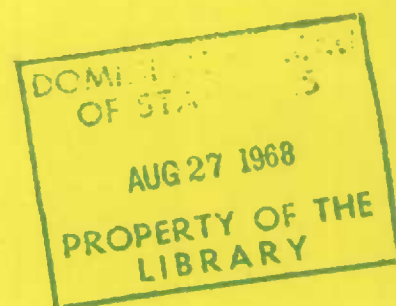


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MISCELLANEOUS NON-METAL MINES

1964

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MISCELLANEOUS NON-METAL MINES

1964

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SYMBOLS

The following standard symbols are used in Dominion Bureau of Statistics publications:

- .. figures not available.
- ... figures not appropriate or not applicable.
- nil or zero.
- amount too small to be expressed.
- preliminary figures.
- revised figures.

INTRODUCTION

For statistical purposes, the Standard Industrial Classification--see Standard Industrial Classification Manual (Catalogue No. 12-501) provides for a major group in the mining sector titled Major Group 3, Non-metal Mines except Coal Mines. This group includes four industries at the three digit level as follows:

- Industry 071--Asbestos Mines
- Industry 073--Gypsum Mines
- Industry 077--Salt Mines
- Industry 079--Other Non-metal Mines

Separate reports are released covering the first three of the above listed industries; however, for presentation purposes, statistics for Industry 079--Other Non-metal Mines are released in another series of separate reports as follows each representing a split at the four digit level as follows:

- Industry 0792--Feldspar and Quartz Mines
- Industry 0795--Peat Industry
- Industry 0798--Talc and Soapstone Mines
- Industry 0799--Miscellaneous Non-metal Mines

The latter covers a residual group of industries in this group and is the subject of the present report. For statistical purposes, the industry 0799--Miscellaneous Non-metal Mines is defined as including establishments primarily engaged in mining and milling non-metallic minerals not elsewhere classified. This industry includes mines such as the following: barite, fluorspar, potash, natural sodium sulphate, etc. The present report also includes notes of a summary nature on arsenious oxide, titanium

dioxide, pyrite, pyrrhotite and sulphur in smelter gases; these are by-products of the metal mining and smelting and refining industries, thus principal statistics relating to output, employment, etc., are credited to the producing industries.

Data presented in this report under the heading of Miscellaneous Non-metal Mines (Tables 1-8) reflect the full implementation of the revised Standard Industrial Classification (S.I.C.) and the New Establishment Concept including an extension of the latter to cover total activities of mining establishments (see Explanatory Notes section of this report). Commodity statistics reflecting total production from all sources, world figures on production, trade data, etc. are presented along the same general lines as in the earlier issues of this report.

The combination of improvements in internal procedures with the introduction of the final stage of the establishment concept in the annual Census of Mining produced changes which, for some industries, required major adjustments in industry statistical data--see Explanatory Notes. In the case of the industry under review in this report, the changes primarily affected the items relating to number of establishments and cost of materials and supplies, as evidenced in the comparative series of statistics presented in Tables 1 and 2. The reduction in the number of establishments indicated is the result of the exclusion of non-producers. These latter are no longer being included as establishments under the new definition. The higher cost of materials reflects the broadening of the coverage of materials used under the new definition--see Explanatory Notes.

TABLE 1. Principal Statistics,¹ Miscellaneous Non-metal Mines, 1957-63

Basis: Revised Standard Industrial Classification

Year	Estab- lish- ments	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of materials and supplies	Value of production	Value added ²
	number		dollars				
1957	78	1,644	5,803,537	1,937,880	1,605,521	14,341,239	10,965,489
1958	68	1,268	4,882,848	1,701,198	1,092,272	12,149,111	9,289,930
1959	53	1,441	5,793,924	1,880,614	1,568,157	14,029,884	10,512,803
1960	75	1,143	4,586,811	1,862,888	1,009,156	10,869,459	7,688,746
1961	65	1,132	4,741,001	1,778,330	1,533,397	11,586,033	7,974,043
1962	42	1,177	5,412,014	1,879,552	1,482,818	15,235,071	11,585,517
1963	32	1,373	7,025,733	2,601,393	2,522,675	35,074,074	29,631,490

¹ During the years under review there have been changes in the methods of compilation. Some commodities have been added to this group and some commodities have been removed to form a separate classification. Natural Iron Oxides Industry and Mica Mines figures were included in 1957-63.

² Value of production, less the value of fuel, electricity, process supplies, containers and freight.

See footnote Table 2.

TABLE 2. Principal Statistics,¹ Miscellaneous Non-metal Mines, 1961-64

Basis: Revised Standard Industrial Classification and New Establishment Concept

Year	Estab- lish- ments	Mining activity							Total activity				
		Production and related workers			Cost of fuel and elec- tricity	Cost of materials and supplies	Value of production	Value added	Working owners and partners		Employees		Value added
		Number	Man- hours paid	Wages					Number	With- drawals	Number	Salaries and wages	
	No.		'000	\$'000						\$'000	\$'000		
1961	14	818	1,715	3,237	1,458	2,386	12,094	8,250	x	x	975	4,102	8,412
1962	15	911	1,900	3,805	1,816	3,025	17,985	13,144	x	x	1,129	5,008	13,167
1963	15	988	2,152	4,464	2,550	4,338	36,809	29,920	x	x	1,311	6,735	29,935
1964	17	1,139	2,459	5,453	3,425	6,249	47,838	38,165	x	x	1,567	7,979	38,366

¹ Refer to Explanatory Notes for description of concepts and definitions, and an explanation of differences in Tables 1 and 2. See also text page 5.

TABLE 3. Employment and Payroll, Miscellaneous Non-metal Mines 1961-63

Basis: Revised Standard Industrial Classification

Year	Employees										Salaries and wages				
	Production and related workers				Adminis- trative and office		Sales and distribution		Total		Production and related workers		Adminis- trative and office	Sales and distrib- ution	Total
	Mining		Other												
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Mining	Other			
	number										\$'000				
1961	900	4	—	—	201	27	—	—	1,101	31	3,517	—	1,224	—	4,741
1962	937	1	—	—	215	24	—	—	1,152	25	4,059	—	1,353	—	5,412
1963	1,026	2	—	—	314	31	—	—	1,340	33	4,632	—	2,394	—	7,026

See footnote Table 2.

TABLE 4. Employment and Payroll, Miscellaneous Non-metal Mines, 1961-64

Basis: Revised Standard Industrial Classification and New Establishment Concept

Year	Employees										Salaries and wages				
	Production and related workers				Adminis- trative and office		Sales and distribution		Total		Production and related workers		Adminis- tra- tive and office	Sales and distribution	Total
	Mining		Other												
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Mining	Other			
	number										\$'000				
1961	817	1	-	-	141	16	-	-	958	17	3,237	-	865	-	4,102
1962	910	1	-	-	198	20	-	-	1,108	21	3,805	-	1,203	-	5,008
1963	986	2	-	-	293	30	-	-	1,279	32	4,464	-	2,271	-	6,735
1964	1,137	2	-	-	377	51	-	-	1,514	53	5,453	-	2,526	-	7,979

See footnote Table 2.

TABLE 5. Production and Related Workers, Miscellaneous Non-metal Mines, 1963 and 1964

Basis: Revised Standard Industrial Classification and New Establishment Concept

Year and Month	Mine			Mill	
	Surface		Under-ground	Male	Female
	Male	Female			
1963	number				
January	320	2	207	449	—
February	301	2	208	446	—
March	271	2	216	444	—
April	281	2	217	469	—
May	288	2	213	481	—
June	282	3	213	481	—
July	301	1	198	467	—
August	310	1	207	477	—
September	299	1	215	466	—
October	314	1	236	487	—
November	308	1	243	496	—
December	303	1	238	484	—
Averages	298	2	217	471	—
1964					
January	192	1	333	449	1
February	176	1	366	465	1
March	188	1	359	468	1
April	212	1	384	514	1
May	256	1	379	532	1
June	247	1	374	540	1
July	247	1	343	529	1
August	256	1	350	574	1
September	248	1	339	581	1
October	222	1	352	628	2
November	210	1	398	643	2
December	250	1	393	650	2
Averages	225	1	364	548	1

TABLE 6. Purchased Fuel and Electricity Used, Miscellaneous Non-metal Mines, 1963 and 1964

Basis: Revised Standard Industrial Classification and New Establishment Concept

Description	1963		1964	
	Quantity	Cost	Quantity	Cost
		\$'000		\$'000
Bituminous coal:				
(a) From Canadian mines..... ton	735	12	15	--
(b) Imported	552	10	559	10
Sub-bituminous coal (from Alberta mines only)	—	—	—	—
Anthracite coal.....	9	--	—	—
Lignite coal.....	9,408	35	15,261	37
Coke	—	—	—	—
Gasoline (including gasoline used in cars and trucks)..... Imp. gal.	230,804	85	212,251	75
Fuel oil including kerosene or coal oil.....	8,432,403	775	11,156,757	1,042
Wood	—	—	—	—
Gas:				
(a) Liquefied petroleum gases	1,609	--	13,274	2
(b) Other manufactured gas	—	—	—	—
(c) Natural gas	2,125,991	594	3,769,125	1,019
Other fuel.....	—	—	—	—
Electricity purchased..... kwh.	113,990,418	1,038	144,440,122	1,239
Steam purchased .....	...	—	...	—
Total fuel and electricity used.....	...	2,550	...	3,425
Electricity generated:				
(a) For own use	6,534,862	--	7,473,014	--
(b) For sale	74,784	--	73,746	--

TABLE 7. Materials and Supplies¹ Miscellaneous Non-metal Mines, 1963 and 1964

Basis: Revised Standard Industrial Classification and New Establishment Concept

Description	Cost	
	1963	1964
	\$'000	
Ore or other semi-processed materials purchased and used in mine/mill operations.....	7	8
Containers shipping materials and supplies used	226	237
Operating maintenance and repair supplies used (excluding fuel)	3,942	5,598
Amount said out to others for work done on materials owned by establishments	165	406
Totals.....	4,338	6,249

¹ Refer to Explanatory Notes for explanation of differences in Tables 7 and 8 with data published in earlier years.**TABLE 8. Value of Production, Miscellaneous Non-metal Mines, 1963 and 1964**

Basis: Revised Standard Industrial Classification and New Establishment Concept

Description	1963		1964	
	Quantity	Value	Quantity	Value
		\$'000		\$'000
1. Value of production	36,809	...	47,838
2. Amount received in payment for work done on materials and products owned by others	—	...	—
Less adjustment for value of sales taxes, excise duties and outward transportation charges which could not be deducted from individual commodity items described above.....	...	—	...	—
Total value of production and work done	36,809	...	47,838

See footnote Table 7.

