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DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

+ + + *Industry and Merchandising Division* + + +

MINING, METALLURGICAL & CHEMICAL SECTION

Report

on

THE MISCELLANEOUS INDUSTRIAL OR NON-METALLIC MINERALS IN CANADA 1947

including

Barite
Corundum
Diamonds
Diatomite
Fluorspar
Garnet
Graphite
Grindstones
Lithium Minerals
Magnesitic Dolomite
Magnesium Sulphate
Natural Mineral Waters
Phosphate
Silica Brick
Sodium Carbonate
Sodium Sulphate
Strontium Minerals
Sulphur (Pyrites)
Volcanic Ash

OTTAWA
1949

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MISCELLANEOUS INDUSTRIAL OR NON-METALLIC MINERALS IN CANADA, 1947

Canadian operators producing certain industrial minerals, and who are usually relatively few in number, have been segregated for statistical purposes into a single group designated as the Miscellaneous Industrial or Non-metallic Minerals Industry. Minerals or primary mineral products produced (or deposits developed) by this industry during 1947 included barite, brucite, diatomite, fluorspar, garnet, graphite, grindstones, magnesitic-dolomite (crude and refined), mineral waters, silica brick, sodium carbonate and sodium sulphate. For convenience, the sulphur content of pyrites shipped and sulphur recovered from smelter gas are recorded with the various miscellaneous minerals listed above; the value of sulphur production, however, is not included in the total for the miscellaneous non-metallic or industrial minerals as the value of this element is credited to the copper-gold-silver mining and non-ferrous smelting industries.

During the year under review, the production of this group of minerals had a gross value of $5,130,972 compared with $4,248,107 in 1946. Salaries and wages paid to 1,038 employees amounted to $1,699,609. The cost of fuel, electricity, freight, process supplies and containers was recorded at $1,651,544.

Table 1 - PRINCIPAL STATISTICS RELATING TO THE MISCELLANEOUS NON-METAL MINING INDUSTRY IN CANADA, 1946 and 1947

		1946	1947
Number of plants		42	42
Number of employees - Administrative		102	119
Workmen		809	919
Total		911	1,038
Salaries and wages - Salaries	$	230,609	304,880
Wages	$	1,352,237	1,699,609
Total	$	1,582,846	2,004,489
Selling value of products (gross)	$	4,248,107	5,130,972
Cost of fuel and electricity	$	822,546	953,518
Cost of process supplies used	$	493,642	629,180
Cost of containers	$	35,863	34,759
Freight	$	37,047	34,087
Selling value of products (net)	$	2,859,009	3,479,428

Table 2 - PRODUCTION OF MISCELLANEOUS NON-METALLIC MINERALS IN CANADA, 1946 and 1947

Item	Unit of measure	1946 Quantity	1946 Value	1947 Quantity	1947 Value
			$		$
Barite	ton	120,419	1,006,473	128,675	1,380,753
Corundum	ton	742	102,340	...	...
Diatomite	ton	90	2,532	103	2,677
Fluorspar	ton	8,042	237,491	7,186	209,886
Garnet (schist)	ton	2	1,200	1	300
Graphite	ton	1,975	180,405	2,398	207,364
Grindstones	ton	295	17,450	335	21,475
Magnesitic dolomite	...	...	1,225,593	...	1,167,484
Mineral waters	Imp.gal.	217,842	122,404	198,952	117,440
Phosphate	ton	57	869	...	...
Silica brick	M	2,902	197,804	3,094	193,998
Sodium carbonate	ton	...	...	163	1,793
Sodium sulphate	ton	105,919	1,117,683	163,290	1,793,043
TOTAL	...	...	4,212,244	...	5,096,213
Sulphur production (*)	ton	234,771	1,784,666	221,781	1,822,867

Note: Value of containers is excluded.

(*) Includes sulphur content of pyrites at its sales value and estimated figures for quantity and value of sulphur in smelter gases used for acid making. General statistics relating to production of sulphur are included with those of the copper-gold mining and non-ferrous smelting industries.

Table 3 - WORKMEN, BY MONTHS, IN THE MISCELLANEOUS NON-METAL MINING INDUSTRY IN CANADA, 1946 and 1947

Month	1946					1947				
	Mine			Mill		Mine			Mill	
	Surface		Under-			Surface		Under-		
	Male	Female	ground	Male	Female	Male	Female	ground	Male	Female
January	140	...	60	548	1	237	...	77	601	1
February	149	...	59	600	1	239	...	80	600	1
March	163	1	60	482	1	224	...	75	580	2
April	195	1	66	543	1	253	1	77	577	2
May	223	2	62	536	1	270	1	82	536	2
June	218	2	68	550	1	269	...	73	567	2
July	240	2	68	545	1	273	...	82	563	1
August	234	2	74	462	1	263	...	89	521	4
September	239	2	70	446	...	289	...	83	537	5
October	228	2	72	537	...	296	...	90	608	2
November	218	...	75	580	...	263	...	115	606	2
December	166	...	73	610	...	241	...	74	553	2
AVERAGE	201	1	68	538	1	261	1	83	571	3

Table 4 - FUEL AND ELECTRICITY USED IN THE MISCELLANEOUS NON-METAL MINING INDUSTRY IN CANADA, 1946 and 1947

Kind	Unit of measure	1946		1947	
		Quantity	Cost	Quantity	Cost
			$		$
Bituminous coal—Canadian	ton	4,218	26,091	353	3,954
Imported	ton	19,545	186,100	10,649	101,059
Anthracite--From the United States	ton	45	806	45	894
Lignite coal	ton	18,065	59,329	27,285	91,574
Coke	ton	14	195	25	374
Gasoline	Imp.gal.	194,344	55,560	212,279	65,693
Kerosene or coal oil	Imp.gal.	2,399	463	2,398	487
Fuel oil and diesel oil	Imp.gal.	5,293,061	339,162	6,753,857	519,659
Wood (cords of 128 cubic feet)	cord	1,164	8,404	128	758
Gas--Manufactured	M cu.ft.	267,800	31,920	307,223	33,179
Electricity purchased	K.W.H.	12,356,251	114,516	14,525,767	135,887
TOTAL	...	...	822,546	...	953,518
Electricity generated for own use.	K.W.H.	4,933,590	...	5,227,756	...

Table 5 - POWER EQUIPMENT IN THE MISCELLANEOUS NON-METAL MINING INDUSTRY, 1947

Description	Ordinarily in Use		In Reserve or Idle	
	Number of units	Total horse power rating	Number of units	Total horse power rating
Steam engines	2	20	2	60
Steam turbines	...	...	...	...
Diesel engines	24	2,385	5	897
Gasoline, gas and oil engines, other than Diesel engines	21	1,204	5	580
Hydraulic turbines or water wheels	2	650	...	...
Electric motors (except motor-generator sets) -				
(a) Operated by purchased power	446	8,163	58	899
TOTAL	495	12,422	70	2,436
(b) Operated by above primary units	109	1,505	23	500
Stationary power boilers	18	773	3	140
Motor-generator sets	4	50	1	80

BARITE

(Text from the Annual Review by the Bureau of Mines, Ottawa)

Canadian Industrial Minerals, Limited, with mine and mill at Walton, Hants county, Nova Scotia, is now firmly established as one of the world's major producers of barite, and estimates of reserves run to over 2 million short tons, sufficient to provide for many years of operation. Although the barite is off-colour and thus not suitable for the general pigment and filler trades, the ore is high in barium sulphate and meets drilling mud and chemical specifications without need for concentration. It is amenable to bleaching at a 325-mesh grind and yields a product of good white colour. About 75 per cent of the production in 1947 was from open-cut mining and the remainder from underground operations. Further stripping of overburden was done on the eastern section of the deposit, and underground development work comprised 1,216 feet of drifting, raises, and crosscuts on the 270-foot and 350-foot levels.

In British Columbia, Mountain Minerals, Limited, shipped 2,875 tons of crude barite from its properties at Parson and Brisco, southeast of Golden. Of this total, 2,348 tons was consigned to Industrial Fillers, Limited (formerly Pulverized Products, Limited), Montreal, for grinding, and the remainder to the plant of Summit Lime Works, Crow's Nest, Alberta, where it was ground for local use in drilling mud.

In Ontario, Woodhall Mines, Limited was proceeding with plans to bring the old Premier Langmuir mine, on Nighthawk River, in Langmuir township, Porcupine area, into production, and a small tonnage trial shipment of crude ore was made for concentrating and grinding tests.

Crude lump barite is used in the manufacture of lithopone, an important white pigment and filler material, and in a wide range of barium chemicals. For these trades, barite is required to contain 95 to 96 per cent $BaSO_4$, and not more than 3 per cent SiO_2 and 1 per cent Fe_2O_3. The ore should be furnished crushed to $1\frac{1}{2}$ inch size. There is no manufacture of the above products in Canada, but they are produced on a large scale in the United States, where, in 1946, 34 per cent of the total barite used was employed for such purposes.

For most other industrial purposes barite is used in finely ground form, 325 mesh being the general specification. The material should be of good white colour, the best grades being obtained by wet grinding, bleaching with acid, and water floating. Some off-colour material is used for less exacting purposes. Content of $BaSO_4$ is usually required to be not less than 95 per cent. Chief uses for ground barite are as a heavy, inert filler or loader in rubber, asbestos products, paper, linoleum and oilcloth, textiles, leather and plastics. It is one of the leading pigments and extenders in paints, and has become of increasing importance as a heavy weighting medium in oil-well drilling muds to overcome gas pressures. About 5 tons of barite is used for each 1,000 feet of hole drilled. The requirements are a minimum specific gravity of 4.25 (corresponding to a $BaSO_4$ content of 93 per cent) and absence of soluble salts. Considerable barite is used in the glass industry as a batch fluxing ingredient for moulded flint glass, for which purpose it should contain not less than 96 per cent $BaSO_4$, under 3 per cent moisture, and not more than 0.4 per cent iron oxide (Fe_2O_3), with a fineness range of 20 to 100 mesh.

