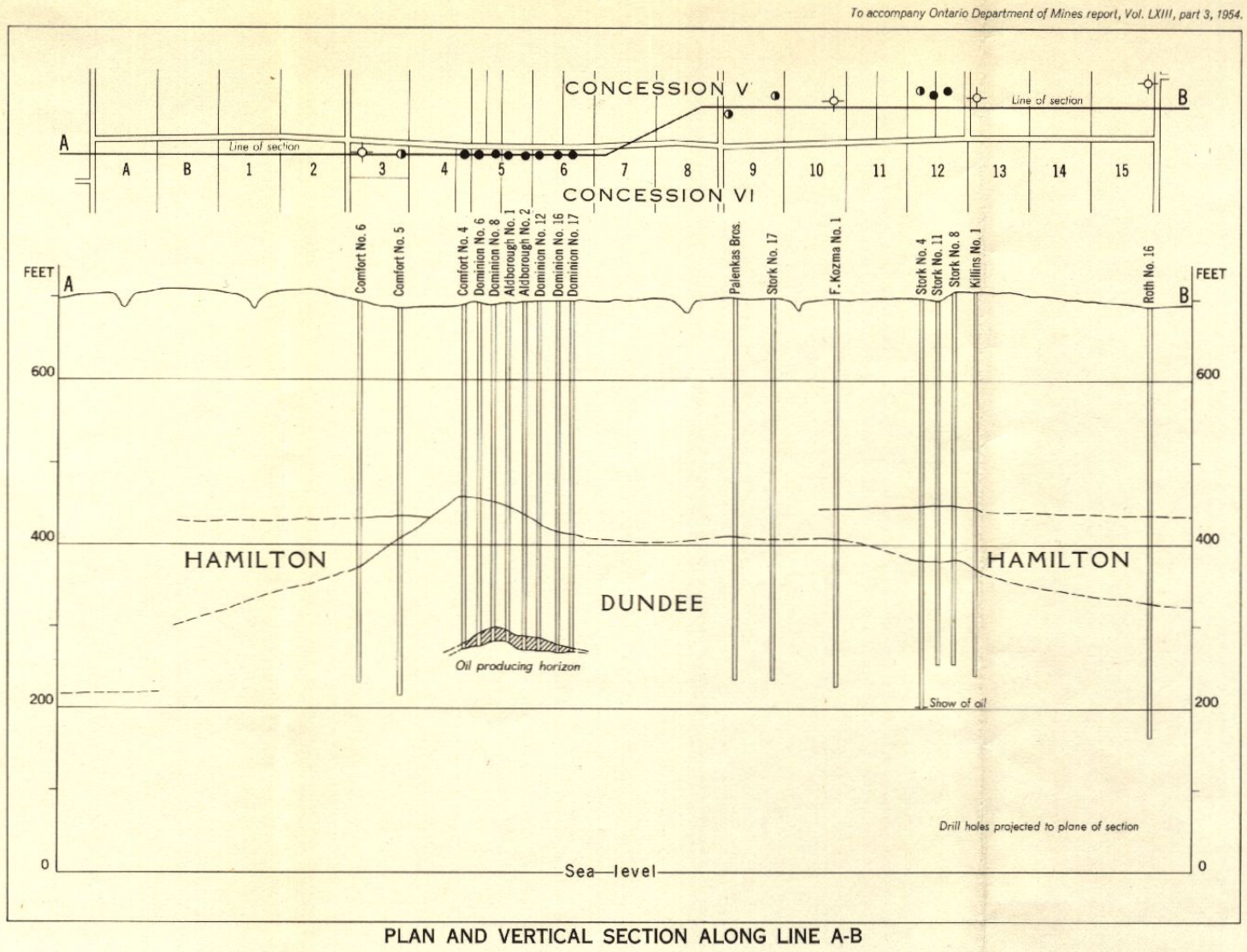
ANNUAL PRODUCTION STATISTICS AREAS, 1885–1948

(Value includes gold and silver, and exchange premium and equalization have been added since 1920)

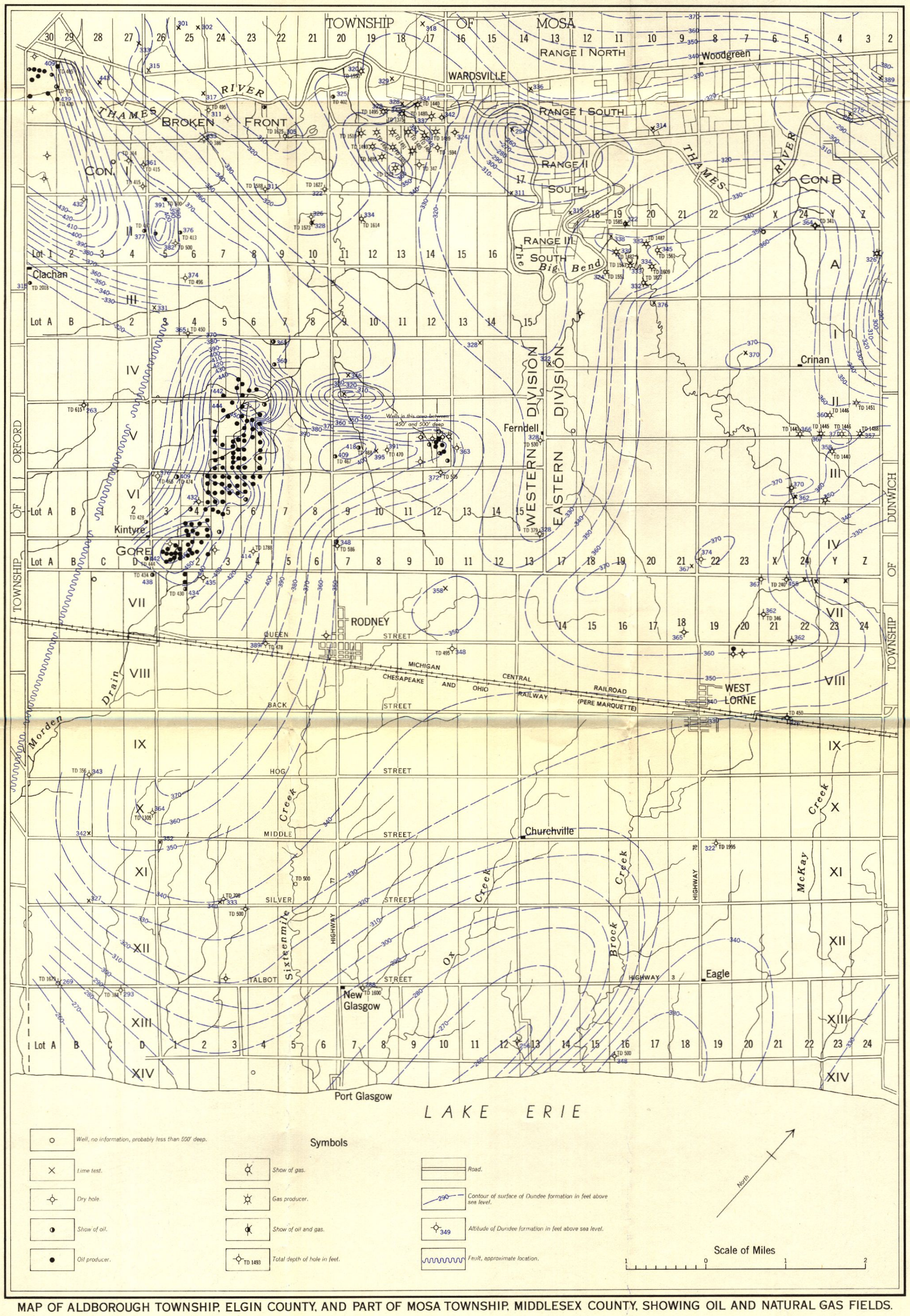
Year	Southeastern Ontario		Larder Lake area		Kirkland Lake belt		Porcupine belt		Matachewan area		Sudbury district		Algoma district		Thunder Bay district		Rainy River district		Kenora district		Patricia portion of Kenora district		Miscellaneous[1]		Total	
	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$	tons	$
Prior to 1910	[2]124,569	587,843	.....	.....	.....	.....	.....	.....	.....	.....	[3]9,320	55,982	[4]16,118	92,644	[5]14,200	60,682	[6]36,594	285,983	[7]207,601	1,327,836	.....	.....	[8]909	29,793	409,311	2,440,762
1910	500	3,349	.....	.....	30	286	.....	35,549	.....	.....	3,294	18,553	1,660	7,090	.....	.....	.....	.....	.....	3,791	.....	.....	.....	.....	5,484	68,618
1911	.....	.....	225	1,414	675	4,650	432	15,437	.....	.....	1,750	9,828	.....	627	540	4,318	.....	.....	200	6,354	30	57	.....	.....	3,852	42,685
1912	4,221	13,963	.....	.....	.....	.....	139,951	1,740,596	.....	.....	.....	.....	.....	.....	11,500	61,327	50	400	400	2,101	.....	.....	.....	.....	156,072	1,817,987
1913	9,950	24,088	480	14,005	6,383	88,936	321,305	4,316,807	.....	.....	20,646	114,833	.....	.....	6,432	20,408	.....	.....	.....	.....	.....	.....	.....	.....	365,246	4,579,477
1914	424	2,793	.....	5,204	3,734	117,644	554,774	5,231,989	.....	.....	45,458	217,103	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	604,390	5,574,733
1915	1,036	4,043	.....	.....	26,196	555,539	857,969	7,605,993	.....	.....	44,271	282,123	.....	.....	.....	.....	.....	.....	450	562	.....	.....	.....	.....	929,922	8,448,260