TABLE 9. Drilling Completed on Miscellaneous Non-metal Deposits, 1964

	Footage drilled
Diamond drilling for exploration and testing:	
By mining companies with their own personnel and equipment	11,787
By diamond drilling contractors	9,058
Other diamond drilling:	
Blast hole diamond drilling:	
By mining companies with their own personnel and equipment	—
By diamond drilling contractors	—
Drilling by percussion or other machines ¹	1,019,221

¹ Not complete as records are unobtainable at certain mines.**TABLE 10. Specified Taxes Paid by Companies in Miscellaneous Non-metal Mines Operations, ¹ 1964**

Taxes paid	Dollars
Dominion income taxes.....	1,792,292
Provincial taxes	1,061,756
Municipal taxes	377,403

¹ Includes related corporate activities associated with operations of Miscellaneous Non-metal Mines.

TABLE 11. Miscellaneous Expenditures Made by Companies Engaged in Miscellaneous Non-metal Mines Operations,¹ 1964

Description	Dollars
(a) Workmen's compensation	192,420
(b) Silicosis assessment	—
(c) Unemployment insurance	78,778
(d) Aggregate cost of structures, roads, machinery, equipment, etc., built by or purchased from outside contractors or suppliers and chargeable to Fixed Assets Accounts	38,226,857
(e) Book value of fixed assets (new structures, roads, machinery, equipment, etc., including major repairs and alterations) produced by own employees and chargeable to Fixed Assets Account	230,869
(f) Other capital expenditures not reported in (d) and (e)	22,430
(g) Cost of materials and supplies used in the production of machinery and equipment and in the construction of roads and new structures (including major repairs and alterations by own employees and chargeable to Fixed Assets Account)	78,240
(h) Cost of office supplies used during the year, not chargeable to Fixed Assets Account. Excludes cost of stamps and meter expenses.	109,425

¹ Includes related corporate activities associated with Canadian operations of Miscellaneous Non-metal Mines not allocable separately elsewhere.

TABLE 12. Producers' Shipments of Miscellaneous Non-metallic Minerals, 1963 and 1964

Item	1963		1964	
	Quantity	Value excluding containers	Quantity	Value excluding containers
		\$		\$
Barite ton	173,503	1,693,119	169,149	1,574,398
Diatomite "	798	26,830	1,143	64,555
Fluorspar "	..	1,976,006	..	2,258,796
Gemstones lb.	16,000	15,529	11,537	13,804
Grindstones ton	10	2,000	—	—
Iron oxides "	978	74,505	1,033	79,250
Lithia lb.	644,354	682,029	1,056,408	1,155,282
Magnesitic dolomite, brucite .....	..	3,439,890	..	3,569,619
Mica ton	592	44,284	599	86,025
Potash, K ₂ O lb.	626,860	22,500,000	858,351	31,161,954
Pozzolan "	..	17,994	..	35,200
Sodium sulphate ton	256,914	4,121,114	333,263	5,222,313
Totals .....	...	34,593,300	...	45,221,196
Pyrite, pyrrhotite ¹ ton	476,438	1,643,629	351,850	1,126,167
Sulphur ² in smelter gases "	353,243	3,488,181	443,448	4,261,912
Sulphur, elemental ³ "	1,249,887	13,380,182	1,788,165	18,637,597
Arsenious oxide ¹ "	94	7,498	162	16,195
Titanium dioxide, etc. ¹ .....	..	13,806,608	..	21,262,861

¹ General statistics relating to pyrite, arsenious oxide and titanium dioxide are included with the smelting industry.

² Data for 1963 and 1964 include sulphur in smelter gases in the form of acid or sulphur dioxide. General statistics relating to production of sulphur are included with those of the metal mining and non-ferrous smelting industries.

³ Produced from sour natural gas; includes sulphur recovered in processing nickel-copper matte.

Note: (a) Value of containers is excluded.

(b) The above and subsequent tables contain data on commodities in various forms and sources, therefore the figures are not directly comparable to those appearing in the industry series, that is, Tables 1-8.

TABLE 13. Consumption¹ of Non-metallic Minerals, 1963 and 1964

	Used during	
	1963	1964
	tons of 2,000 lb.	
Arsenic trioxide (refined)	285	280
Barite: ²		
Lump	6,610	6,536
Ground:		
Natural	2,985	3,835
Bleached .....	...	...
Bentonite ² :		
Swelling (also called sodium or Wyoming bentonite)	59,162	110,097
Non-swelling (also called calcium or Southern decolorizing bentonite)	8,162	10,154
Clay:		
China clay (Kaolin)	130,122	139,728
Fire clay .....	...	110,022
Ball clay .....	...	12,200
Diatomite (diatomaceous earth, Kieselguhr, Celite, etc.):		
Ground or powdered:		
Natural	9,434	10,381
Calcined	1,544	1,501
Other	101	856
Feldspar	6,509	7,491
Fluorspar:		
Metallurgical grade (lump)	131,698	140,879
Ceramic and other	2,047	2,845
Acid	9,093	12,104
Fullers earth	2,294	1,221
Graphite:		
Natural	3,824	3,315
Magnesia:		
Dead burned .....	...	107,464
Mica - Muscovite:		
Sheet, splittings	142	333
Wet ground	693	668
Other ground	777	851
Nepheline Syenite	42,824	43,206
Phosphate rock	1,166,573	1,462,044
Potash (muriate of potash):		
Agricultural	158,963	178,212
Chemical .....	..	2,044
Silica:		
Lump (quartz, quartzite, sandstone)	772,239	633,959
Sand (including foundry sand but excluding concrete sand)	1,205,433	1,406,757
Flour or pulverized	36,444	38,205
Sodium sulphate:		
Lump crude	206	2,346
Salt cake	221,204	227,632
Glauber's salts	591	552
Sulphur:		
Elemental	525,709	524,953
Liquid sulphur dioxide	102,785	103,833
Talc, soapstone, pyrophyllite	39,423	36,643
Whiting or whiting substitute:		
Ground chalk, whiting, calcium carbonate, precipitated chalk	36,359	33,254
Whiting substitute, ground limestone and ground marble	59,119	65,147
Sold to oil well drilling firms: ³		
Barite	8,376	10,220
Bentonite	34,459	65,323

¹ Due to a difference in coverage and concept the data in this table will differ from those relating to "Available consumption" as reported by specified industries shown in subsequent tables, e.g. Tables 16, 21, 26 etc.

² In addition, barite and bentonite were sold to oil well drilling firms. See end of table.

³ Not included in the consumption of barite and bentonite above.

Source: Special Survey "Consumption of Non-metallic Minerals" conducted by Manufacturing and Primary Industries Division, DBS.

ARSENIOS OXIDE

Arsenious oxide is also known as arsenic trioxide or white arsenic.

Production in Ontario was at the smelter of the Cobalt Refinery, Cobalt, Ont. which treated the cobalt-silver concentrates from Cobalt and Gowganda, and other custom ores.

Compounds of arsenic such as lead arsenate and calcium arsenate are used in insecticides, rodenticides and other pesticides. Other uses are:

as a decolourizer in glass, as preservatives and depilatories in the tanning of hides, in the chemical debarking of trees; in pyrotechnics; and in paint pigments.

The auriferous quartz ores exported to the United States from British Columbia mines contain considerable amounts of arsenic, but no data are available on the possible recovery of this arsenic and since the Canadian gold mines receive no payment for the arsenic content it, is not credited as commercial production.

TABLE 14. Producers' Shipments, Imports and Exports of Arsenic, 1963 and 1964

	1963		1964	
	Quantity	Value	Quantity	Value
	lb.	\$	lb.	\$
Producers' shipments:				
White arsenic (crude and refined)	187,450	7,498	323,900	16,195
Imports:				
Arsenic acid	664,462	24,165	..	..
Arsenious oxide and arsenic sulphide .....	—	—	..	..
Sodium arsenate and sodium biarsenate	132,604	34,526	..	..
Arsenate of lead	63,840	11,829	..	..
Arsenate of lime	132,000	8,435	..	..
Botanical arsenical formulation, n.e.s. ....	..	..	1,403,700	450,220
Exports:				
Arsenic	4,800	284	..	..

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007 and "Exports by Commodities", Catalogue No. 65-004.

TABLE 15. Production, Imports and Exports of White Arsenic, 1955-64

Year	Production, crude and refined, but no duplication	Imports ¹	Exports	
			Refined	Crude
pounds				
1955	1,571,787	—	940,600	—
1956	1,790,381	16,320	1,168,100	—
1957	3,697,317	1,559	3,229,800	—
1958	2,323,320	—	1,703,200	—
1959	1,578,307	—	1,130,400	—
1960	1,724,326	—	1,054,200	—
1961	419,300	—	244,500	—
1962	160,750	—	100	—
1963	187,450	—	4,800	—
1964	323,900	—	..	—

¹ Arsenious oxide and arsenic sulphide.

TABLE 16. Consumption of Refined White Arsenic, 1960-64

Industry	1960	1961	1962	1963	1964
	pounds				
Glass	224,663	219,934	179,163	172,404	168,793
Insecticides ¹	2	2	2	2	2
Metal rolling, casting, extruding	22,934	46,888	82,529	69,731	112,234
Miscellaneous chemicals	245,635	347,242	426,416	393,860	437,099
Totals accounted for .....	...	614,066	688,108	635,995	718,126

¹ Does not include arsenic acid (As₂O₅) imported for use in making insecticides, as follows: 1960, 407,465 pounds; 1961, 406,892 pounds; 1962, 627,558 pounds; 1963, 664,262 pounds; 1964, data not available separately.

² Included with miscellaneous chemicals total.