Barium carbonate is the principal intermediate salt used in the manufacture of other barium chemicals. It is also used to prevent the unsightly white efflorescence ("Scumming") in bricks and other heavy clay products, and for case-hardening of steel. Blanc fixe, or precipitated barium sulphate, is used in white paints, rubber, linoleum, and oilcloth. Barium chloride is used to purify salt brines for the manufacture of chlorine and sodium hydroxide; in making coatings for photographic paper; as a flux in the production of magnesium alloys; as an extender in titanium pigments; in colour lakes; in finishing white leather; and in the purification of beet sugar. Barium hydroxide is used in the refining of sugar and of animal or vegetable oils; and the peroxide, in making hydrogen peroxide. Barium nitrate has important military uses, for flares and tracers. Barium titanate possesses very high electrical insulating properties and is specially adapted for use in radio equipment. Porous barium oxide is being produced commercially in the United States for use as a dessicating agent for laboratory work.

Barium metal has only limited industrial applications. It is used as a wire coating to remove traces of gas in radio, vacuum, and thermionic tubes, and to coat steel balls in the rotating anodes of X-ray tubes. Alloys of barium with lead and calcium ("Frary" metal) are used for bearings; and nickel-barium alloys for corrosion resistant spark-plug electrodes. Nickel coated with barium oxide can replace tungsten to advantage for the cathodes of the smaller types of electron tubes, giving a high yield of electrons per watt of heating energy.

Small-scale production of barium metal was commenced in Canada in 1946 at the magnesium plant of Dominion Magnesium, Limited, at Haley, near Renfrew, Ontario.

The average unit price of domestic crude barite of white, pigment grade sold in 1947 was $8 per short ton f.o.b. mine. Ground, off-colour barite exported for oil-well drilling use averaged $15.30 per

ton f.o.b. Atlantic ports, and off-colour crude, $7.30 per ton. Ground white for the pigment and filler trade averaged $38.50 per ton f.o.b. mill.

In the United States, in December 1947, Georgia crude was quoted at $11.50 to $12.00 per long ton, f.o.b. mines, and Missouri crude, 93 to 94 per cent grade, at $9 to $9.40. Missouri prime white, water-ground, floated and bleached sold for $30.30 per ton, f.o.b. works. These prices showed increases up to 25 per cent above those in the early part of the year.

In the American market, crude barite is usually sold on a penalty-premium basis, a content of 94 per cent $BaSO_4$ and less than 1 per cent iron (Fe_2O_3) being considered standard. A premium or penalty of 25 cents per ton is set for each per cent of barium sulphate above or below 94 per cent, and a similar premium or penalty for each 0.1 per cent of Fe_2O_3 below or above 1 per cent.

The United States duty of $4 per ton on crude barite was reduced to $3.50 as from January 1, 1948, but the duty of $7.50 per ton on ground or otherwise manufactured material remains unchanged. Canadian imports are free of duty under the British preferential tariff, and there is no duty on barite used in drilling mud, or in the manufacture thereof. Otherwise, imports from countries other than the United Kingdom are subject to a duty of 25 per cent.

Table 6 - PRODUCTION OF BARITE IN CANADA, 1939-1947

Year	Short tons	$	Year	Short tons	$
1939	323	3,639	1944	118,719	1,023,696
1940	338	4,819	1945	139,589	1,211,403
1941	6,890	74,416	1946	120,419	1,006,473
1942	19,667	188,144	1947	128,675	1,380,753
1943	24,474	279,253			

Table 7 - IMPORTS OF BARITE INTO CANADA, 1940-1947

Year	Tons	$	Year	Tons	$
1940	2,622	64,922	1944	1,824	47,913
1941	3,431	81,620	1945	1,150	32,531
1942	2,536	68,196	1946	1,547	42,904
1943	1,686	43,239	1947	1,737	51,060

Table 8 - CONSUMPTION OF BARITE IN CANADA, 1941-1946

	1941	1942	1943	1944	1945	1946
			(tons)			
(a) By Uses						
Paints	2,453	3,417	2,760	1,971	1,749	1,711
Rubber goods	830	557	351	288	478	461
Wall paper	13	18	15	20	22	...
Glass	367	286	290	294	879	266
Miscellaneous	180	161	123	226	200	400
TOTAL	3,843	4,439	3,649	2,799	3,328	2,838
(b) By Provinces						
Nova Scotia	109	67	38	41	33	34
Quebec	1,483	1,639	1,191	893	931	1,123
Ontario	1,902	2,325	1,983	1,388	1,916	1,179
Manitoba	113	155	162	183	210	276
Saskatchewan	5	10	11	8	4	4
Alberta	96	93	128	119	105	106
British Columbia	135	150	136	167	129	116
CANADA	3,843	4,439	3,649	2,799	3,328	2,838

Note: Above figures do not include amounts used in oil drilling.

CORUNDUM

(Text from the Annual Review by the Bureau of Mines, Ottawa)

No corundum has been produced in Canada since October, 1946, when treatment of the old tailings at the Craigmont property, Renfrew county, Ontario, for the recovery of corundum was completed. This operation was undertaken during the war at the request of the United States Government. During the two years of operation about 2,600 tons of concentrate was shipped from the Craigmont property to American Abrasive Company, Westfield, Massachusetts, the only handler of corundum on the continent.

Shipments from the Transvaal to the United States have not improved and in the summer of 1947 American Abrasive Company asked for the co-operation of the Canadian Department of Mines and Resources, and engaged the services of an engineer to thoroughly investigate the possibility of supplying the deficiency from Canadian deposits. Results of preliminary examinations of several deposits and of tests on bulk samples sent to the Bureau of Mines, Ottawa, have been very encouraging.

The main and only zone from which production has been obtained is in a belt 100 miles long and 6 miles wide in Haliburton, Hastings, and Renfrew counties in Ontario. Several of the numerous deposits examined recently contain fair amounts of corundum, the most promising being an extensive deposit in Monteagle township on the east side of the York River, about 10 miles northeast of Bancroft. (For a description of corundum-bearing nepheline syenite belts of south and eastern Ontario, see Report No. 820 "The Corundum Mineral Industry in 1945", page 53, issued by the Bureau of Mines, Ottawa.) It is doubtful, however, if the production of corundum alone would be economic and consequently marketable by-products would be necessary. Present indications are that a large tonnage of good quality nepheline feldspar product suitable for the glass trade, as well as fine mica for fillers and for backing, can be extracted from the Monteagle deposit, in addition to high-quality fine-grained corundum.

The United States is by far the largest consumer of corundum and uses from 4,000 to 6,000 tons annually. Most of it is used as a flour for the polishing of lenses, and the remainder as coarse grain for snagging wheels. For these purposes it is more suitable than artificial abrasives for certain types of work.

United States' prices of South African crystal and concentrate are $100 and $110 per ton. Prices of prepared grain and flour corundum vary considerably according to mesh size, and are 8¾ cents per pound for 6 to 60 mesh and 9¾ cents for 70 to 275 mesh. Flours range from 30 cents for 850 mesh to 70 cents for 2,600 mesh.

DIAMONDS

Although there is no production of diamonds in Canada, the mining industry uses fairly large quantities for diamond drilling. In 1947 the diamond drilling on Canadian mineral deposits exceeded 1,200 miles. During the year the imports of black diamonds and borts for borers were appraised at $2,997,101 compared with $4,002,457 in the previous year. The imports of unset gem diamonds amounted to 22,525 carats valued at $2,985,600 compared with $6,103,856 worth brought in during 1946.

Table 9 - WORLD PRODUCTION AND SALES OF DIAMONDS, 1938-1947

Year	Production	Sales		
	Metric carats	Total	Industrials	Cuttables
		(£ Sterling)		
1938	11,619,971	3,673,934		
1939	12,500,553	5,865,000		
1940	13,012,525	6,144,314		
1941	9,104,978	7,414,420	2,000,000	5,550,000
1942	9,258,734	10,694,671	4,240,000	6,250,000
1943	8,347,239	20,500,000	5,000,000	15,500,000
1944	11,676,578	17,000,000 (estimate)	4,000,000	13,000,000
1945	14,257,157	24,500,000 (estimate)	4,900,000	19,600,000
1946	10,212,573	30,000,000 (estimate)	3,400,000	26,100,000
1947	not available	24,500,000 (estimate)	not available	

DIATOMITE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

All of the Canadian production of diatomite since 1939 has come from deposits in the swamps and lake bottoms of northern Nova Scotia; in southern British Columbia; in the Muskoka area, Ontario; and in various parts of British Columbia. Production in 1947 came from two deposits, one at Digby Neck, Nova Scotia, operated by G. Wightman, and the other on Lot 1122 on the west bank of the Fraser River, north of Quesnel, British Columbia, operated by L. T. Fairey of Vancouver. The Tertiary fresh-water deposits near Quesnel in the Cariboo area are by far the largest known in Canada. They extend for many miles along the Fraser River, are compact, and are up to 40 feet thick. At Digby Neck, Nova Scotia, is the largest known Recent fresh-water (swamp) deposit in Canada.

The Nova Scotia Department of Mines completed its investigation that was started in 1946 of some of the diatomite deposits of the province, particularly those along Digby Neck.

In New Brunswick, deposits of diatomite in the vicinity of Saint John that were examined by the Resources Development Board, Fredericton, in 1946, were being prospected by a Boston group. The deposits are owned by Murray Campbell of Saint John.

Diatomite is used as a fertilizer dusting agent, for filtration, and as a filler in the paint, chemical, paper, rubber and textile industries. Small amounts are used in silver polish bases, and as an admixture in concrete. A small amount of lime-diatomite insulation bricks is made by a company in Toronto which uses diatomite from Nova Scotia. Diatomite is being used in pressure filters in industrial plants in place of sand filters for the removal of disease-producing organisms.

The ammonium nitrate fertilizers in which diatomite is used as a dusting agent are made in Canada by The Consolidated Mining and Smelting Company of Canada Limited in its plants in Trail, British Columbia, and in Calgary, Alberta; and by North American Cyanamid, Limited, in its plant near Welland, Ontario. The diatomite thus used is highly porous and when added to the nitrate it absorbs moisture and coats the small grains or nitraprills which prevents caking and ensures even spreading. Specifications call for uncalcined material of 325 mesh and less than 5 per cent moisture. Much of the output of these fertilizers is exported to Europe.