1916	.....	.....	.....	.....	39,865	711,626	1,327,039	9,494,139	.....	.....	26,846	187,103	.....	.....	.....	.....	.....	.....	1	130	.....	.....	.....	.....	1,393,751	10,392,998
1917	860	593	.....	.....	49,952	409,552	1,179,469	8,345,367	.....	.....	.....	.....	.....	.....	.....	1,967	.....	.....	40	279	.....	.....	.....	.....	1,230,321	8,757,758
1918	.....	.....	1,502	11,334	53,526	637,780	816,754	7,899,381	.....	.....	.....	.....	.....	.....	3,603	18,340	.....	.....	208	216	.....	.....	.....	.....	875,593	8,567,051
1919	.....	300	735	2,631	40,792	489,207	1,092,744	10,041,579	.....	.....	.....	.....	.....	.....	.....	.....	.....	211	.....	.....	.....	.....	.....	.....	1,134,271	10,533,928
1920	.....	.....	4,637	29,888	91,237	1,145,722	1,162,065	11,953,907	.....	.....	.....	.....	.....	.....	1	8,834	2	108	291	2,367	.....	.....	.....	.....	1,258,233	13,140,826
1921	.....	.....	.....	549	136,529	1,650,752	1,580,460	14,415,455	.....	.....	.....	.....	.....	.....	350	6,191	.....	.....	.....	.....	.....	.....	.....	.....	1,717,339	16,072,947
1922	.....	1,064	.....	.....	191,747	2,192,138	2,076,989	18,662,724	.....	987	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,268,736	20,856,913
1923	.....	.....	4,818	73,262	188,011	2,693,634	2,060,721	17,674,549	.....	.....	.....	.....	.....	153	.....	1,707	.....	.....	915	3,012	.....	124	.....	136	2,254,465	20,446,577
1924	.....	.....	24,178	152,072	201,393	3,328,411	2,642,502	22,445,680	.....	.....	.....	.....	.....	.....	.....	114	.....	.....	.....	.....	.....	126	.....	.....	2,868,073	25,926,403
1925	.....	.....	36,651	271,161	346,584	5,133,423	3,015,607	24,834,793	.....	.....	.....	.....	.....	41	.....	.....	.....	.....	131	2,147	.....	.....	.....	.....	3,398,973	30,241,565