See footnote Table 13.

TABLE 17. World Production of White Arsenic, by Countries

Country ¹	1960	1961	1962	1963	1964
	short tons				
Brazil	233	64	164	323	207
Canada	862	210	80	94	162
France	9,200	10,357	7,477	11,668	12,563
Germany, West (exports)	110	154	75	62	42
Japan	1,247	1,047	1,011	904	550
Mexico ¹	13,372	18,418	16,352	14,666	16,380
Peru	433	388	572	683	685
Portugal	810	330	634	622	410
Rhodesia, Southern	204	—	1,207	605	206
Spain	435	343	234	161	158
Sweden	12,950	12,153	6,342	16,369	19,809
World totals (estimate)²	57,300	59,000	49,600	61,000	64,500

¹ Including black arsenic.

² Arsenic is also produced in Argentina, Austria, China, Czechoslovakia, Finland, East Germany, Hungary, U.S.S.R., United Kingdom and Yugoslavia but there is too little information to estimate production. Estimate is included in world total for Belgium and United States. U.S. figure withheld to avoid disclosing individual company confidential data.

Source: The "Minerals Yearbook" published by the United States Bureau of Mines.

BARITE

The producers of barite in Canada shipped 169,149 tons valued at \$1,574,398 in 1964 compared with 173,503 tons worth \$1,693,119 in the preceding year. Nova Scotia produced most of the nation's barite. The open pit operation is located near Walton at the head of the Bay of Fundy. Shipments are made by boat from Walton. In British Columbia barite was quarried at Brisco in the East Kootenay district, then shipped to a grinding plant at Lethbridge, Alberta. Shipments were made from Kootenay district to a grinding plant at Onoway, Alberta.

The principal use of barite is in oil-well drilling muds with bentonite and minor conditioning agents. Barite is used also as a pigment and filler in paints, rubber, linoleum and papers; in the manufacture of barium chemicals; as an additive to glass

batches; as an aggregate in concrete where additional weight is required (such as coatings for under water pipes), or where shielding is required against radiation such as in X-ray rooms or atomic energy plants.

Barium compounds are used widely in industry. Barium carbonate is used to reduce "dry house" scum on bricks; in pharmaceuticals; as a flux in the enamelling and ceramic trades; and in heat-treatment compounds. The chloride is used as a pigment in lithographic inks; in the purification of salt brine and in water treatment; as a mordant in dyeing textiles; and in many other applications. Other compounds include the hydrate, phosphate, oxide, sulphide, stearate and chlorate.

TABLE 18. Production of Barite, 1955 - 64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1955	253,736	2,277,166	1960	154,292	1,462,212
1956	320,835	3,031,034	1961	191,404	1,799,119
1957	228,048	2,992,913	1962	226,600	2,123,964
1958	195,719	2,196,384	1963	173,503	1,693,119
1959	228,967	2,254,582	1964	169,149	1,574,398

TABLE 19. Imports of Barite, 1963 and 1964

	1963		1964	
	Tons	Value	Tons	Value
		\$		\$
United Kingdom	—	—	—	—
Germany, West	78	3,051	95	4,158
United States	3,752	192,887	3,111	160,698
Totals	3,830	195,938	3,206	164,856

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 20. Exports of Barite, 1963 and 1964

	1963		1964	
	Tons	Value	Tons	Value
		\$		\$
Trinidad	15,680	290,080	6,048	106,560
Venezuela	3,920	33,318	8,175	69,489
United States	140,292	1,215,540	142,304	1,234,722
Totals	159,892	1,538,938	156,527	1,410,771

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

TABLE 21. Consumption of Barite, 1960 - 64

	1960	1961	1962	1963	1964
	tons				
By uses:					
Paints and varnish	902	984	1,244	1,854	1,858
Rubber goods	343	361	—	1	..
Glass	366	412	628	838	731
Oil-well drilling	23,809	17,011	19,797	14,495	14,475
Rubber tire and tube .....	..	..	..	..	1
Rubber industries .....	..	..	..	..	12

See footnote Table 13.

TABLE 22. World Production of Barite, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons ²				
North America:					
Canada	154,292	191,404	226,600	173,503	169,149
Mexico	298,458	274,153	350,684	283,246	359,372
United States	771,318	731,381	886,964	803,106	816,706
Totals	1,224,068	1,196,938	1,464,248	1,259,855	1,345,227
South America:					
Argentina	26,987	31,476	13,819	25,350	15,107
Brazil	44,464	68,834	60,241	37,601	36,968
Chile	1,991	1,551	1,156	1,123	1,203
Colombia	8,000	11,272	8,800	11,574	11,244
Peru	120,800	122,538	126,271	137,557	145,934
Totals	202,242	235,671	210,287	213,205	210,456
Europe:					
Austria (marketable)	4,829	2,716	1,192	2,395	1,390
France	116,860	95,007	92,570	820,078	92,397
Germany West (marketable)	549,134	518,951	512,231	466,419	487,884
Greece	112,203	82,673	78,712	93,696	74,957
Ireland	11,704	4,659	22	10,192	68,629
Italy	157,925	143,555	133,976	114,229	93,408
Poland	12,400 ³	41,161	49,841	50,376	50,376
Portugal	4,310	2,285	1,489	1,828	384
Spain	28,596	37,449	42,923	54,312	65,183
U.S.S.R. ²	140,000	165,000	200,000	220,000	220,000
United Kingdom ³	67,431	91,677	84,754	61,066	68,343
Yugoslavia	120,691	114,872	114,379	115,176	112,072
Totals^{1,2}	1,360,000	1,330,000	1,350,000	1,310,000	1,370,000
Africa:					
Algeria	61,564	33,883	30,404	32,421	32,665
Morocco	92,945	90,591	98,980	104,228	49,036
Rhodesia, Southern	—	—	—	1,953	1,561
South Africa, Republic of	1,878	1,962	1,873	2,704	2,835
Swaziland	200	454	68	93	17
United Arab Republic (Egypt)	2,988	1,734	1,356	4,545	6,017
Totals	159,585	128,624	132,681	145,944	142,131
Asia:					
Burma	1,792	2,248	4,462	—	—
China, mainland ²	65,000	90,000	90,000	100,000	110,000
India	14,976	17,325	36,004	41,752	50,954
Iran ⁴	14,330	20,944	16,535	16,500 ²	16,500 ²
Japan	25,184	32,243	42,016	41,360	43,810
Korea:					
North ²	45,000	60,000	65,000	75,000	75,000
South	220	772	1,014	3,040	3,024
Pakistan	709	489	3,264	5,422	13,235
Philippines	6,198	2,109	459	1,008	1,627
Turkey	1,653	—	2,094	1,081	6,669
Totals^{1,2}	175,000	226,000	261,000	285,000	321,000
Oceania:					
Australia	12,787	21,523	14,038	9,206	13,778
World totals²	3,130,000	3,140,000	3,430,000	3,220,000	3,400,000

¹ In addition to countries listed, barite is produced in Bulgaria, Czechoslovakia and East Germany but production data are not available. Estimates included in total, with the exception of Bulgaria.

² Estimate.

³ Includes witherite.

⁴ Year ended March 20, of year following that stated.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

CORUNDUM

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 were shipped from the Craigmont property to American abrasive Company, Westfield, Massachusetts, the only handler of corundum on the continent.

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 in 1961 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 economical and consequently marketable by-products would be necessary.

TABLE 23. World Production of Corundum, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons ²				
India	276	363	332	725	595
Rhodesia, Southern	3,843	2,792	3,348	5,940	2,870
South Africa, Republic of	123	159	349	79	60
World totals^{1,2}	9,000	8,000	9,000	11,000	9,000

¹ Corundum is produced in U.S.S.R., data on production are not available, and estimate is included in the total.

² Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

DIATOMITE

In 1964 the producers shipped 1,143 tons of diatomite which was valued at \$64,555. In the preceding year the production was 798 tons valued at \$26,830. All the diatomite recovered in the past three years came from deposits in British Columbia. The calcining plant in Nova Scotia was dismantled.

Diatomite, also known as diatomaceous earth and keiselguhr, consists of microscopically small, opaline silica, skeletal remains of organisms known as diatoms. The purest varieties of diatomite are chalklike in appearance, free from grit, porous, and friable and an apparent specific gravity under one when dry.

It is the physical properties of porosity and chemical inertness that account for most of the uses of diatomite. The principal uses are as a filtering medium filler, and as an insulator against heat, cold and sound. Diatomite is important in many industries, such as sugar refining, liquor distilling, dry cleaning and water purification. For filtration the important considerations are size and shape of principal diatoms present, purity, and density of the consolidated material.

Diatomite is used as a filler in rubber, paper, asphalt products, plastics, explosives, insecticides, paints, and many other products. It is used as a

concrete admixture and as the mild abrasive in metal polishes and dentifrices. Important properties of diatomite to be considered for such uses include: color, freedom from grit, low density, inertness, and particle size. Diatomite imparts bulk with little increase in weight, along with certain desirable physical properties to the end products.

It is being used successfully as insulation in a wide variety of applications, some of these being: boilers, kilns, furnaces, retorts, anens, fire-resistant safes, chill rooms, ice cellars, cold storage, and building walls. The important properties when used as insulation are porosity and structure and freedom from solid impurities.

Acceptance of diatomite by consumers depends mainly upon the physical properties of the mineral in relation to its intended use. Microscopic examination can determine, in a general way, to what uses any particular material may be put.

The major Canadian use is in the manufacture of fertilizer, where it is used to coat pellets to prevent caking and sticking. The diatomite should be uncalcined, 95 per cent minus 325-mesh, with less than 5 per cent moisture content. The next major use is in filtration in sugar and brewing industries.

TABLE 24. Producers' Shipments of Diatomite, 1965-64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1955	16	352	1960	44	1,430
1956	2	40	1961	214	8,817
1957	120	2,400	1962	211	10,228
1958	27	540	1963	798	26,830
1959	5	100	1964	1,143	64,555

TABLE 25. Imports of Diatomaceous Earth, 1963 and 1964

Imported from	1963		1964	
	Tons	Value	Tons	Value
		\$		\$
United States	26,612	1,406,073	25,089	1,349,330
Totals	26,612	1,406,073	25,089	1,349,330

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 26. Consumption of Infusorial Earth in the Sugar Refining Industry, 1955-64

Year	Tons	Value	Year	Tons	Value
		\$			\$
1955	2,094	158,960	1960	2,218	191,213
1956	2,196	165,026	1961	2,089	188,703
1957	2,260	174,677	1962	2,093	188,850
1958	1,965	164,382	1963	2,317	219,089
1959	2,113	167,117	1964	2,243	221,620

See footnote Table 13.