The price of diatomite used in Canada for fertilizer grades varies from $38 to $42 a ton; for filtration from $33 to $75 per ton; and for insulation from $23 to $40 a ton. For material suitable for polishes the price for small lots ranged up to $200 a ton in 1947. Imported insulation bricks vary in price from $85 to $140 per 1,000, according to grade and density.

Table 10 - PRODUCTION OF DIATOMITE IN CANADA, 1938-1947

Year	Short tons	$	Year	Short tons	$
1938	398	13,842	1943	98	3,331
1939	301	10,388	1944	13	437
1940	248	7,957	1945	46	1,238
1941	344	9,935	1946	90	2,532
1942	365	9,088	1947	103	2,677

Table 11 - CONSUMPTION OF INFUSORIAL EARTH BY THE CANADIAN SUGAR REFINING INDUSTRY, 1938-1946

Year	Tons	Value	Year	Tons	Value
		$			$
1938	2,454	101,473	1943	1,726	89,075
1939	2,410	105,711	1944	2,188	115,053
1940	2,492	112,369	1945	1,992	102,961
1941	2,672	138,973	1946	2,196	104,794
1942	1,504	75,295			

Table 12 - CONSUMPTION OF DIATOMACEOUS EARTH IN THE MANUFACTURE OF FERTILIZERS, 1944-1947

Year	Tons	$
1944	9,690	297,987
1945	6,444	274,968
1946	8,185	308,446
1947	7,488	295,773

FLUORSPAR

(Text from the Annual Review of the Bureau of Mines, Ottawa)

The Madoc deposits furnished about 63 per cent of the total Canadian production from 1905 to the end of 1947. Peak production was in 1943, when 10,385 tons was shipped. In 1947, the following producers made shipments: Reliance Fluorspar Mining Syndicate, Limited, operating the Rogers mine; Millwood Fluorspar Mines, Limited (Bailey mine); Charles Stocklosar (Blakely mine); and Fluoroc Mines, Limited (Johnson mine). The first two companies accounted for nearly 90 per cent of total sales. During the year, Reliance Fluorspar Mining Syndicate sank a 3-compartment shaft at the northwest end of its former workings, preparatory to opening two new levels at 175 feet and 225 feet. Millwood Fluorspar Mines also sank a further 70 feet and opened a new level.

Beneficiation of Madoc fluorspar is confined to screening out of fines from mine-run ore, followed by crushing and picking of washed coarse lump. Screened fines commonly run from 60 to 70 per cent CaF_2, and are sweetened with high-grade lump to make a shipping product averaging 70 to 80 per cent grade. Calcine and barite are the chief gangue impurities.

Fluorspar, associated with calcite and apatite, occurs as the filling of veins and pockets in bodies of pegmatite rock in the Wilberforce-Harcourt district, Cardiff township, Haliburton county, about 50 miles north of Madoc, and various attempts at development of certain of these deposits have been made. In 1946, Fission Mines, Limited, took over the former Ontario Radium Corporation and Richardson holdings east of Wilberforce and proceeded with a program of exploration of the fluorspar showings on these properties. This work was continued through 1947, when some 12,000 feet of drilling was done. Some ore has been stockpiled, but no shipments have been made. In the same area, Cardiff Fluorite Mines, Limited, in the past few years has done considerable exploratory work by trenching, tunneling, drifting, and drilling on its holdings southwest of Wilberforce. Further work of this nature was continued during 1947, some ore was stockpiled, and the company reported that it was considering plans for a mill to treat its anticipated production. The ore of the Wilberforce area, where numerous surface showings exist, has a general average content of about 25 to 30 per cent CaF_2 and 5 to 10 per cent apatite, the remainder being calcite.

Near Cobden, in Ross township, Renfrew county, Ontario, there are several occurrences of fluorspar ore essentially similar in character to that of the Wilberforce area. Some of these were explored in 1944-45 by Dominion Magnesium, Limited, who was considering drawing on the deposits as a local source of fluorspar for the company's nearby plant at Haley, but so far this project has not been undertaken.

In Quebec, fluorspar ore similar to that of the Wilberforce area occurs in Huddersfield township, Pontiac county, and a few years ago some small-tonnage shipments of high-grade picked lump were made from one of the deposits.

In Nova Scotia, veins of fluorspar associated with barite and calcite occur in the Lake Ainslie district, Cape Breton Island, and during the war two of the deposits were worked and about 1,500 tons of run-of-mine metallurgical grade spar was shipped.

In British Columbia, the Rock Candy mine of The Consolidated Mining and Smelting Company of Canada, Limited, near Grand Forks, produced about 42,000 tons of fluorspar concentrate between 1919 and 1929, but has not been operated since. Near Birch Island, North Thompson River, drilling exploration was done some years ago on a deposit consisting of a fine-grained, intimate mixture of fluorspar, celestite, and feldspar, with considerable pyrite.

Fluorspar is used chiefly as a powerful fluxing agent in the steel industry, and is used in small amounts in numerous other metallurgical industries. The next largest market is in the manufacture of hydrofluoric acid, which is used mainly in making artificial cryolite and aluminum fluoride for the aluminum industry. The fluorspar imported from Newfoundland is used for this purpose at Arvida, Quebec. The ceramic industry is next, and uses fluorspar as a fluxing and opacifying ingredient in glass and enamels. Uranium hexafluoride is used for the gaseous diffusion separation of the uranium isotopes U235 and U238 in the development of atomic energy.

Of considerable interest are the possible uses of elemental fluorine in the development of new industrial products and processes. A field of use is envisaged for fluorine in the chemical industry comparable to that of its closely related element chlorine. Only recently available on a commercial scale, compressed fluorine gas is being offered in small half-pound steel cylinders by a company in Philadelphia. The fluorine is produced in a specially designed electrolytic cell, using an electrolyte of anhydrous hydrofluoric acid and fused potassium bifluoride. Fluorine gas is evolved at the anode and hydrogen at the cathode. The fluorine is purified from associated small amounts of HF either by absorption of the latter in sodium fluoride or by chilling. Among the new compounds expected to be made available by the use of fluorine are: a liquid fluorinated non-inflammable and non-toxic hydrocarbon which can be used in place of

mercury in the present mercury vapour boiler; sulphur hexafluoride gas of high insulating value for high voltages used in X-ray and nuclear physics work; and an extremely stable synthetic lubricating oil capable of withstanding high pressures and friction. Other suggested fluorine compounds include: insecticides, fungicides, germicides, fumigants, anaesthetics, fire extinguishers and for proofing media, resins, and plastics.

Canadian trade journal quotations for metallurgical gravel, 85 per cent grade fluorspar in 1947 remained at $40 per ton, f.o.b. Toronto, and for ground, 97 per cent grade, $66 to $69. Madoc fluorspar, under individual contract, sold for $25.50 per ton for 70 per cent grade and $29.75 for 80 per cent, with a premium of 50 cents per ton for each unit of CaF_2 above 80 per cent. Average unit value of Madoc shipments was $29 per ton. Average declared unit value of fluorspar imports from Mexico was $18 per ton; from Newfoundland, $22; and from the United States, $34. The last probably included a proportion of acid and ceramic grades, neither of which is produced in Canada.

In the United States, prices for metallurgical grade advanced $2 per ton during the latter part of 1947 from those in March. Based on effective units of CaF_2, and f.o.b. Kentucky - Illinois mines, year end prices were as follows: 70 per cent and over, $35 per ton; 65 to 70 per cent, $34; 60 to 65 per cent, $33; and under 60 per cent, $32. "Effective units" are computed as the actual CaF_2 content less $2\frac{1}{2}$ times the percentage of contained silica. Acid grade fluorspar, 97 per cent CaF_2, rose from $37 to $40.

The duty on metallurgical grade fluorspar entering the United States is $5.625 a ton, and on acid and ceramic grades $3.75. Fluorspar enters Canada duty-free.

Table 13 - PRINCIPAL STATISTICS OF THE FLUORSPAR MINING INDUSTRY IN CANADA, 1946 and 1947

		1946	1947
Active firms	No.	4	5
Employees - Administrative	No.	8	8
Workmen	No.	64	56
Total	No.	72	64
Salaries and wages - Salaries	$	15,594	25,946
Wages	$	76,080	86,542
Total	$	91,674	112,488
Gross value of production	$	237,491	209,886
Cost of fuel and electricity	$	16,648	16,851
Process supplies used	$	9,729	9,117
Net value of production	$	211,114	183,918

Table 14 - PRODUCTION OF FLUORSPAR IN CANADA, 1938-1947

Year	Short tons	$	Year	Short tons	$
1938	217	3,906	1943	11,210	318,424
1939	240	4,995	1944	6,924	217,701
1940	4,454	59,317	1945	7,369	233,708
1941	5,534	97,767	1946	8,042	237,491
1942	6,199	146,039	1947	7,186	209,886

Table 15 - IMPORTS OF FLUORSPAR INTO CANADA, 1938-1947

Year	Tons	$	Year	Tons	$
1938	15,057	212,131	1943	77,436	1,738,669
1939	16,322	258,796	1944	37,100	840,309
1940	30,312	628,719	1945	20,517	530,670
1941	26,539	567,656	1946	31,813	717,094
1942	47,784	1,046,526	1947	32,001	702,419

Table 16 - CONSUMPTION OF FLUORSPAR IN CANADA, 1941-1946

	1941	1942	1943	1944	1945	1946
			(tons)			
(a) By Uses						
Steel	17,054	20,133	20,790	20,024	19,462	13,805
Glass	185	231	273	376	302	145
Enamelling and glazing	300	434	216	243	200	220
Heavy chemicals	3,405	3,599	2,680	3,113	3,600	3,388
Non-ferrous smelters	10,194	22,493	39,396	33,643	12,830	10,972
Ferro-alloys	...	853	1,407	104	792	1,431
White metal alloys	15	13	23	30	20	34
Miscellaneous	62	13	137	99	100	...
TOTAL	31,215	47,769	64,922	57,632	37,304	29,995
(b) By Provinces						
Nova Scotia	7,886	8,898	7,916	9,112	7,390	6,612
Quebec	10,422	21,471	38,990	32,745	13,300	11,098
Ontario	12,532	15,565	17,309	15,371	16,266	12,058
Manitoba	175	212	210	165	170	205
Alberta	52	138	151	118	70	...
British Columbia	148	1,485	346	121	110	22
TOTAL	31,215	47,769	64,922	57,632	37,304	29,995

GARNET

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Niagara Garnet Company was the only operator in 1947. The garnet ore mined in 1946 from the deposit near River Valley in Dana township, Ontario, was shipped 25 miles southeast to the company's mill at Sturgeon Falls. About 30 tons of the ore was crushed and concentrated to about 95 per cent garnet content and then pulverized into flour grades for use in the grinding of lenses and in the optical trade. A small shipment of flour grade powder was made to the United States.