1926	.....	.....	48,761	229,650	466,363	5,963,165	3,180,943	23,811,304	.....	.....	.....	.....	415	1,847	.....	.....	.....	.....	.....	73	.....	.....	.....	2,468	3,696,482	31,008,507
1927	.....	.....	65,592	338,600	731,989	9,365,243	3,488,972	24,029,244	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,286,553	33,733,087
1928	.....	.....	43,275	174,681	995,275	12,132,045	3,185,604	20,384,904	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,224,154	32,691,630
1929	.....	.....	22,343	161,717	1,076,877	13,998,202	2,864,820	19,460,413	.....	.....	.....	.....	33	8,255	679	2,685	19	245	334	908	.....	14,617	.....	.....	3,965,105	33,647,042
1930	.....	.....	31,738	219,726	1,242,805	17,012,039	2,558,385	17,843,392	.....	.....	.....	.....	1,824	3,147	8	458	.....	.....	25	326	110,438	460,857	.....	.....	3,945,223	35,539,945
1931	.....	.....	32,038	235,347	1,671,592	22,554,463	3,091,946	20,772,501	.....	.....	.....	.....	18,530	155,812	34	315	.....	.....	33	3,855	211,552	914,291	.....	.....	5,025,725	44,636,584
1932	.....	.....	35,001	182,053	1,757,995	25,683,705	3,351,263	24,289,974	6,805	70,142	32	3,718	35,704	351,654	25,574	213,427	.....	.....	48	3,888	284,664	1,268,780	.....	.....	5,497,086	53,067,341
1933	.....	.....	5,459	71,766	1,760,555	27,757,371	3,402,632	29,928,849	38,004	495,984	.....	.....	35,342	429,708	34,800	270,365	415	4,677	.....	.....	344,310	1,165,641	.....	.....	5,621,517	60,124,361
1934	.....	.....	33,457	153,948	1,923,601	34,049,728	3,711,714	33,002,770	100,054	614,909	12,320	68,600	42,041	484,874	87,983	658,057	855	12,270	25	2,242	500,960	1,882,398	.....	.....	6,413,010	70,929,796
1935	.....	.....	35,227	148,266	1,962,637	33,290,016	3,829,279	34,202,950	325,521	1,510,729	40,474	274,980	66,015	604,425	175,820	2,247,053	.....	671	3,675	98,973	595,226	3,541,436	.....	2,245	7,033,874	75,921,744