TABLE 27. Consumption of Diatomaceous Earth in the Manufacture of Fertilizers, 1960-64

Year	Tons	Value
		\$
1960	15,984	649,639
1961	11,575	664,021
1962	12,086	717,663
1963	15,771	780,306
1964	12,387	758,742

See footnote Table 13.

TABLE 28. World Production of Diatomite, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada.....	44	214	211	798	1,143
Costa Rica.....	2,425	717	827	2,000 ²	4,000 ²
Nicaragua.....	2,249	2,976	1,414	1,760 ²	—
United States.....	482,202	482,208 ³	482,208 ³	580,278 ⁴	580,278 ⁴
South America:					
Argentina.....	117	3,833	3,741	6,256	8,567
Columbia.....	440	330	165	2,425	255
Peru.....	1,127	2,048	1,624	2,733	2,756
Europe:					
Austria.....	4,431	5,993	4,613	4,339	4,224
Denmark:					
Diatomite ²	17,600	21,500	22,000	22,000	20,393
Moler ^{2,5}	204,300	212,900	230,800	212,000	210,762
Finland.....	1,457	805	1,320	2,535	2,392
France ⁶	140,468	118,429	140,093	146,304	146,600 ²
Germany, West ⁶ (marketable).....	51,138	72,200	67,800	47,289	109,356
Italy.....	51,888	63,050	62,379	65,509	66,140 ²
Portugal ⁶	1,172	847	1,598	2,067	2,207
Spain.....	13,840	19,346	13,352	11,229	11,000 ²
Sweden ⁷ (marketable).....	472	732	252	400	220
U.S.S.R. ²	300,000	330,000	330,000	340,000	340,000
United Kingdom.....	16,553	24,920	22,412	15,946	16,540 ²
Yugoslavia.....	5,000 ²	5,000 ²	5,000	11,600 ²	11,600 ²
Africa:					
Algeria.....	24,266	35,213	30,565	19,401	22,489
Kenya.....	3,791	3,537	3,207	3,677	3,368
Mozambique.....	103	397	385	—	—
Rhodesia, Southern ⁶	164	409	423	301	347
South Africa, Republic of.....	346	137	647	220	546
United Arab Republic (Egypt).....	805	332	55	916	44,080
Asia:					
Korea, South.....	2,646	1,989	758	1,916	41,031
Oceania:					
Australia.....	5,218	6,067	8,189	6,533	9,780
New Zealand.....	6,992	3,961	2,099	1,796	1,881
World totals.....	1,550,000	1,645,000	1,665,000	1,740,000	1,890,000

¹ Diatomaceous earth is produced also in Brazil, Bulgaria and Japan, but complete data are not available: estimates included in total. Hungary and Rumania may produce diatomaceous earth but data are not available and no estimates are included in total.

² Estimate.

³ Average annual production 1960-62.

⁴ Average annual production 1963-65.

⁵ Data represents estimates of moler earth used as a raw material in making refractory bricks plus moler earth exported in bulk form.

⁶ Includes tripoli.

⁷ Includes calcined.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

FLUORSAPAR

During 1964 the value of fluorspar shipped amounted to \$2,258,796 compared with \$1,976,006 worth in the preceding year. Fluorspar is mined in Newfoundland and is produced as a by-product from a silica deposit in British Columbia. The Ontario mines did not operate in 1963.

In Canada fluorspar is consumed chiefly by the aluminum industry. The fluorspar is used to make

hydrofluoric acid, which in turn is used to make a flux (artificial cryolite). The flux, together with a small amount of fluorspar, dissolves alumina, and from this solution aluminum is recovered electrolytically. Fluorspar finds its other major use as a flux in the steel industry. In smaller but increasing amounts, fluorspar is used in the heavy-chemical, glass, enamelling, glazing, white-metal alloy and metal refining industries.

In the United States the largest consumer is the steel industry, which is followed by the hydrofluoric acid manufacturers. Hydrofluoric acid is used in large amounts by the aluminum, fluorine, chemical and uranium industries. It is worth noting that despite the steel-production increase of recent years, the rate of fluorspar consumption is growing faster in the manufacture of hydrofluoric acid than in the use of fluorspar as a flux in steel plants.

Standard fluxing gravel or lump grade for metallurgical purposes is usually sold on a specification of a minimum of 85 per cent CaF_2 and a maximum

of 5 per cent SiO_2 (silica) and 0.3 per cent sulphur. Fines should not exceed 15 per cent.

Ceramic or glass and enamel grades call for not less than 94 per cent CaF_2 with a maximum 3.5 per cent CaCO_3 (calcium carbonate), 3 per cent SiO_2 and 0.1 per cent Fe_2O_3 (ferric oxide). The material must be in mesh sizes ranging from coarse to extra fine.

Acid grade has the most rigid specifications. It must be over 97 per cent CaF_2 and not over 1 per cent SiO_2 . Like ceramic grade, it is used in powdered form.

TABLE 29. Production of Fluorspar, 1955-64

Year	Short tons	Selling value f.o.b. works	Year	Short tons	Selling value f.o.b. works
		\$			\$
1955	128,114	2,708,437	1960 .....	..	1,921,820
1956	140,071	3,407,582	1961 .....	..	1,990,200
1957	140,071	1,756,841	1962 .....	..	1,870,184
1958	140,071	1,542,589	1963 .....	..	1,976,006
1959	140,071	1,850,497	1964 .....	..	2,258,796

TABLE 30. Imports of Fluorspar, 1955-64

Year	Tons	Value	Year	Tons	Value
		\$			\$
1955	21,774	518,002	1960	59,690	1,286,107
1956	28,148	690,779	1961	32,769	914,221
1957	14,547	377,706	1962	67,847	2,052,056
1958	30,408	763,438	1963	66,798	1,946,257
1959	26,588	718,774	1964	69,986	2,060,677

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 31. Consumption of Fluorspar, 1960-64

	1960	1961	1962	1963	1964
	tons				
By uses:					
Steel	21,029	24,310	33,824	41,822	41,533
Glass	733	739	1,157	1,968	2,744
Heavy chemicals	87,186	6,150	7,848	8,982	11,246
Smelting and refining	1	77,874	78,034	84,995	65,104
Totals accounted for	108,948	109,073	120,863	137,767	120,627
By provinces:					
Nova Scotia	6,592	5,084	6,060	7,880	6,882
Quebec	86,125	82,945	83,718	92,849	75,866
Ontario	15,420	19,987	30,028	35,215	36,526
Manitoba and Saskatchewan	291	442	317	324	332
Alberta	379	271	400	693	489
British Columbia	141	344	340	806	532
Totals accounted for	108,948	109,073	120,863	137,767	120,627

¹ Included in heavy chemicals industry.

See footnote Table 13.

TABLE 32. World Production of Fluorspar, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada ²	77,000	80,000	75,000	85,000	96,000
Mexico	404,487	440,286	553,642	530,893	708,644
United States (shipments)	229,782	197,354	206,026	199,948	217,137
South America:					
Argentina	13,748	11,325	13,799	10,761	10,994
Europe:					
France	149,345	214,936	154,064 ³	160,307 ³	215,119 ³
Germany:					
East ²	80,000	80,000	80,000	80,000	80,000
West ³	143,474	133,515	116,592	95,843	86,098
Italy	178,957	172,582	176,709	148,407	136,724
Spain ³	122,377	161,954	165,356	169,094	164,995
Sweden (sales)	3,212	3,542	3,855	3,253	3,300 ²
United Kingdom	109,249	99,868	79,525	84,878	131,175
Africa:					
Morocco	—	869	546	7,000	7,242
Rhodesia, Southern	19	—	20	343	77
South Africa, Republic of	113,550	95,862	111,683	57,761	66,431
South-West Africa	—	—	240	480	—
Tunisia	—	—	—	—	—
Asia:					
China, mainland ²	275,000	220,000	220,000	220,000	220,000
Japan	10,108	16,326	17,120	23,037	21,078
Korea, North ²	33,000	33,000	33,000	33,000	33,000
Korea, South	20,834	31,790	36,343	43,855	62,167
Mongolia	44,400	42,000	41,800	54,000	62,800 ²
Thailand	3,814	5,241	11,806	32,221	70,039
Turkey	359	42	640	719	1,436
U.S.S.R. ^{2,5}	210,000	230,000	265,000	300,000	330,000
Oceania:					
Australia	8	—	—	17	—
World totals ^{1,2}	2,230,000	2,275,000	2,370,000	2,350,000	2,730,000

¹ Fluorspar is produced in Bulgaria. Estimates are included in the total.² Estimate.³ Marketable.⁴ Includes fluorspar recovered from old lead and zinc mine dumps.⁵ U.S.S.R. in Europe included in U.S.S.R. in Asia as deposits are predominantly in Asiatic Russia.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

GARNET

The garnet deposit near River Valley, Ontario was not operated by Industrial Garnet Co. Ltd. The garnets which were mined in the earlier years were used as abrasives for cutting granite building stone as the firm's other stone plants.

The garnet group of minerals are aluminum silicates containing variable amounts of iron, magnesium, manganese calcium and chromium. They are

common constituents of many rocks, particularly metamorphic types, and some beach sands.

Garnet is used for making abrasive-coated papers and cloth, which in turn are used mainly in the wood-working and shoe-leather industries. Garnet flour of superfine grade is used as a partial substitute for corundum flour for polishing optical lenses.

GEM STONES

Jade boulders were found in the alluvial deposits in the Lillooet, the Omineca and the Laird Mining Divisions of British Columbia. These nephrite

boulders were cut and the pieces shipped to the jewellery industry.