Over 85 per cent of the world output of garnet comes from North Creek, New York, and the product is regarded as the world standard garnet. Production in the United States in 1947 was nearly 9,000 tons compared with 7,743 tons in 1946.

Garnet, crushed and suitably graded as to size, is used for making abrasive-coated papers and cloth, which in turn are used mainly in the wood-working (hard woods), and to a lesser extent in the shoe-leather industries. The specifications for garnet for this use are somewhat exacting. Garnet is used to a minor extent for sandblasting and for surfacing plate glass. Garnet superfine (flour) grades are used as a partial substitute for corundum flour, which is used for polishing optical lenses.

Canadian consumption of garnet grain suitable for the manufacture of sandpaper is about 500 tons a year, the two Canadian manufacturers of sandpapers being Canadian Durex Abrasives Limited, Brantford, and Canada Sandpapers Limited, Preston, both in Ontario. Competition from silicon carbide, and oxide of alumina, is a serious factor in the marketing of garnet. Little, if any garnet is used for other purposes in Canada.

Prices of ungraded concentrate suitable for sandpaper range from $60 to $85 a ton, and flours from 6 cents a pound for 275 mesh, to 65 cents a pound for 5 and 10 micron. Garnet for surfacing plate glass is $100 a ton and for sandblasting, $90 a ton.

GRAPHITE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Flake graphite is found in many parts of the Canadian Shield, chiefly in gneisses and crystalline limestone. Occurrences of flake graphite are known also in Manitoba and British Columbia, but have attracted little interest. Bodies of amorphous graphite near Saint John, New Brunswick, were worked on a small scale many years ago. Otherwise, production has been confined to adjacent sections of western Quebec and eastern Ontario, in the general Ottawa region, where about 12 mines and mills were operated at

various times in the early years of the industry.

A large proportion of the Black Donald output in recent years was derived from the re-treatment of old mill tailings recovered by pumping or power shovel from Whitefish Lake alongside the workings, but in 1947 this procedure was discontinued and the entire production came from crude ore, newly mined, or salvaged from old surface waste piles. Underground development comprised 161 feet of crosscuts, 178 feet of drifts, and 243 feet of raises, together with 1,500 feet of diamond drilling. This work was done on new orebodies located by earlier exploration, and resulted in the production of 7,764 tons of milling ore. A total of 13,952 tons of ore was milled, of which 7,701 tons was obtained from the aforementioned orebodies and 6,237 tons was salvaged on surface. Average carbon content of mill heads was 14 per cent, and carbon recovery, 77.4 per cent.

Plant additions during 1947 included a new crusher house of 150 tons daily capacity, and a primary grinding unit of 100 tons capacity. Ore reserves at the year end were estimated at 15,000 tons proven, with an additional 25,000 tons possible. Remaining tailings reserves were estimated at 5,000 tons.

Early in 1948 the company announced that the property had been sold to the Hydro-Electric Power Commission of Ontario, in connection with plans for developing a water-power site at Indian Chute on the Madawaska River. Completion of the project will result in flooding of the greater part of the property, but Black Donald Graphite retains the right to continue in operation until the end of 1949, and thereafter until the land is actually required for flooding purposes.

Graphite has many uses, but is employed principally in foundry facings, lubricants, crucibles, retorts and stoppers, packings, pencils and crayons, paints, and stove polish. Important quantities, mostly amorphous or artificial, are used in dry batteries, electrodes, and commutator brushes. Flake from the Black Donald deposit is too small for crucible use and finished products consist mainly of amorphous foundry grades, but include high-grade fine flake and dust sold for use in lubricants, packings, and polishes. Prepared facings for the domestic foundry trade also are made.

In Canada, graphite is used chiefly in the foundry, dry battery, packings, lubricants, and paint trades. Foundry needs are met in part by domestic production, and in part by plumbago from Ceylon. The battery trade uses mainly Mexican amorphous, and paint requirements are filled largely by low-grade amorphous and flake. American imports of Canadian graphite are used chiefly in foundry facings, lubricants, and pencils.

Trade journal quotations for flake graphite in the United States in 1947 ranged from 9 to 15 cents per pound, nominal, according to grade. Crude Ceylon lump, chip, and dust ranged from 12 cents to 5 cents per pound, according to carbon content. Madagascar crucible flake sold for 9 to 15 cents per pound, nominal. Maximum crude amorphous was quoted at $16 to $35 per ton, f.o.b. New York, according to grade.

Under the new Multilateral Trade Agreement, in effect from January 1, 1948, the duty on natural amorphous and artificial graphite entering the United States remains at 5 per cent ad valorem. On crystalline lump, chip, and dust grades, the former duty of 15 per cent is reduced to 7½ per cent, and on crystalline flake, from 30 per cent to 15 per cent. It is further specified that the duty on the last-named shall not be less than 0.4125 cent per pound nor more than 0.825 cent. On manufactures of graphite, including electrodes, the former duty of 30 per cent ad valorem is reduced to 15 per cent.

The Canadian tariff is as follows: graphite, not ground or otherwise manufactured, British, free; intermediate (including the United States), 7½ per cent ad valorem; general, 10 per cent; on ground and manufactures of, including foundry facings, but not crucibles, British, 15 per cent; intermediate, 22½ per cent; general, 25 per cent. Graphite crucibles enter Canada free under the British Preferential Tariff; under other tariffs the duty is 15 per cent ad valorem.

Table 17 - MINE PRODUCTION (SALES) OF GRAPHITE IN CANADA, 1938-1947

Year	Short tons	$	Year	Short tons	$
1938	723	41,590	1943	1,903	197,431
1939	1,101	61,684	1944	1,582	179,457
1940	1,382	94,038	1945	1,910	187,364
1941	1,644	132,924	1946	1,975	180,405
1942	1,192	117,904	1947	2,398	207,364

GRINDSTONES, PULPSTONES AND SCYTHESTONES

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Material suitable for these stones occurs in certain sandstone beds in Nova Scotia, New Brunswick, and on the coast of British Columbia. Many years ago the output was considerable, but most of the known beds have been depleted and the demand for natural stones has decreased.

A total of 335 tons of grindstones valued at $21,475 was shipped by the two operators in 1947, all for domestic use. This compares with shipments of 295 tons of grindstones valued at $17,450 in 1946. Read Stone Company, Sackville, New Brunswick, by far the larger operator, obtains its material in New Brunswick and ships from Stonehaven in that province. Bay of Chaleur Company obtains its material from along the Bay of Chaleur at low tide near Grande Anse, New Brunswick.

Good pulpstones are in demand, particularly for use in the large magazine grinders, but known Canadian deposits containing thick beds of sandstone of the proper quality appear to be almost worked out. There is increasing competition from Canadian-made artificial segmental pulpstones, mainly of silicon carbide grit, and 759 of these stones were in use and 150 in stock at the end of 1947 in Canadian pulp mills. Most of these are made by Norton Company of Canada, Hamilton, Ontario, but those supplied by Carborundum Company are made in its plant in the United States.

The imported natural pulpstones come mainly from West Virginia.

Table 18 - PRODUCTION OF GRINDSTONES, PULPSTONES AND SCYTHESTONES IN CANADA, 1938-1947

Year	Tons	$	Year	Tons	$
1938	306	16,198	1943	164	6,225
1939	304	15,278	1944	225	12,000
1940	341	14,543	1945	225	10,870
1941	188	11,500	1946	295	17,450
1942	216	10,000	1947	335	21,475

Table 19 - PRODUCTION OF NATURAL ABRASIVE STONES, 1946 and 1947

	Grindstones			
	1946		1947	
	Tons	$	Tons	$
Nova Scotia	...	...	...	...
New Brunswick	295	17,450	335	21,475
CANADA	295	17,450	335	21,475

Table 20 - CONSUMPTION OF PULPSTONES BY THE CANADIAN PULP AND PAPER INDUSTRY, 1938-1947

Year	Number for 2 ft. wood	Value	Number for 2.5 ft. wood	Value	Number for 4 ft. wood	Value
		$		$		$
1938	306	92,822	37	13,351	186	238,488
1939	242	60,622	60	22,443	203	238,620
1940	311	96,957	110	49,899	163	257,628
1941	295	127,349	77	35,843	97	215,913
1942	237	100,466	53	23,898	94	208,986
1943	197	102,888	54	20,000	66	151,411
1944	187	89,133	57	34,865	76	193,396
1945	191	117,585	33	14,132	114	271,108
1946	233	121,705	41	16,868	139	349,866
1947	258	153,075	35	22,629	153	409,060

LITHIUM MINERALS

Amblygonite, spodumene, and lepidolite are the chief lithium minerals of commerce; their ores contain, respectively, about 8, 6 and 4 per cent of lithium oxide. Spodumene is in greatest supply, and is the base raw material for the manufacture of many lithium salts, lithium metal, and alloys. Amblygonite has similar uses, but is scarcer and more expensive. Lepidolite, or lithia mica, is employed mainly in the natural state as a batch ingredient in glass. The occurrence of all three minerals is confined to pegmatite dykes of a definite type, which usually have a localized, regional distribution and often carry, also, important amounts of beryl and tantalite-columbite. In some cases, such dykes have been worked for the recovery of all of these minerals.