1936	.....	.....	114,472	470,507	2,074,197	33,432,460	4,049,786	35,920,945	378,918	1,476,505	10,555	80,615	90,868	801,133	243,274	3,173,014	.....	105	36,144	380,339	749,153	5,213,694	46	2,637	7,747,413	80,951,954
1937	.....	238	162,740	754,026	2,217,802	34,302,064	4,303,047	39,305,160	470,310	1,836,854	56,067	401,747	113,390	586,133	272,500	3,791,764	330	1,737	30,063	272,981	800,649	6,841,515	.....	891	8,426,898	88,095,110
1938	.....	.....	349,458	2,046,983	2,277,421	34,321,796	4,789,094	44,398,639	513,675	2,071,929	76,910	741,452	115,702	571,631	559,824	6,909,917	.....	822	32,516	377,306	868,990	7,906,822	.....	4,196	9,583,590	99,351,493
1939	6,908	14,596	556,390	3,411,814	2,302,518	34,179,271	5,133,186	47,791,659	591,847	2,600,838	61,188	661,343	110,920	905,166	714,446	8,747,923	.....	.....	72,599	697,402	1,173,127	10,585,825	.....	9,976	10,723,129	109,605,813
1940	26,526	119,505	839,275	5,706,127	2,150,762	33,794,946	5,647,214	55,000,954	630,155	2,719,471	38,575	443,045	83,563	644,196	825,012	10,284,099	1,072	6,523	49,041	570,585	1,477,078	13,328,595	.....	7,936	11,768,273	122,625,982
1941	300	2,310	1,124,221	7,929,708	1,900,481	28,690,198	5,974,447	55,506,187	620,477	2,695,319	71,319	470,730	89,422	446,075	821,917	9,348,630	1,880	12,739	51,154	688,673	1,569,616	14,827,689	.....	7,489	12,225,234	120,625,747
1942	.....	.....	1,166,209	8,277,116	1,308,307	20,895,850	5,624,554	50,489,026	643,365	2,432,574	168,628	1,138,027	92,125	343,623	662,816	8,452,345	.....	26,300	36,449	457,761	987,697	11,700,793	.....	16,190	10,650,150	104,229,605
1943	.....	.....	981,020	6,521,781	1,114,818	17,983,456	4,297,973	39,387,112	442,506	1,495,884	107,608	719,778	1,782	16,514	438,522	5,456,186	.....	.....	3,420	59,667	681,714	8,097,364	.....	1,531	8,069,363	79,739,273