TABLE 33. Producers' Shipments of Gem Stones (Jade) 1959 - 64

Year	Pounds	Value
1959	15,000	5,000
1960	50,300	10,325
1961	69,751	20,876
1962	56,935	20,760
1963	16,000	15,529
1964	11,537	13,804

GRAPHITE

There were no shipments of graphite during the year. With the exception of 1961 there have been no shipments since 1954 when the Black Donald mine closed in Renfrew county, Ontario.

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 flake. American imports by Canadian graphite are used chiefly in foundry facings, lubricants and pencils.

TABLE 34. Producers' Shipments of Graphite, 1948 - 64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1948	2,539	239,931	1953	3,466	366,528
1949	2,147	212,496	1954	2,463	254,534
1950	3,586	390,815	1955-60	—	—
1951	1,569	231,167	1961	1	146
1952	2,040	255,732	1962-64	—	—

TABLE 35. Imports and Exports of Graphite,¹ 1962-64

	1962	1963	1964
	dollars		
Imports:			
Plumbago, not ground	58,351	86,991	...
Crucibles, plumbago and covers	254,447	284,206	244,643
Plumbago, ground and manufactured, n.o.p.	1,362,492	2,353,816	...
Exports:			
Graphite, crude and refined	—	—	...
Carbon and carbon electrodes	328,425	400,831	1,202,368

¹ Includes artificial graphite.

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007 and "Exports by Commodities", Catalogue No. 65-004.

TABLE 36. Available Data on the Consumption of Graphite, 1960-64

	1960	1961	1962	1963	1964
	pounds				
By industries:					
Paints	82,400	53,385	48,577	60,722	46,645
Copper and alloy	49,577	58,711	94,421	119,445	139,941
Electrical apparatus	341,633	...	...	...	...
Industrial chemicals	1,239,385	657,355	651,047	955,130	1,544,005
Boilers and platework	20,166	19,317	1,330	1,219	1,462
Iron and steel mills	2,358,000	1,424,000	1,944,000	2,660,000	2,506,000
Agricultural implements	4,370	7,400	800	1,950	1,450
Railroad rolling stock	49,212	44,600	23,849	8,000	6,209
Machinery, office and store	200	—	—	—	—
Iron foundries	726,845	790,127	738,664	789,671	1,045,821
Heating equipment	1,900	12	200	240	306
Refractories	400,000	372,000	328,000	372,000	486,000
Electrical industrial equipment .....	...	...	—	1,005	150
Batteries .....	...	299,115	503,157	316,039	217,696
Miscellaneous non-metallics	124,445	3,225	—	—	—
Miscellaneous metal fabricating	512,205	648,118	733,807	880,600	694,110
Motor vehicle parts	261,288	330,900	413,900	430,500	622,700
Communications equipment	2,665	1,054	540	262	525
Miscellaneous machinery and equipment	205,491	385,868	309,923	612,625	504,652
Miscellaneous electrical equipment .....	...	150	50	736,343	864,898
Miscellaneous chemicals	1,350	2,725	—	—	...
Truck body and trailer .....	...	1,300	—	—	—
Smelting and refining .....	..	..	172,644	169,206	138,398
Totals for above industries	6,381,132	5,099,362	5,964,909	8,114,957	8,820,968
By provinces:					
Newfoundland	54,516	11,809	9,120	21,384	23,375
Nova Scotia					
New Brunswick					
Quebec	2,003,638	1,530,345	1,769,120	2,835,867	2,690,433
Ontario	3,820,453	3,070,985	3,767,981	4,460,073	5,243,349
Manitoba	156,856	89,253	108,067	76,288	31,979
Saskatchewan	35,110	136,159	1,954	1,650	8,752
Alberta	204,975	180,654	188,236	414,391	237,771
British Columbia	105,584	80,157	120,431	305,304	585,309
Totals accounted for	6,381,132	5,099,362	5,964,909	8,114,957	8,820,968

See footnote Table 13.

TABLE 37. World Production of Natural Graphite, by Countries

Country ¹	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada.....	—	1	—	—	—
Mexico.....	37,827	19,846	31,992	33,065	33,441
South America:					
Argentina.....	538	869	522	306	171
Brazil.....	1,430	1,593	1,775	6,640	5,150
Europe: ¹					
Austria.....	97,043	89,255	98,416	109,778	112,697
Germany, West.....	12,760	13,349	13,134	14,110	14,793
Italy.....	4,098	4,485	3,327	2,053	1,443
Norway.....	6,437	6,300	7,222	8,400	8,350
Spain.....	288	303	—	—	—
Sweden.....	—	—	—	—	—
U.S.S.R. ²	50,000	55,000	60,000	60,000	60,000
Africa:					
Kenya.....	1,113	—	—	—	—
Malagasy Republic.....	15,923	16,473	19,274	21,214	14,521
South Africa, Republic of.....	894	963	1,308	671	1,042
South West Africa.....	—	—	—	—	275
Tanganyika.....	26	—	—	—	—
Asia:					
Ceylon (exports).....	10,107	10,015	9,665	9,280	11,957
China ² mainland.....	45,000	45,000	45,000	45,000	45,000
Hong Kong.....	4,255	1,865	902	891	795
India.....	²	1,830	²	²	²
Japan.....	4,979	3,836	3,812	3,305	2,700
Korea:					
North ²	68,000	72,000	72,000	77,000	77,000
South.....	101,777	98,892	204,032	374,428	291,515
Taiwan.....	551	882	880	—	—
World totals (estimate) ¹	480,000	455,000	590,000	785,000	700,000

¹ Graphite has been produced in Czechoslovakia but production data are not available; estimates included in total. U.S. figure withheld to avoid disclosing individual company confidential data, included in world total.

² Estimate, included in total.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

GRINDSTONES, PULPSTONES AND SCYTHESTONES (Natural)

Sandstone beds in Nova Scotia, New Brunswick and British Columbia contain material suitable for grindstones. The output is only from the New Brunswick coast where the stones are removed along the shore area of the Bay of Chaleur. This operation is carried on intermittently. No shipments were made

in 1964 but in preceding years of 1960 to 1963 the annual shipments were 10 tons valued at \$2,000. There were 60 tons of grindstones valued at \$9,000 in 1959. Prior to 1959 there had been no shipments of grindstones since 1955.

TABLE 38. Production of Grindstones, Pulpstones and Scythestones, 1953-64

Year	Tons	Value	Year	Tons	Value
		\$			\$
1953	15	900	1960	10	2,000
1954	—	—	1961	10	2,000
1955	10	1,500	1962	10	2,000
1956-58	—	—	1963	10	2,000
1959	60	9,000	1964	—	—

IRON OXIDES (Natural)

Iron oxide pigments are used also as colouring agents and fillers in the manufacture of imitation leather, shade cloth, shingle stain, paper and cardboard. Siennas and umbers are used in wood stains and wood fillers. The natural ochre is used as a pigment for linoleum and oilcloth; as a pigment in wood stains and wood fillers; and in colouring cement, stuccos and mortar.

Canadian producers of ochreous iron oxides shipped 1,033 tons valued at \$79,250 in 1964 com-

pared with 978 tons worth \$74,505 in 1963. In 1964 the major portion of the shipments was a higher grade milled calcined material.

The ochreous iron oxide used in the manufacture of paints is largely in the calcined form. However, a small quantity of natural iron oxides associated with clay-like materials in the form of umbers and siennas is also used as pigments in paints, both in the raw and calcined state.

TABLE 39. Production of Natural Iron Oxides, 1955-64

Year	Quantity	Value	Year	Quantity	Value
	short tons	\$		short tons	\$
1955	7,702	162,512	1960	909	76,780
1956	8,803	186,225	1961	808	68,199
1957	7,518	187,211	1962	771	58,363
1958	1,632	113,390	1963	978	74,505
1959	1,235	108,286	1964	1,033	79,250

TABLE 40. Imports and Exports of Ochres and Colours, 1963 and 1964

	1963		1964	
	Quantity	Value	Quantity	Value
	tons	\$	tons	\$
Imports:				
Orange and yellow pigments	539	1,110,314	528	1,036,285
Pigments color lakes, toners, n.o.p.	912	1,089,522	1,795	1,896,276
Exports:				
Iron oxides	2,219	432,158	2,408	473,633

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007 and "Exports by Commodities", Catalogue No. 65-004.

TABLE 41. Consumption of Iron Oxides in Paints and Varnishes, 1960-64

	Paints and varnishes			
	Iron oxide pigments		Ochres, siennas and umbers	
	Quantity	Value	Quantity	Value
	tons	\$	tons	\$
1960	1,858	440,614	150	48,241
1961	1,755	434,206	130	45,481
1962	1,955	469,534	150	56,025
1963	2,009	520,010	168	74,478
1964	2,178	583,526	191	76,042

LITHIA

During 1964 the producers of lithia shipped 1,056,408 pounds valued at \$1,155,282 compared with 644,354 pounds worth \$682,029 in 1963. These figures on quantities are the lithia or lithium oxide content of spodumene concentrates exported for processing and of lithium compounds. The Quebec Lithium Corporation operated the chemical plant which produced lithium carbonate and other lithium chemicals. The mine, mill and chemical plants are located at Barraute, Quebec.

Lithium compounds find their most important applications in the ceramic industry and in the manufacture of lubricating greases. Practically all lithium concentrates are converted chemically to lithium carbonate or hydroxide, the usual basic compounds used in industry. For chemical processing, the only specification available is for the spodumene that Quebec Lithium Corporation is exporting. Four and a half per cent lithia is required as a minimum in the concentrate. However, practically all producers of lithium compounds either own or have a share in mining properties from which they obtain concentrates; standard specifications have, therefore, not been established and grades are a matter of individual negotiation.

Lithium greases, first evolved in 1943, came to play an important role in lubrication wherever operational extremes of temperature were experienced, as they maintain their lubricating qualities between -60° and $+320^{\circ}\text{F}$ and, moreover, have excellent water-insolubility characteristics. In wartime, lithium greases were invaluable for aircraft engines. Since the war their industrial use has grown rapidly, as their unique properties make possible the production of multi-purpose greases, simplifying both manufacture and application.