There has been no recorded production of lithium minerals in Canada since 1937, when 32 tons of amblygonite and spodumene valued at about $1,700 was shipped, and little if any lithium ore is known to be used or required for any purpose in the Dominion. Thus, an outside market would have to be found for any production. Considerable development work has been done in recent years, however, on deposits in the Pointe du Bois area in southeastern Manitoba; increased interest was shown in the commercial possibilities of lithium deposits in other sections of that province, though activities have been confined to exploratory drilling. Some attention has been given, also, to lithium-bearing deposits in the Yellowknife-Beaulieu area in the Northwest Territories, and in LaCorne township in northwestern Quebec.

Lithium ores and compounds early became of strategic importance in the present war, and to conserve supply for defence needs the United States Government placed both under allocation control in 1942. Government assistance also was given to the establishment of two spodumene mills, one in North Carolina, and the other in South Dakota. These measures resulted in a considerable easing of the general supply situation in 1944.

Total production in Canada during the active period 1925-1937, inclusive, is estimated at about 250 tons, and comprised lepidolite, spodumene, and amblygonite. Most of the material was exported to the United States.

The United States and Southwest Africa have been the two leading producers of lithium ores in recent years, with the former probably supplying well over 50 per cent of the annual total, and possessing the largest reserves. Production consists mainly of spodumene and amblygonite, and in the United States has come chiefly from the Black Hills region in South Dakota. An additional important source of lithia in the United States is lithium-sodium phosphate, recovered from the brine of Searle's Lake, at Trona, California, which at present furnishes nearly 50 per cent of the total American lithia production. Shipments of lithium ores and compounds in the United States in 1944 reached an all-time high of 13,319 tons, a 63 per cent increase over the previous year.

There are no plants in Canada for the chemical treatment of lithium ores. Most of the world production marketed prior to the war was treated by a few large chemical firms specializing in the business, the principal plants being in the United States, Great Britain, Germany and France. Such firms usually purchased their requirements under individual contract, and there has thus been little in the way of an open market, price quotations given in trade journals being merely nominal. Some of the larger consumers own and operate their own mines.

MAGNESITE AND BRUCITE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Magnesitic dolomite, a rock composed of an intimate mixture of magnesite and dolomite, is quarried at Kilmar, Argenteuil county, Quebec, by Canadian Refractories Limited, and is processed for use as refractory products and to a minor extent as fertilizer material. Good progress was made by the company in the extensive program of enlargement and modernization of its production facilities at Kilmar, begun in 1946, but slow delivery of some essential materials prevented the new 245-foot rotary coming into operation until early in 1948. The sink-float plant is also expected to be in operation in 1948.

Brucitic limestone, a rock composed of granules of the mineral brucite (magnesium hydroxide) thickly distributed throughout a matrix of calcite, is quarried from large deposits near Wakefield, Quebec, by Aluminum Company of Canada, Limited, and is processed for the recovery of magnesia and lime. The magnesia is used in part by the company for making magnesium metal at Arvida, Quebec, but the major part of the output is sold for the manufacture of basic refractories and for use as fertilizer. Hydrated lime, the co-product, is produced in the process of recovering the magnesia, and is sold for the various purposes for which lime is used.

Brucitic limestone deposits occur also at Bryson, Quebec; at Rutherglen, Ontario; on West Redonda Island in British Columbia. There are small deposits at a number of other places in Ontario and Quebec.

Magnesite deposits occur in British Columbia and in Yukon. The most important of these, at Marysville, British Columbia, between Cranbrook and Kimberley, is owned by The Consolidated Mining and Smelting Company of Canada, Limited. Considerable silica and alumina occur as impurities in this magnesite. The company, however, has devised a flotation method to remove the greater part of these impurities, but there has been no commercial production. Other magnesite deposits in British Columbia and Yukon are of limited extent or are too far from transportation to be of economic interest at present. Some deposits of earthy hydromagnesite near Atlin and Clinton in British Columbia have been worked at various times on a small scale, but there has been no production in recent years.

Magnesitic dolomite is being entirely utilized for the production of basic refractory products. These include dead-burned grain material; bricks and shapes (burned and unburned); and finely ground refractory cements.

Brucitic limestone yields magnesia for the making of basic refractory products (burned and unburned); magnesium metal; fertilizers; magnesium oxysulphate products; and several minor uses. Hydrated lime is an important co-product, obtained in the processing of brucitic limestone. The magnesia has been satisfactorily used for the making of magnesium bisulphite liquor needed in the manufacture of special grades of paper, and on an experimental scale for magnesium oxychloride cement.

Table 21 - PRODUCTION OF MAGNESITIC DOLOMITE (CALCINED) IN CANADA, 1938-1947

Year	Value	Year	Value
	$		$
1938	420,261(b)	1943	1,260,056
1939	474,418	1944	1,139,281
1940	897,016	1945	1,278,596
1941	831,041	1946	1,225,593
1942	1,059,374(a)	1947	1,167,584

(a) 1942 and following years include the value of brucite shipped.
(b) Represents value of magnesite (dead-burned, etc.) only, whereas the values for years immediately preceding include the value of some end products containing imported material; for this reason the 1938 to 1947 values are not entirely comparable with those for preceding years.

Table 22 - MAGNESITE AND DOLOMITE USED IN THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, 1939-1947

Year	Calcined Dolomite		Dolomite, Crude		Magnesite	
	Short tons	Value	Short tons	Value	Short tons	Value
		$		$		$
1939	14,858	99,838	40,592	78,904	11,401	351,680
1940	21,949	136,360	59,284	123,429	13,673	506,032
1941	21,608	160,602	71,087	159,037	18,127	682,742
1942	22,550	179,427	79,091	225,393	20,665	786,321
1943	10,310	99,740	78,746	243,793	19,427	744,716
1944	8,516	125,990	134,907	296,631	18,665	740,450
1945	6,146	111,581	110,478	266,236	18,249	755,958
1946	3,788	66,473	87,217	230,384	13,049	546,396
1947	6,748	124,107	188,449	357,288	18,261	783,536

Table 23 - CALCINED MAGNESITE USED BY THE ARTIFICIAL ABRASIVES AND ABRASIVE PRODUCTS INDUSTRY IN CANADA, 1939-1947

Year	Tons	Value	Year	Tons	Value
		$			$
1939	121	7,735	1944	771	103,591
1940	302	19,331	1945	840	96,780
1941	809	77,508	1946	1,676	187,250
1942	398	58,648	1947	1,832	195,586
1943	150	12,164			

MAGNESIUM SULPHATE

Natural hydrous magnesium sulphate (Epsom Salts or Epsomite) occurs in deposits in lake bottoms or in solution in brine lakes in British Columbia. In Saskatchewan, it is found associated with sodium sulphate. Attempts have been made to produce refined salts, and a number of years ago there was a considerable production from several of the "lakes" in British Columbia. Experimental shipments have been made also from one of the lakes in Saskatchewan.

Canada's output of magnesium sulphate has come chiefly from a deposit in Basque, British Columbia, production from which was discontinued in the autumn of 1942. The salt was refined at Ashcroft, 15 miles south of the deposit, and the grade of the product was high. The refinery, now owned by Ashcroft Salts Company, Limited, had a capacity of 10 tons of salt a day. There are a number of other occurrences in British Columbia, near Clinton, north of Kamloops, and in Kruger's Pass, south of Penticton.

In Saskatchewan, two lakes south of Wiseton contain brines high in magnesium sulphate, and Muskiki Lake, just north of Dana, contains brine high in magnesium and sodium sulphates, which at certain times of the year crystallizes into a bedded deposit with layers of both salts.

In the chemical industries Epsom salt has many uses. It is employed for tanning and in dyeing, and for textile and medicinal use. Magnesium sulphate is used in the paper industry for weighting paper. In the sole leather industry it is used to obtain a clean shiny cut, and it also helps to retain moisture in the leather and increases its weight. Magnesium salt is used to a small extent in the dyeing industry. In some cases it is used in the treatment of leather to increase the fastness of the colour in washing. It is used extensively and in large quantities in medicine and for various purposes in the manufacture of textiles. In bleaching wool, magnesium sulphate is added to destroy the corrosive effect of sodium peroxide. It is also used for weighting textile fabric, especially silk. Mixed with gypsum and ammonium sulphate, it is used in the manufacture of non-inflammable fabrics.

Table 24 - PRODUCTION OF NATURAL MAGNESIUM SULPHATE IN CANADA(*), 1938-1947

Year	Tons	Value	Year	Tons	Value
		$			$
1938	470	9,400	1943	...	...
1939	550	9,900	1944	...	...
1940	...	...	1945	...	...
1941	265	7,343	1946	...	...
1942	1,140	38,760	1947	...	...

(*) Produced entirely in British Columbia.

Table 25 - IMPORTS OF MAGNESIUM SULPHATE INTO CANADA, 1939-1947

Year	Tons	Value	Year	Tons	Value
		$			$
1939	1,951	56,648	1944	2,684	108,795
1940	2,211	86,090	1945	2,545	101,695
1941	2,729	109,022	1946	3,463	132,342
1942	1,688	68,532	1947	2,908	108,840
1943	3,379	137,372			

Table 26 - AVAILABLE DATA ON CONSUMPTION OF MAGNESIUM SULPHATE IN CANADA, 1941-1946

Industry	1941	1942	1943	1944	1945	1946
				(tons)		
Leather tanneries	752	891	935	932	1,013	1,019
Medicinals	968	539	577	562	828	645
Fertilizers	200	790	...	54	431	57
Textiles	303	55	330	350	44	28
Miscellaneous	...	46	60	119	...	...
TOTAL ACCOUNTED FOR	2,223	2,321	1,902	2,017	2,316	1,749

NATURAL MINERAL WATERS

Production of natural mineral waters in past years originated in Ontario and Quebec. Some of the more prominent Canadian mineral waters possessing special therapeutic or hygienic properties include the following: in Quebec, the Abenakis springs on the St. Francois river in Yamaska county, Potton Springs in Brome county and the Columbia spring at L'Epiphanie. In Ontario, saline, sulphur and gas springs occur at Caledonia Springs and at Carlsbad Springs, near Ottawa; the waters range from alkaline to strongly saline. St. Catharines, near Niagara, is one of the oldest Canadian mineral water resorts and sulphur waters are found at the Preston mineral springs in Waterloo county. The most famous of all Canadian springs is undoubtedly the group of hot sulphur springs at Banff, Alberta. In British Columbia, the Harrison Hot Springs in Fraser Valley and the Halcyon Hot Springs on Arrow Lake are noted for their curative properties.