1944	.....	.....	752,954	4,431,405	1,011,225	14,786,464	3,788,313	33,678,991	341,359	1,105,877	.....	1,918	.....	1,443	305,276	3,883,238	.....	.....	.....	.....	601,441	6,913,673	.....	.....	6,800,568	64,803,009
1945	.....	.....	688,205	4,212,919	983,724	14,275,035	3,585,003	32,061,352	367,917	1,355,175	.....	414	.....	1,536	128,543	1,919,548	.....	.....	.....	970	524,044	5,672,020	.....	.....	6,277,436	59,498,969
1946	.....	.....	862,078	5,328,834	1,077,790	14,916,970	3,952,840	33,303,325	431,509	1,564,349	.....	.....	.....	.....	384,521	3,905,263	.....	.....	.....	.....	555,745	6,244,038	.....	.....	7,264,483	65,262,779
1947	.....	.....	1,109,513	6,593,108	1,092,316	15,430,524	3,925,751	32,923,648	503,738	1,838,013	25,743	168,456	.....	2,700	439,918	4,110,057	.....	.....	800	8,227	579,963	5,864,292	.....	.....	7,677,742	66,939,025
1948	.....	.....	1,200,275	7,154,415	1,180,044	15,759,921	4,356,812	35,135,980	506,761	1,725,944	100,072	850,214	.....	642	409,736	3,936,131	.....	356	.....	32	784,843	8,001,217	.....	2,287	8,538,543	72,567,139
Total	175,294	774,685	10,332,927	65,316,017	35,657,748	535,734,232	110,922,359	947,343,224	6,912,921	27,611,483	921,076	6,910,562	875,454	6,461,069	6,567,829	77,494,363	41,217	353,147	526,563	4,973,002	13,401,240	120,445,864	955	87,775	186,335,583	1,793,505,423

[1]Origin unknown.
[2]1891–1895, 1897–1909.
[3]1897, 1898, 1905–1908.
[4]1893, 1894, 1900 1902–1904, 1907–1910.
[5]1897, 1905–1907.
[6]1895–1901, 1904.
[7]1885, 1886, 1893–1909.
[8]1899–1902.

To accompany Ontario Department of Mines report, Vol. LXIII, part 3, 1954.



PLAN AND VERTICAL SECTION ALONG LINE A-B



MAP OF ALDBOROUGH TOWNSHIP, ELGIN COUNTY, AND PART OF MOSA TOWNSHIP, MIDDLESEX COUNTY, SHOWING OIL AND NATURAL GAS FIELDS.