In ceramics, lithia serves primarily as a flux, permitting the development of low-temperature ceramic bodies with the attendant benefits of refractoriness, fuel economies and wider colour use. It also makes possible the production of glass transparent to ultraviolet light for use in germicidal

lamps. Lithium compounds reduce the maturing temperature and increase the fluidity and gloss of glass, glazes and enamels, facilitate production of certain glasses of high electrical resistance and have many other desirable effects that render them of great benefit in the field of ceramics.

Lithium as a metal has so far had limited application. Its principal use appears to be as a scavenger of impurities in refining non-ferrous metals and as a grain-refining agent. Only very small amounts are added for these purposes. Lithium alloys of magnesium, aluminum, copper, lead and zinc are under development and have promise. The Aluminum Company of America announced during the year the development of a lithium-aluminum alloy which will maintain high strength up to 400°F .

The use of lithium in nuclear-energy production and as a source of fuel for rockets and guided missiles has received much publicity, and speculation as to its exact function has been widespread. Little information is available in either case, but from scientific publications it has become generally known that tritium, a reported constituent of the hydrogen bomb, is obtained by bombarding the lithium-6 isotope with neutrons. The association of lithium with solid fuels is in the form of lithium hydride. The chemical compound furnishes a readily available source of hydrogen, which is a high-energy fuel.

Other common applications include the use of lithium hydroxide as a constituent of the electrolyte in alkaline storage batteries; of lithium chloride and bromide in air-conditioning units, and in refrigeration systems; of lithium fluoride as a flux in the welding and brazing of aluminum; and of compounds in the production of single-crystal optical units, in the control of reactions leading to the formation of alkyd resins for use in paints and in the manufacture of dry-cell batteries which will function at extremely low temperatures where normal cells are inoperative.

TABLE 42. Producers' Shipments of Lithia, 1956-64

Year	Pounds	Value
		\$
1956	4,789,380	2,643,950
1957	5,140,257	2,827,143
1958	3,853,322	2,047,880
1959	2,756,280	1,422,153
1960	204,666	84,135
1961	536,190	392,871
1962	499,736	558,634
1963	644,354	682,029
1964	1,056,408	1,155,282

TABLE 43. World Production of Lithium Minerals, by Countries

Country	Mineral produced	1960	1961	1962	1963	1964
short tons						
North America:						
Canada ¹	Spodumene	103	268	250	322	528
United States	Lithium minerals					
South America:						
Argentina	Lithium Minerals	153	443	496	1,583	799
Brazil	Spodumene (exports)	—	—	165	28	—
.....	Amblygonite (exports)	55	—	—	—	—
Surinam	Amblygonite	—	475	827	568	..
Europe:						
Spain	Amblygonite	29	19	—	—	—
Africa:						
Mozambique	Lepidolite	—	170	302	115	—
Rhodesia, Southern	Eucryptite	1,334	1,879	866	1,164	806
.....	Amblygonite	..	86	35	52	—
.....	Lepidolite	15,485	24,037	21,244	16,157	22,943
.....	Petalite	63,335	27,698	21,704	29,946	36,449
.....	Spodumene	7,690	1,627	1,496	2,235	6,965
Rwanda	Amblygonite	2,569	1,854	359	406	325
South Africa, Republic of	Lithium minerals	173	260	1,263	417	179
South-West Africa	Amblygonite	161	136	141	128	12
.....	Lepidolite	972	1,418	1,781	86	407
.....	Petalite	3,909	2,540	1,008	865	798
Uganda	Amblygonite	—	25	22	53	22
Oceania:						
Australia	Petalite	1	108	94	437	233
.....	Amblygonite	17	26	31	22	—
.....	Spodumene	—	6	26	24	58

¹ Tons of lithia in spodumene concentrates.² Figure withheld to avoid disclosing individual company confidential data.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MAGNESITE AND BRUCITE

Magnesitic dolomite is mined at Kilmar, Argenteuil county, Quebec, by Canadian Refractories Limited, and is processed there into basic refractory products. These include dead burned grain material, bricks and shapes (burned and unburned), and finely-ground refractory cements.

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 there for the recovery of magnesia and lime. A minor portion of the magnesia was formerly used by the company to make magnesium metal at Arvida, Quebec. The magnesium plant is now closed. Most of the magnesia output is sold for the manufacture of basic refractories, but some is used as a soil conditioner. 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.

TABLE 44. Production of Magnesitic Dolomite, 1955-64

Year	Value	Year	Value
	\$		\$
1955	2,151,820	1960	3,279,021
1956	2,783,181	1961	3,064,403
1957	3,046,298	1962	3,431,873
1958	2,529,161	1963	3,439,890
1959	3,050,779	1964	3,569,619

Note: Above figures include the value of brucite shipped, dead burned magnesitic dolomite and serpentine used or sold.

TABLE 45. Magnesite and Dolomite Used in the Canadian Primary Iron and Steel, 1959-64

Year	Calcined dolomite		Dolomite, crude		Magnesite	
	Short tons	Value \$	Short tons	Value \$	Short tons	Value \$
1959	90,403	2,351,634	331,398	961,531	9,626	662,193
1960	83,121	2,162,556	500,687	1,326,958	10,551	725,458
1961	82,565	2,112,961	604,074	1,273,530	8,138	560,650
1962	90,269	2,315,866	667,613	1,257,587	15,320	1,029,598
1963	100,415	2,565,130	663,560 ^r	1,280,350 ^r	13,588	966,958
1964	103,609	2,634,998	729,514	1,414,819	14,600	980,599

TABLE 46. World Production of Magnesite, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons				
North America:					
United States	498,528	603,656	492,471	527,655	²
South America:					
Brazil	69,793	84,549	103,348	99,536	103,331
Colombia	—	110	110	276	243
Europe:					
Austria	1,791,701	1,982,704	1,771,863	1,447,099	1,826,058
Czechoslovakia ³	470,000	550,000	580,000	580,000	580,000
Greece	206,451	163,573	299,789	275,000 ³	220,000 ³
Italy	6,584	7,478	9,275	7,512	6,954
Norway	—	—	—	—	—
Poland	23,900	29,873	37,589	29,321	²
Spain	53,239	91,702	78,691	93,315	102,874
U.S.S.R. ³	2,650,000	2,760,000	2,760,000	2,980,000	3,090,000
Yugoslavia	277,613	301,002	411,561	454,107	548,311
Africa:					
Kenya	33	1,930	—	288	187
Rhodesia, Southern	8,031	13,880	11,619	12,077	42,410
South Africa, Republic of	66,793	67,732	102,352	108,309	93,443
Tanganyika (exports)	126	46	—	94	546
Asia:					
China, mainland ³	1,100,000	770,000	880,000	990,000	1,100,000
India	172,325	231,203	234,669	258,564	228,985
Korea North ³	55,000	220,000	550,000	880,000	990,000
Pakistan	486	180	336	968	680
Turkey	17	2,414	10,736	19,750	43,065
Oceania:					
Australia	69,626	110,651	69,654	63,780	35,001
New Zealand	891	650	711	875	676
World totals³	7,850,000	8,300,000	8,750,000	9,200,000	10,025,000

¹ Quantities in this table represent crude magnesite mined. Magnesite is also produced in Canada and Bulgaria, but data on tonnage output are not available; estimates included in total.

² Data not available; estimates included in total.

³ Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MAGNESIUM SULPHATE (Natural)

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 salts 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 47. Imports of Magnesium Sulphate, 1955-64

Year	Tons	Value	Year	Tons	Value
		\$			\$
1955	2,376	69,009	1960	2,434	63,998
1956	2,614	69,517	1961	2,591	69,524
1957	2,558	71,295	1962	2,806	81,389
1958	2,453	71,209	1963	3,361	88,348
1959	2,721	70,697	1964 .....	..	..

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 48. Available Data on Consumption of Magnesium Sulphate, 1960-64

Industry	1960	1961	1962	1963	1964
	tons				
Leather tanneries	355	431	412	436	397
Medicinals	501	572	571	408	513
Fertilizers	130	162	40	131	85
Textiles	—	—	—	—	—
Totals accounted for	986	1,165	1,023	975	995

MICA

Amber mica or phlogopite is mined in Quebec and Ontario. The major portion of the output is derived from Quebec mines. Muscovite production

is from Ontario mines. The mica obtained from the schist rock in British Columbia is included for statistical purposes in the muscovite class.

TABLE 49. Mica Production (Primary Sales), by Classes, 1963 and 1964

Grade	1963		1964	
	Pounds	Total value f.o.b. shipping point	Pounds	Total value f.o.b. shipping point
		\$		\$
Rough, mine-run or rifted	12,021	1,390	—	—
Mica sold for mechanical splitting	—	—	68,100	14,820
Splittings	—	—	—	—
Ground or powdered	813,935	36,759	615,968	27,659
Scrap, mine or shop waste and mica mined and sold, for grinding	352,850	3,529	493,640	7,867
Trimmed mica	4,235	2,606	20,454	35,679
Unspecified	—	—	—	—
Totals, mica shipments	1,183,041	44,284	1,198,162	86,025
Varieties:				
Phlogopite mica (amber) and biotite	1,182,041	42,684	1,198,114	85,942
Muscovite mica (white) and schist	1,000	1,600	48	83

TABLE 50. Production of Mica, by Provinces and by Varieties, 1964

Province	Phlogopite and biotite		Muscovite and schist		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Quebec	765,814	79,608	—	—	765,814	79,608
Ontario	432,300	6,334	48	83	432,348	6,417
Totals, Canada	1,198,114	85,942	48	83	1,198,162	86,025

TABLE 51. Production of Mica, 1955-64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1955	820	77,541	1960	856	94,203
1956	922	95,666	1961	908	125,377
1957	641	111,583	1962	602	84,598
1958	752	89,651	1963	592	44,284
1959	407	63,004	1964	599	86,025

TABLE 52. Imports and Exports of Mica, 1962-64

	1962		1963		1964	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Imports:						
Mica, unmanufactured	2,306,300	286,047	1,737,600	333,458	...	...
Mica, fabricated, n.e.s. ....	...	439,069	...	642,695	...	741,605
Mica, rough, scrap or schist .....	...	...	...	...	544,000	18,878
Mica, blocks, sheets and ground mica .....	...	...	...	...	5,340,000	568,083
Exports:						
Mica, rough, scrap and schist	97,900	30,355	..	..	..	..
Mica, fabricated	102,300	64,463	..	..	..	..
Totals, mica exports reported .....	...	94,818	..	..	..	..