There were 14 firms reporting production of natural mineral waters in the Dominion in 1947. Twelve of these firms were in Quebec and 2 in Ontario.

Table 27 - SHIPMENTS OF NATURAL MINERAL WATERS FROM CANADIAN SPRINGS, 1938-1947

Year	Quebec		Ontario		CANADA	
	Imp.gal.	$	Imp.gal.	$	Imp.gal.	$
1938	159,893	19,033	28,416	2,586	188,309	21,619
1939	104,629	17,503	19,140	1,602	123,769	19,105
1940	109,025	18,466	31,638	2,426	140,663	20,892
1941	144,441	58,062	36,623	14,469	181,064	72,531
1942	129,062	60,316	28,023	14,189	157,085	74,505
1943	125,605	61,793	14,006	5,748	139,611	67,541
1944	148,965	88,113	7,185	805	156,150	88,918
1945	236,476	148,714	8,285	976	244,761	149,690
1946	211,842	121,526	6,000	878	217,842	122,404
1947	195,452	116,840	3,500	600	198,952	117,440

PHOSPHATE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Production of phosphate in Canada has consisted almost wholly of the mineral apatite, frequently found associated with the phlogopite mica deposits of the general Ottawa region, in Ontario and Quebec. Mined on a fairly substantial scale prior to 1895, annual production during the past fifty years has only occasionally exceeded 1,000 tons. In 1946, production fell to only 57 tons, the lowest since 1930, and in 1947 there were nc recorded shipments. Total recorded production of apatite in Canada to the end of 1947 was 348,740 tons, of which Quebec supplied 90 per cent and Ontario 10 per cent.

For many years, Electric Reduction Company, Buckingham, Quebec, has purchased most of the small output for use in the production of elemental phosphorus and various phosphorus compounds. The company, however, obtains most of its phosphate rock requirements from Florida. That state and Montana supply the great bulk of the phosphate rock which Canada imports for the manufacture of fertilizer, occasional shipments being obtained also from North Africa. Rock low in fluorine is obtained from Curacao, Netherlands West Indies, for use in stock feeds.

In 1947, some interest developed in the possibility of recovering apatite from a body of ilmenite-magnetite-apatite on the St. Charles property in the Saguenay region, Quebec, in the event that the deposit comes into operation as a simultaneous source of titanium and iron.

Rock phosphate of Permo-Triassic age occurs along the Rocky Mountain Divide, notably in the vicinity of Crow's Nest, British Columbia, where a few thousand tons was mined about 1930 by The Consolidated Mining and Smelting Company of Canada, Limited. The material is too low grade to be of present economic interest and rock for the company's fertilizer plant at Trail, British Columbia, is obtained from richer deposits in Montana.

Phosphate is used chiefly for the manufacture of fertilizer. Ordinary superphosphate, made by treatment of rock phosphate with sulphuric acid, is the chief product made, but triple superphosphate, ammonium phosphate, and other compounds of higher P_2O_5 content are produced on an important scale. In Tennessee, production of phosphoric acid, calcium metaphosphate, and fused tricalcium phosphate, by furnace treatment of rock has been increasing steadily, and permits the use of low-grade material that it would be

uneconomic to acidulate. Thermal defluorination of phosphate rock and of superphosphate has also shown a marked increase in order to meet deficiencies of bone-meal and other fluorine-free phosphatic materials for stock-feed use. Production of fertilizer made from fused phosphate rock and olivine or serpentine was commenced in 1946 on the U.S. Pacific Coast.

Rock phosphate is the sole commercial source of phosphorus.

Overall average f.o.b. value of United States phosphate rock in the first half of 1947 was $5.17 per long ton, compared with $4.24 per ton reported for the corresponding period in 1946. Laid-down cost of Florida rock at eastern Canadian points in 1947 varied between $14.50 and $17.35 per long ton, according to grade and whether shipped all-rail or by water and rail.

The price paid in recent years for Canadian apatite delivered at plant was $16 per short ton for material of 80 per cent B.P.L. (bone phosphate of lime) content, with a penalty or premium of 20 cents per unit below or above that figure.

Table 28 - PRODUCTION OF PHOSPHATE IN CANADA, 1938-1947

Year	Short tons	$	Year	Short tons	$
1938	208	1,886	1943	1,451	18,385
1939	157	1,712	1944	482	6,716
1940	358	4,039	1945	299	4,356
1941	2,487	33,376	1946	57	869
1942	1,264	17,431	1947	...	...

Table 29 - IMPORTS OF PHOSPHATE ROCK INTO CANADA, 1938-1947

Year	Tons	Value	Year	Tons	Value
		$			$
1938	128,409	455,697	1943	260,846	1,085,080
1939	124,900	477,317	1944	388,247	1,710,378
1940	165,858	663,554	1945	317,695	1,450,580
1941	237,029	863,833	1946	373,677	2,164,841
1942	271,373	1,053,229	1947	485,391	2,857,522

Table 30 - CONSUMPTION OF PHOSPHATE ROCK IN CANADA, 1945 and 1946

	1945	1946
	(tons)	
(a) By Uses		
Fertilizers	365,195	372,914
Chemicals	26,804	17,861
Steel furnaces	1,895	1,989
Refractories	154	153
Miscellaneous	...	7,100
TOTAL	394,048	400,017
(b) By Provinces		
Quebec	93,751	85,871
Ontario	69,060	70,933
British Columbia	231,237	243,213
TOTAL	394,048	400,017

SILICA BRICK

The manufacture of silica brick for refractory use was confined to the plants of the Dominion Steel and Coal Company, Limited, Sydney, Nova Scotia, and the Algoma Steel Corporation Limited, Sault Ste. Marie, Ontario. The brick manufactured by both these firms are processed from crushed silica rock and are utilized in furnace construction and repairs.

Table 31 - PRODUCTION OF SILICA BRICK IN CANADA, 1938-1947

Year	M	$	Year	M	$
1938	1,788	100,403	1943	4,165	295,505
1939	2,493	124,807	1944	3,997	312,092
1940	3,438	182,786	1945	4,208	317,263
1941	4,111	238,433	1946	2,902	197,804
1942	4,273	263,006	1947	3,094	193,998

Note: Quantities are shown as 9" equivalent.

SODIUM CARBONATE (NATURAL)

Deposits of natural sodium carbonate in the form of "Natron" (sodium carbonate with 10 molecules of water) and of brine occur in a number of small "lakes" throughout the central part of British Columbia, chiefly in the Clinton Mining Division and in the neighborhood of Kamloops. As the deposits are far from the main eastern Canadian markets, production is restricted to the requirements of consumers within economical rail haul.

Sodium carbonate has many industrial uses, notably in the manufacture of glass and soap, in the purification of oils, in the production of aluminum, in the flotation of minerals, in the refining of metals, and in the production of caustic soda.

Table 32 - PRODUCTION OF SODIUM CARBONATE (NATURAL) IN CANADA, 1938-1947

Year	Tons	$	Year	Tons	$
1938	252	2,268	1943	468	5,148
1939	300	2,400	1944	44	484
1940	220	1,760	1945	286	3,146
1941	186	1,488	1946	...	...
1942	256	2,048	1947	163	1,793

SODIUM SULPHATE (NATURAL)

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Sodium sulphate occurs as crystals or in the form of highly concentrated brines in many lakes and deposits throughout Western Canada. From these, hydrated sodium sulphate, known as Glauber's salt, and anhydrous sodium sulphate, known to the trade as "salt cake", are produced in Canada.

Investigations of the sodium sulphate deposits in Western Canada were made by the Mines Branch, predecessor organization of the Bureau of Mines, Ottawa, in 1921, and over 120,000,000 tons of hydrous salts were proved in the few deposits examined in detail. The material is in the form of the hydrous salt (mirabilite or Glauber's salt) which contains 55.9 per cent of water of crystallization that is removed before marketing. For the small amount of the hydrous product that is marketed as such, clean crystals are harvested and stock-piled, after which they are screened to various sizes, bagged and shipped.

Anhydrous sodium sulphate is also obtained as a by-product from the manufacture of hydrochloric acid and as a by-product from the viscose industry. The latter source of supply is likely to increase rapidly as the demand for the other products of the viscose industry expands. Thus, unless the anhydrous material from Western Canada can be made of such a high degree of purity that consumers will be willing to pay a premium based on the sodium sulphate content, it will be unable to compete in the export market with the by-product material.

Glauber's salt is used widely in the chemical industries and the demand is increasing. Sodium sulphate is used chiefly in the sulphate process for the manufacture of kraft pulp, and large amounts are used at Copper Cliff in the smelter. It is used in the glass, dye and textile industries and to a smaller extent for medicinal purposes, and for tanning.

The price of natural sodium sulphate from the deposits in Western Canada in 1947 was quoted at $10.00 per short ton in carload lots f.o.b. plant. The delivered price at pulp mills, which are mostly distant from producing centres, is considerably higher, being over $20 a ton in the Maritime Provinces.

Table 33 - PRINCIPAL STATISTICS OF SODIUM SULPHATE MINING INDUSTRY, 1946 and 1947

		1946	1947
Active firms	No.	4	4
Producing plants	No.	4	4
Employees - Administrative	No.	13	15
Workmen	No.	154	218
Total Employees	No.	167	233
Salaries	$	32,259	38,224
Wages	$	219,628	418,445
Total Salaries and Wages	$	251,887	456,669
Gross value of production	$	1,118,783	1,798,481
Cost of fuel and electricity	$	254,450	370,557
Cost of process supplies and containers	$	66,423	99,156
NET VALUE OF PRODUCTION	$	797,910	1,328,768

Table 34 - PRODUCTION OF NATURAL SODIUM SULPHATE(*) IN CANADA, 1938-1947

Year	Short tons	$	Year	Short tons	$
1938	63,009	553,307	1943	107,121	1,025,151
1939	71,485	628,151	1944	102,421	987,842
1940	94,260	829,589	1945	93,068	884,322
1941	115,608	931,554	1946	105,919	1,117,683
1942	131,258	1,079,692	1947	163,290	1,793,043

(*) All produced in the province of Saskatchewan, with the following exceptions:
Includes production in Alberta - 1938 ..... 89 tons, value $1,127
1939 ..... 10 tons, value $186
1940 ..... 10 tons, value $50
1941 ..... 8 tons, value $32

Table 35 - PRODUCTION IN CANADA OF MANUFACTURED SODIUM SULPHATE, 1938-1947

Year	Salt Cake		Glauber's Salt	
	Tons	$	Tons	$
1938	2,955	42,049	2,464	39,935
1939	2,661	40,219	3,189	52,331
1940	4,100	61,567	4,425	82,969
1941	5,191	83,991	3,372	64,203
1942	4,945	68,377	914	18,761
1943	4,256	57,526	...	...
1944	3,758	46,077	...	...
1945	2,850	35,226	...	...
1946	2,584	33,333	...	...
1947	3,175	51,047	...	...

Table 36 - IMPORTS INTO CANADA OF SODIUM SULPHATE, 1938-1947

Year	Salt Cake		Glauber's Salt	
	Tons	$	Tons	$
1938	5,786	61,122	2,266	20,288
1939	6,542	73,575	1,330	20,102
1940	8,295	94,674	543	12,450
1941	7,819	105,502	250	8,244
1942	7,070	85,479	75	4,664
1943	11,904	150,496	566	15,399
1944	20,460	195,105	777	21,960
1945	13,535	120,982	1,016	29,452
1946	20,881	244,617	1,258	33,136
1947	9,329	172,531	1,383	41,125

STRONTIUM MINERALS

(Text from the Annual Review by the Bureau of Mines, Ottawa)

In Ontario, several occurrences of celestite are known in the general Ottawa region, but very little mining has been undertaken for the mineral, and production has been small and intermittent.

Between 1918 and 1920, about 250 tons of white, fibrous celestite was mined from a deposit in Bagot township, Renfrew county, and after grinding in a small mill erected on the property was sold for use in paint. The material was not very pure and contained about 18 per cent of barium sulphate. The old pit was pumped out in 1941 and a few tons of ore was scaled down from a small drift. This, together with some stockpile material from the earlier work, was shipped to Montreal for grinding and pigment use. The property has since been idle. The above comprises the only production of strontium minerals in Canada of which there is any official record.

Celestite similar in character and analysis to that from the above locality occurs at certain of the fluorspar mines of the Madoc area, Hastings county, but no attempt at commercial recovery has ever been made.

In Lansdowne township, Leeds county, platy crystals of very pure celestite analysing 99 per cent strontium sulphate occur as the filling of a narrow, 1 to 2 foot, vein in crystalline limestone. A couple of small surface pits were opened on the deposit many years ago, but there are no records of any shipments. No further attempt at development has been made. The ore should be well adapted to concentration by gravity methods, but the deposit is unlikely to be capable of yielding more than a small tonnage.

Celestite similar to the foregoing occurs also in Fitzroy township, Carleton county, in a narrow vein in crystalline limestone. The deposit was encountered in a small prospect pit opened for galena about thirty-five years ago, but no attempt has ever been made to determine its extent. A selected sample of the purest material analysed 93 per cent strontium sulphate.

Tabular crystals of celestite analysing 76 per cent strontium sulphate and 15 per cent barium sulphate occur as the cementing material of brecciated fragments of crystalline limestone on a fault-zone in Loughborough township, Frontenac county. A small pit was opened on the deposit about 40 years ago, but no shipments were made, and no further work has been done.

In British Columbia, celestite occurs near Birch Island, North Thompson River, Kamloops Mining Division. The deposit is reported to contain a large tonnage of ore consisting of a fine-grained intergrowth of fluorspar, celestite, feldspar, quartz, mica, and pyrite. Celestite is estimated to form up to 17 per cent of the mass, and fluorspar up to 27 per cent. Milling tests have shown that a grind of minus 200-mesh is necessary to unlock the fluorspar and celestite grains, but some difficulty was met in recovering clean concentrates of either mineral. The property is controlled by B.C. Fluorspar Syndicate, of Toronto, who conducted considerable exploration of the deposit, including diamond drilling, between 1942 and 1944. No further development has been reported.

There are a number of recorded minor occurrences in Canada of celestite and strontianite, these being located in Ontario, Quebec, Nova Scotia, and British Columbia. They are briefly mentioned in Mines Branch report No. 570, "Barium and Strontium in Canada", but none of them is regarded as of any economic interest.

The earliest important use for strontium minerals was for the production of strontium hydrate for desaccharizing beet sugar molasses by the Scheibler process. This process found its greatest application in Germany, that country for many years importing and using the greater part of the world supply of strontium minerals. Later it was adopted by sugar manufacturers in Russia, France, and the United States, but for some time past the German Dessau Sugar Refinery is reported to be the only company in the world using it.

Pyrotechnics, including fireworks, railroad, marine, truck, and aircraft flares, or "fusees", rockets, and tracer bullets, now consume a large proportion of the available strontium supply, in the form of strontium peroxide or nitrate, which gives a vivid red flame.

Minor uses for the ores are for the production of strontium salts and chemicals used in certain types of glass, ceramic fluxes and glazes, medicinals, and lubricants, and for purifying caustic soda used in the rayon industry. All such compounds are prepared from the basic intermediate strontium carbonate made by reacting celestite with sodium carbonate solution. Strontium greases are said to be stable in the range 300°-400° F., and to have other desirable properties. Strontium chloride has found use as an absorbent in gas refrigerators, and the carbonate (mostly natural strontianite) has been used, principally in Germany, as a flux and desulphurizer in steel furnaces. Strontium metal has no particular uses, outside of the addition of small amounts to copper to prevent blowholes in castings, and to a minor extent in some tin, lead, aluminum, and cadmium alloys.

May, 1948, price quotations in the United States for crude lump celestite, 90 per cent grade, were $19 per short ton, f.o.b. mines California. Finely powdered celestite, 92 per cent grade, was quoted at $45 per ton, f.o.b. eastern United States plants. In 1946, imported crude celestite was worth $28 to $30 a short ton laid down at Philadelphia. In the same year, the average declared unit value of celestite imports from Mexico was $12.25 per short ton, and from the United Kingdom, $16.60 per ton. Crude lump strontianite, 84 to 86 per cent grade, currently is priced at $55 per ton, f.o.b. Atlantic seaboard.

A wide range of strontium chemicals is offered by United States companies in the business (see above), of which the nitrate, one of the most widely used, for pyrotechnics, is quoted at 8 cents per pound. Strontium carbonate, an important base salt, is priced at 15 cents per pound for 90 per cent grade, and 24 cents per pound for 98 per cent grade. Strontium chloride sells for 23 cents per pound. Strontium-calcium sulphide, a phosphorescent salt, is priced at $2.50 to $2.85 per pound. Strontium metal is not openly quoted, but in 1945 was reported to sell at approximately $15 per pound.

SULPHUR (Including Pyrites)

(Text from the Annual Review by the Bureau of Mines, Ottawa)

Pyrites is produced in Canada as a by-product in the treatment of copper-pyrites ores at Waite-Amulet and Noranda mines in Quebec and Britannia mine in British Columbia. No lump pyrites has been produced in Canada for several years, and published statistics on recent pyrites production refer to by-product iron pyrites recovered in the concentrating of copper and copper-zinc ores.

Deposits of native sulphur of commercial grade have not been found in Canada, but sulphur occurs in combination with copper, lead, zinc, nickel, or iron in many base metal sulphide orebodies in various parts of the country. In smelting these ores sulphur dioxide gas is produced, and to 1925 this gas was a total waste as no facilities were available for the recovery from it of sulphur or of sulphur compounds. In practice this gas can be used directly for the manufacture of liquid sulphur dioxide or for the production of elemental sulphur. Sulphur used in the making of sulphuric acid is recovered in the form of sulphur dioxide from salvaged gas by The Consolidated Mining and Smelting Company of Canada, Limited at Trail, British Columbia, and by Canadian Industries Limited at Copper Cliff, Ontario. There has been no production of elemental sulphur in Canada since July 1943.

In Quebec, Noranda Mines Limited, Noranda, recovers the pyrites from the cyanide mill tailings and sells it to pulp and paper mills at Trois Rivieres and at Hull, Quebec, and to chemical plants in Canada and the United States. Waite Amulet Mines, Limited has been producing a pyrite concentrate since March 1944, which it ships mainly to the United States. Noranda Mines Limited are operating a pilot plant for the recovery of elemental sulphur from pyrite. It is expected that the iron residues will be used to produce pig iron.

In British Columbia, most of the large output of pyrites from the Britannia mine of Britannia Mining and Smelting Company, Limited, at Britannia Beach, was sold to Nichols Chemical Company's acid plant at Barnet, British Columbia, and the remainder was exported to Compagnie des Boleo in Mexico. The pyrites averaged over 50 per cent in sulphur. A considerable tonnage from operations in previous years has

accumulated for disposal when market conditions are more favourable. The property of Northern Pyrites, Limited at Ecstall River, about 60 miles south of Prince Rupert, remained idle. Reserves are estimated at 5,000,000 tons with a sulphur content of 45 per cent.

By July 1943, the demand for sulphuric acid for fertilizer manufacture had become so great that the production of elemental sulphur at Trail, which was commenced in 1936, was discontinued. The sulphiric acid is made in a plant using the contact process, that was erected by Consolidated Mining and Smelting Company in 1929. Canadian Industries Limited also uses the contact process in its acid plant at Copper Cliff, the production of sulphuric acid being from converter gas that is withdrawn from the flues by arrangement with The International Nickel Company of Canada, Limited.