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007 and "Exports by Commodities", Catalogue No. 65-004.

TABLE 53. Consumption of Mica, in Specified Industries, 1960-64

	1960	1961	1962	1963	1964
	pounds				
By industries:					
Paints	2,364,002	2,428,880	1,780,195	1,938,765	2,071,989
Rubber tire and tube .....	...	...	...	...	542,815
Rubber footwear	824,556	483,729	6,524	7,123	273
Rubber industries .....	..	..	..	..	93,097
Roofing	204,000	658,000	42,000	38,000	456,000
Non-metallic mineral products	60,000	45,000	150,000	213,000	257,921
Small electrical appliances	30,200	1,200	120,000	54,770	32,673
Major appliances	64,034	120,018	250,000	255,000	240,000
Communications equipment	1,034	12,384	18,141	4,150	4,120
Electrical industrial equipment	195,831	56,912	87,239	390,728	459,945
Electrical wire and cables	14,480	11,830	7,400	13,900	1,250
Miscellaneous electrical products .....	...	1,500	4,000	8,000	40,400
Totals accounted for	3,758,137	3,819,453	2,465,499	2,923,436	4,200,483
By provinces:					
Quebec, Nova Scotia and Newfoundland	1,453,869	1,482,932	1,307,237	1,469,183	1,453,279
Ontario	1,515,780	1,064,183	985,910	1,271,958	1,965,249
Manitoba	54,467	54,622	60,830	54,217	70,887
Alberta	390,436	855,524	42,000	42,000	624,257
British Columbia	343,585	362,192	69,522	86,078	86,811
Canada	3,758,137	3,819,453	2,465,499	2,923,436	4,200,483

See footnote Table 13.

TABLE 54. World Production of Mica by Countries¹

Country ¹	1960	1961	1962	1963	1964
thousands of pounds					
North America:					
Canada (shipments):					
Block	175	155	132	16	89
Splittings	—	22	—	—	—
Ground	792	1,434	610	814	616
Scrap	735	205	456	353	494
United States (sold or used by producers):					
Sheet	587	526	363	103	243
Scrap	195,824	198,088	215,404	218,646	229,458
South America:					
Argentina:					
Sheet	190	121	108	196	701
Brazil	4,440	9,101	3,885	3,289	3,241
Europe:					
Austria ²	317	194	33	—	—
France	686	304	190	381	646
Germany, West	22	18	20	11	18
Norway, including scrap	6,400	7,700	2,200	—	8,800
Sweden (ground)	348	110	126	44	—
Yugoslavia	4	4	4	77	26
Africa:					
Angola:					
Sheet	26	4	—	—	—
Scrap and splittings	721	51	108	—	—
Kenya	2	—	2	2	—
Malagasy Republic (phlogopite):					
Block	256	223	181	214	205
Splittings	1,973	2,002	2,780	1,914	1,299
Rhodesia, Southern:					
Block	90	64	33	60	75
Crude and scrap	754	101	172	225	157
South Africa, Republic of:					
Sheet	2	2	2	40	104
Scrap	6,710	5,440	4,900	4,680	6,764
South West Africa	—	—	150	1,197	831
Tanzania (exports):					
Sheet	179	196	218	236	212
Scrap	—	—	—	—	324
Asia:					
India (exports):					
Block	5,216	4,592	4,396	3,979	4,264
Splittings	17,469	18,208	18,838	15,595	19,378
Scrap	42,829	35,355	45,523 ⁴	55,547 ⁴	42,256 ⁴
Oceania:					
Australia:					
Block	9	—	—	—	—
Scrap	648	185	—	—	—
Damourite	1,252	1,138	1,087	1,100	1,270
World totals ^{1,5}	365,000	365,000	390,000	400,000	410,000

¹ Mica is also produced in China, Rumania and U.S.S.R., but data on production are not available; estimates are included in total.

² Including reclaimed from dumps.

³ Less than 500 pounds.

⁴ Includes condenser film as follows: 1962, 412,000 pounds; 1963, 234,000 pounds; 1964, 198,000 pounds.

⁵ Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

PERLITE

Perlite is a volcanic glass characterized by a concentric "onion skin" fracture and usually a 2 to 5 per cent water content. When heated rapidly in a furnace it expands into a frothy material of low density.

Commercially-expanded perlite is granular material and is generally white. Because of its cellular nature it is light in weight and has good insulating and sound-proofing qualities. Expanded perlite is used chiefly in lightweight concrete aggregates, insulating and sound-proofing pre-cast wallboard, and in lightweight plaster. A sack of

expanded perlite containing 3 cubic feet weighs approximately 30 to 36 pounds.

Development work has been done on deposits of perlite at Francois Lake, British Columbia, about eighteen miles by road from Burns Lake on the C.N.R. Other deposits have been found in British Columbia at Empire Valley northwest of Clinton.

Shipments of 1,112 tons of perlite valued at \$11,120 were made from the British Columbia deposits to the expanding plant of Western Gypsum Products Ltd., Calgary, Alberta, during 1953. There was no production reported since.

PHOSPHATE

Phosphate in the form of apatite was mined in Canada on a fairly substantial scale up to 1895, but since then the production has been small and spasmodic. In 1951, about 6 tons were shipped but there were no shipments in subsequent years.

For many years, the Electric Reduction Company Limited, Buckingham, Quebec, has purchased most of the small output for use in the production of

elemental phosphorus and various phosphorous compounds. This 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.

TABLE 55. Production of Phosphate Rock, 1943-64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1943	1,451	18,385	1948	—	—
1944	482	6,716	1949	20	291
1945	299	4,356	1950	129	1,070
1946	57	869	1951	6	94
1947	—	—	1952-64	—	—

TABLE 56. Imports of Phosphate Rock, 1955-64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1955	588,209	4,512,833	1960	941,998	8,320,129
1956	627,648	5,185,597	1961	1,056,885	9,678,644
1957	723,220	5,897,784	1962	1,155,966	10,842,509
1958	744,164	6,854,243	1963	1,297,427	12,203,728
1959	747,068	7,468,368	1964	1,406,424	11,719,401

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 57. Consumption of Phosphate Rock, 1960-64

	1960	1961	1962	1963	1964
	tons				
By uses:					
Fertilizers, mixed	157,421	239,408	339,509	400,217	532,759
Chemicals	731,164	747,920	752,796	781,427	908,695
Feed manufacturers	29,649	33,236	34,659	30,325	37,951
Totals	918,234	1,020,564	1,126,964	1,211,969	1,479,405
By provinces:					
Newfoundland	221	416	356	773	947
Prince Edward Island					
Nova Scotia					
New Brunswick	1,030	1,241	1,367	1,587	2,305
Quebec	219,891	223,120	235,502	251,742	255,353
Ontario	118,951	186,358	288,046	352,031	474,800
Manitoba	1,220	2,007	2,231	2,093	2,608
Saskatchewan	706	968	995	961	967
Alberta	157,814	174,904	176,574	179,378	185,551
British Columbia	418,401	431,550	421,893	423,404	556,874
Canada	918,234	1,020,564	1,126,964	1,211,969	1,479,405

See footnote Table 13.

TABLE 58. World Production of Phosphate Rock, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	thousand long tons				
North America:					
Mexico	27	29	30	30	27
United States	17,516	18,559	19,382	19,855	22,960
Netherlands Antilles (exports)	113	150	129	126	118
Totals	17,656	18,738	19,541	20,011	23,105
South America:					
Brazil:					
Apatite	200	240	305	212	192
Phosphate rock	666	409	251	63	50
Chile:					
Apatite	17	14	12	14	13
Guano	18	19	16	22	15
Peru:					
Guano	155	157	203	189	202
Venezuela .....	..	..	..	—	—
Totals	1,056	839	787	501	472
Europe:					
Belgium	8	14	12	13	22
France	57	80	66	50	42
Poland	40	46	55	64	88
Spain	3	—	—	—	—
U.S.S.R.:					
Apatite ²	4,630	5,510	6,500	6,890	7,870
Sedimentary rock ²	2,260	3,150	3,350	3,940	4,920
Totals	7,000	8,800	9,980	10,960	12,940

See footnotes at end of table.

TABLE 58. World Production of Phosphate Rock, by Countries¹ - Concluded

Country ¹	1960	1961	1962	1963	1964
	thousand long tons				
Africa:					
Algeria	554	433	384	343	72
Malagasy Republic	5	—	—	—	—
Morocco	7,354	7,824	8,033	8,413	9,938
Rhodesia, Southern	3	³	—	—	2
Senegal:					
Aluminum phosphate	104	137	139	124	119
Calcium phosphate	106	401	489	463	666
Seychelles Islands (guano)	7	8	5	7	4
South Africa, Republic of	263	292	302	448	570
South-West Africa:					
Guano	—	1	1	1	³
Togo	—	116	189	506	741
Tunisia	2,063	1,950	2,064	2,333	2,708
Uganda	4	³	1	7	9
United Arab Republic (Egypt)	576	617	592	634	604
Totals	11,039	11,779	12,199	13,279	15,433
Asia:					
China, mainland ²	600	500	600	700	800
Christmas Island (Indian Ocean) (exports)	503	694	521	651	775
India:					
Apatite	15	20	29	13	4
Indonesia	7	10	6	1	3
Israel	221	217	207	295	236
Jordan	356	416	670	605	594
Korea, North (apatite) ²	100	150	200	200	200
Philippines:					
Guano	10	³	³	1	1
Phosphate rock	³	—	4	1	3
Vietnam, North:					
Apatite	480	555	667	910	980 ²
Phosphate rock	50	57	33	49 ²	49 ²
Totals²	2,340	2,620	2,940	3,430	3,645
Oceania:					
Angaur Island (exports)	—	—	—	—	—
Australia	2	5	4	5	6
Makatea Island (French Oceania)	407	375	312	330	382
Nauru Island (exports)	1,351	1,282	1,516	1,547	1,820
Ocean Island (exports)	320	338	257	356	323
Totals	2,080	2,000	2,089	2,238	2,531
World totals²	41,170	44,780	47,540	50,420	58,130

¹ A negligible amount is produced in Jamaica, Sarawak, Somalia Republic and Tanzania.² Estimate.³ Less than 500 tons.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

POTASH

Potash shipments were made from the underground operations at Esterhazy, Saskatchewan and from the solution mining plant at Belle Plaine, Sask. The shaft of the Potash Company of America was undergoing repairs.