Table 37 - PRODUCTION OF SULPHUR(*) IN CANADA, 1938-1947

Year	Tons	$	Year	Tons	$
1938	112,395	1,044,817	1943	257,515	1,753,425
1939	211,278	1,668,025	1944	248,088	1,755,739
1940	170,630	1,298,018	1945	250,114	1,881,321
1941	260,023	1,702,786	1946	234,771	1,784,666
1942	303,714	1,994,891	1947	221,781	1,822,867

(*) Includes sulphur recovered from smelter gas.

Table 38 - PRODUCTION IN CANADA OF PYRITES WITH SULPHUR CONTENT, INCLUDING SULPHUR CONTAINED IN SULPHURIC ACID, ETC., MADE FROM SMELTER GASES, 1945-1947

	Pyrites			Smelter Gas		Total Sulphur	
	Sales	Sulphur Content		Sulphur Content			
	Tons	Tons	Value	Tons	Value	Tons	Value
			$		$		$
1945							
Quebec	218,628	105,613	445,534	...	...	105,613	445,534
Ontario	...	...	...	16,847	168,470	16,847	168,470
British Columbia ..	9,095	4,590	36,677	123,064	1,230,640	127,654	1,267,317
CANADA	227,723	110,203	482,211	139,911	1,399,110	250,114	1,881,321
1946							
Quebec	194,291	92,716	375,328	...	...	92,716	375,328
Ontario	...	...	...	15,433	154,330	15,433	154,330
British Columbia ..	7,644	3,822	27,006	122,800	1,228,002	126,622	1,255,008
CANADA	201,935	96,538	402,334	138,233	1,382,332	234,771	1,784,666
1947							
Quebec	105,271	48,688	187,112	...	...	48,688	187,112
Ontario	...	...	...	15,931	159,310	15,931	159,310
British Columbia ..	72,993	33,949	244,315	123,213	1,232,130	157,162	1,476,445
CANADA	178,264	82,637	431,427	139,144	1,391,440	221,781	1,822,867

Table 39 - AVAILABLE DATA ON THE CONSUMPTION OF SULPHUR (BRIMSTONE) IN CANADA, 1944-1946

Industry	1944	1945	1946
	(Tons of 2,000 pounds)		
Pulp and paper	195,203	203,522	226,296
Heavy chemicals	68,649	53,689	45,346
Rubber goods	1,259	1,496	1,446
Explosives	1,753	1,131	1,461
Insecticides	1,228	1,244	1,297
Adhesives	495	75	64
Starch	240	253	208
Fruit and vegetable preparations	156	123	119
Sugar refining	108	130	128
Petroleum refining	51	51	68
Matches	75	89	83
Miscellaneous	670	600	195
TOTAL ACCOUNTED FOR	269,887	262,403	276,711

Table 40 - IMPORTS OF SULPHUR (BRIMSTONE) INTO CANADA, 1938-1947

Year	Tons	$	Year	Tons	$
1938	93,647	1,471,741	1943	218,527	3,524,006
1939	152,216	2,453,836	1944	235,955	3,875,649
1940	215,597	3,628,348	1945	248,846	4,063,324
1941	235,271	3,920,184	1946	273,502	4,271,081
1942	290,121	4,680,672	1947	361,424	5,466,201

VOLCANIC DUST

(Text from the Annual Review by the Bureau of Mines, Ottawa)

Volcanic dust (pumicite or pumice dust) is a natural glass or silicate, atomized by volcanic explosions and thrown into the air in great clouds which ultimately settle, forming beds of varying thickness, often hundreds of miles from its source. In many instances the dust has been washed down from higher levels and redeposited by the agency of waters, in which case the beds are stratified and mixed with foreign substances. It consists of aluminum silicate (80 to 90 per cent), and of oxides and silicates of iron, sodium, magnesium, calcium, etc.

Deposits of volcanic dust occur in Saskatchewan, Alberta, and British Columbia. There has been no production in recent years, but in 1947 test shipments were made from a deposit near Nanton, Alberta.

In the United States production of pumice volcanic dust reached a peak of nearly 320,000 tons in 1946. About 77 per cent of the output was used for concrete admixture and aggregate; 16 per cent for cleansing compounds and other abrasive uses; and the remainder for acoustic plaster, insecticide, insulation, brick manufacture, filtration, plastics, paint filler, absorbents, etc.

Imports are grouped with a number of similar products (pumice, pumice stone, lava, and calcareous tufa), the value of which totalled $62,063 in 1947. Most of the pumice dust was used in scouring powders.

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DIRECTORY OF FIRMS IN THE MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1947

(x) Active but not producing.
(*) Recover sulphur from smelter gas.

Name of Operator	Head Office Address	Plant Location
BARITE		
Nova Scotia -		
Canadian Industrial Minerals Ltd.	Walton	Walton
Ontario -		
Woodhall Mines Ltd.	347 Bay St., Toronto	Langmuir
British Columbia-		
Mountain Minerals Ltd.	Box 273, Lethbridge, Alberta	Golden M.D.
BRUCITE		
Quebec -		
Aluminum Company of Canada Ltd.	Sun Life Bldg., Montreal	Wakefield
Davis, Norman B.	512 Victoria Bldg., Ottawa, Ontario	Wakefield
DIATOMITE		
Nova Scotia -		
Wightman, Mrs. G. W.	Smith's Cove	Digby Co.
British Columbia -		
Fairey and Co.	661 Taylor St., Vancouver	Cariboo M.D., Vancouver

DIRECTORY OF FIRMS IN THE MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1947
(Continued)

Name of Operator	Head Office Address	Plant Location
	FLUORSPAR	
Ontario -		
Dominion Magnesium Ltd.	67 Yonge St., Toronto	Cobden
Gilman, R. T.	13 Government Road W., Kirkland Lake	Madoc Dist.
Millwood Fluorspar Mines Ltd.	Box 206, Madoc	Madoc Dist.
Reliance Fluorspar Mining Synd. Ltd.	Madoc	Huntingdon Tp.
Stocklosar, Chas. A.	Box 198, Madoc	Huntingdon Tp.
Tops Mining Synd. Ltd. (x)	c/o W. E. Clark, Harcourt	Cardiff Tp.
	GARNET	
Ontario -		
Niagara Garnet Co.	c/o Wm. A. Yarwood, 8573 Krull Parkway, Niagara Falls, N.Y., U.S.A.	River Valley
	GRAPHITE	
Ontario -		
Frobisher Exploration Co. Ltd.	Black Donald Mines	Brougham Tp.
	GRINDSTONES	
New Brunswick -		
Read, H. C.	Bathurst	Stonehaven
Bay of Chaleur Grindstone Co.	Clifton	Clifton
	LITHIUM MINERALS	
Manitoba -		
Lithium Corp. of Canada Ltd. (x)	403 Avenue Bldg., Winnipeg	Bernic and Cat Lakes
Sherritt Gordon Mines Ltd. (x)	25 King St. W., Toronto, Ontario	Herb Lake
	MAGNESITIC DOLOMITE	
Quebec -		
Canadian Refractories Ltd.	1050 Canada Cement Bldg., Montreal	Kilmar and Harrington
	MINERAL WATERS	
Quebec -		
Cie d'eau Minerale, de St. Hyacinthe	632 Concord Ave., St. Hyacinthe	St. Hyacinthe
Eau Minerale Etoile	Ste. Genevieve de Batiscan	Batiscan
Orange Crush Ltd.	1016 Bleury St., Montreal	Varennes
Lemay, Lucien	St. Francois du Lac	Nicolet Tp.
Gauthier, Charles	Louisville	St. Leon
Minard, Edward	Maskinonge	Maskinonge
Montclair-Richelieu Spring Water Co. Ltd.	Chambly Basin	Chambly
Pellerin, A., and Sons	St. Barnabe N.	St. Maurice
Sources Abenakis Springs Ltd.	366 rue Racine, Granby	St. Francois du Lac
Source Coulombia	L'Epiphanie	L'Epiphanie
Source d'eau Minerals Radnor	St. Maurice	St. Maurice
Usine d'Embouteillage Maski	St. Justin	St. Justin
Ontario -		
Carlsbad Springs, The	Carlsbad Springs	Gloucester Tp.
Demeault, J. P.	Bourget	Bourget

DIRECTORY OF FIRMS IN THE MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1947
(Concluded)

Name of Operator	Head Office Address	Plant Location
	PHOSPHATE	
Quebec -		
Bigelow, Robert (x)	Buckingham	Bowman Tp.
Blackburn Bros. Ltd. (x)	85 Sparks St., Ottawa, Ontario	Perkins
High-Rock Phosphates Ltd. (x)	41 Main St., Buckingham	Portland W. Tp.
Cross, Stanley (x)	28 Warren Ave., Ottawa, Ontario	Hull Tp.
Ontario -		
Ontario Phosphate Industries Ltd. (x)	Room 1101, 62 Richmond St. W., Toronto	Bedford Tp.
	SILICA BRICK	
Nova Scotia -		
Dominion Steel & Coal Corp. Ltd.	Sydney	Sydney
Ontario -		
Algoma Steel Corp. Ltd.	Sault Ste. Marie	Sault Ste. Marie
	SODIUM CARBONATE	
British Columbia -		
Bishop, V. C. (Mrs.)	c/o Boyds Garage, Clinton	Clinton area
	SODIUM SULPHATE	
Saskatchewan -		
Horseshoe Lake Mining Co. Ltd. (x)	Ormiston	Ormiston
Midwest Chemicals Ltd.	Palo	Whiteshore Lake
Natural Sodium Products Ltd.	Bishopric	Frederic Lake, Alsask
Sybouts Sodium Sulphate Co. Ltd.	Gladmar	Gladmar
	SULPHUR (Pyrites)	
Quebec -		
Noranda Mines Ltd.	Royal Bank Bldg., Toronto, Ontario	Noranda
Waite-Amulet Mines Ltd.	Noranda	Duprat Tp.
Ontario -		
International Nickel Company of Canada Ltd. (*)	Copper Cliff	Copper Cliff
British Columbia -		
Consolidated Mining & Smelting Company of Canada Ltd. (*)	Trail	Trail
Britannia Mining & Smelting Co. Ltd.	Britannia Beach	Britannia Beach

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