Although the products may be potassium chloride, the market quotations and other calculations are usually based on the K_2O equivalent. In

recent years many millions of dollars have been expended in developing the extensive potash deposits in Saskatchewan. Core drilling has indicated that these beds of sylvite and carnallite extend westward from the Manitoba border through the Saskatoon area to Unity, a distance of nearly 400 miles. Firms which are experienced potash producers were sinking shafts to mine these deposits which lie at depths of from 2,550 to 3,500 feet.

TABLE 59. Producers' Shipments of Potash (K_2O), 1959 - 64

Year	Tons	Value
		\$
1959 .....	..	1,408,462
1960 .....	..	178,700
1961	—	—
1962 .....	..	3,000,000
1963	626,860	22,500,000
1964	858,351	31,161,954

TABLE 60. World Production of Potash (Marketable) in Equivalent K_2O , by Countries

Country	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada	—	—	150,000 ¹	626,860	858,351
United States	2,638,574	2,732,602	2,452,921	2,864,037	2,897,000
South America:					
Chile (Nitrate)	16,500 ¹	15,504	19,541	20,540 ¹	14,881
Europe:					
France	1,688,635	1,884,791	1,897,958	1,897,661	2,059,299
Germany:					
East	1,836,000	1,846,369	1,931,247	2,034,000	2,046,990
West	2,181,206	2,253,122	2,138,637	2,147,300	2,426,184
Italy	54,338	149,187	170,142	207,565	226,866
Spain	291,356	289,037	259,156	286,876	322,427
U.S.S.R. ¹	1,212,500	1,455,000	1,650,000	1,700,000	2,100,000
Asia:					
Israel ²	91,000	93,600	100,200	124,560	281,640
Japan:					
Alunite	190	130	—	—	—
World totals (marketable estimate) ¹	10,000,000	10,700,000	10,800,000	12,100,000	13,400,000

¹ Estimate.

² Year ended March 31 of year following that stated.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

POZZOLAN

This mineral name has alternate spellings, pozzuolana, pozzuolane and pozzolana. It is a siliceous rock or leucitic tuff which was first quarried near Pozzuoli, Italy and used in the manufacture of hydraulic cement. Artificial pozzolan is made from slag, fly ash, etc. In British Columbia,

at Bamberton the British Columbia Cement and facilities to produce this commodity. At Salt Spring Island a rotary-kiln plant was operated by Holdfast Natural Resources Ltd. Producers' shipments in 1962 were valued at \$4,927, in 1963 the value was \$17,994 and in 1964 it was \$35,200.

PYRITE, PYRRHOTITE

Pyrite and pyrrhotite are by-products which are produced from the processing of the metal sulphide ores of Noranda, Quemont, and Normetal Mines in Quebec and Britannia Mine in British Columbia. At Kimberley the waste iron sulphides are used to produce acid for the fertilizer plant. Shipments of pyrite were made to pulp and paper mills and chemical points in Canada and abroad.

At Cutler, Ontario the pyrite and pyrrhotite concentrates from Noranda Mines are treated to

produce sulphuric acid which is sold to the uranium mines in the Elliot Lake area. At Copper Cliff, a plant of the International Nickel Co. of Canada Ltd. treats pyrrhotite, containing some nickel, to produce iron oxide pellets and nickel carbonate. Since 1961 the data on this material have been included in the figures on by-products iron ore. Falconbridge Nickel Mines Ltd. calcines the sulphide ore to produce a feed material for the iron and steel furnaces.

TABLE 61. Producers' Shipments Pyrite and Pyrrhotite, 1955 - 64

Year	Gross weight	Sulphur content ¹	Value	Year	Gross Weight	Sulphur content ¹	Value
	tons		\$		tons		\$
1955	878,452	403,986	3,740,383	1960	1,032,288	437,790	3,316,378
1956	1,046,740	473,605	4,538,785	1961	517,258	255,376	1,830,566
1957	1,166,416	515,096	4,808,228	1962	517,308	257,084	1,879,584
1958	1,191,731	512,427	4,248,668	1963	476,438	235,410	1,643,629
1959	1,099,564	465,611	3,433,095	1964	351,850	173,182	1,126,167

¹ Data for 1955 include sulphur content of acid made from roasting zinc sulphide concentrates at Arvida.

TABLE 62. World Production of Pyrites (including Cupreous Pyrites), by Countries¹

Country ¹	1961		1962		1963		1964	
	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content
	thousand long tons							
North America:								
Canada	462	228	462	230	425	218	314	157
Cuba ²	20	9	26	12	33	15	30	13
United States	987	399	916	379	825	344	847	354
South America:								
Venezuela	-	-	-	-	-	-	-	-
Europe:								
Bulgaria	120	50	140	59	128	54	144	61
Czechoslovakia	363	151	395	155	342	134	355	140
Finland	270	114	467	118	533	224	539	258
France	281	118	299	125	248	107	188	78
Germany:								
East	115 ²	40	120 ²	41	125 ²	43 ²	120 ²	41
West	500	213	380	165	349	158	417	184
Greece	185	86	142	65	136	62	138	62 ²
Italy	1,555	716	1,559	721	1,380	638	1,373	618
Norway	722	319	797	355	710	323	698	314
Poland	198	76	219	82	213	85	230	87
Portugal	643	296	631	290	593	273	598	275
Rumania	259	103	300	120	328	131	403	160
Spain	2,097	1,001	2,095	997	1,995	941	2,355	1,117
Sweden	431	220	372	188	396	186	438	220 ²
U.S.S.R. ²	2,750	1,460	2,950	1,565	3,150	1,670	3,150	1,670
United Kingdom	3	3	27	11 ²	26	10 ²	26 ²	10 ²
Yugoslavia	359	143	408	163	351	140	421	168

See footnotes at end of table.

**TABLE 62. World Production of Pyrites (including Cupreous Pyrites),
by Countries¹ - Concluded**

Country ¹	1961		1962		1963		1964	
	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content
	thousand long tons							
Africa:								
Algeria	48	22	42	19	37	17	60	28
Morocco	14	5	20	7	23	7	21	6
Rhodesia, Southern	58	23	50	19	65	24	81	30
South Africa, Republic of	440	176	434	175	412	165 ²	426	175 ²
Asia:								
China, mainland ²	985	440	1,080	490	1,180	530	1,280	575
Cyprus ⁴	824	396	809	388	905	440	655	319
Japan ⁵	3,869	1,624	3,952	1,664	3,833	1,623	4,081	1,743
Korea:								
North ²	295	118	345	138	395	157	415	167
South	1		—	—				
Philippines	51	24	55	26	57	27	43	21
Taiwan	47	20	45	20	46	17	46	17
Turkey	97	46	105	51	96	44	111	51
Oceania:								
Australia	213	102	149	65	194	85	220	95
World totals²	19,300	8,700	19,800	9,000	19,600	9,000	20,000	9,000

¹ Pyrites is produced in Brazil, but production data are not available.

² Estimate.

³ Less than 500 tons.

⁴ Tons of ore mined containing pyrites in thousand long tons: 1961, 1,042; 1962, 1,800; 1963, 2,180; 1964, 1,681.

⁵ Years 1961-63 include pyrrhotite, cupreous pyrites, sulphur ore and zinc concentrates.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

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 neighbourhood of Kamloops. As the deposits are far from the main eastern Canadian markets,

production is restricted to the requirements of consumers with 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 63. Production of Sodium Carbonate (Natural), 1941-64

Year	Tons	Value	Year	Tons	Value
		\$			\$
1941	186	1,488	1946	—	—
1942	256	2,048	1947	163	1,793
1943	468	5,148	1948	—	—
1944	44	484	1949	47	513
1945	286	3,146	1950-64	—	—

SODIUM SULPHATE (Natural)

All the natural sodium sulphate produced in Canada was obtained from the brine lakes in Saskatchewan. Producers shipped 333,263 tons valued at \$5,222,313 in 1964 compared with 256,914 tons valued at \$4,121,114 in the preceding year.

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.

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. It is used in the glass, dye and textile industries, and to a smaller extent for medicinal purposes and for tanning.

TABLE 64. Producers' Shipments of Natural Sodium Sulphate, 1955-64

Year	Short tons	Selling value f.o.b. shipping point	Year	Short tons	Selling value f.o.b. shipping point
		\$			\$
1955	178,888	2,799,715	1960	214,208	3,449,155
1956	181,053	2,838,186	1961	250,996	4,036,625
1957	157,800	2,568,728	1962	246,672	3,954,273
1958	173,217	2,862,915	1963	256,914	4,121,114
1959	179,535	2,881,861	1964	333,263	5,222,313

TABLE 65. Imports of Sodium Sulphate, 1955-64

Year	Salt cake		Glauber's salt	
	Tons	Value	Tons	Value
		\$		\$
1955	29,928	574,440	3,888	131,447
1956	30,319	558,656	2,768	91,330
1957	28,086	511,457	1,512	50,527
1958	25,812	478,215	1,217	38,798
1959	27,157	511,162	966	39,907
1960	24,706	472,084	1,156	38,350
1961	32,310	575,015	899	29,023
1962	31,347	608,958	426	22,579
1963	19,002	386,037	495	28,180
1964	30,833	599,443	¹	¹

¹ Included with salt cake.

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 66. Exports of Sodium Sulphate, 1955-64

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1955	67,762	1,263,911	1960	63,831	1,025,632
1956	60,579	985,801	1961	87,131	1,331,428
1957	37,023	593,390	1962	74,049	1,210,958
1958	39,763	645,670	1963	65,348	1,076,969
1959	47,922	752,116	1964	107,318	1,776,186

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

TABLE 67. Available Data on Consumption of Sodium Sulphate (Salt Cake) in Canada, by Industries, 1960 - 64

Industry	1960	1961	1962	1963	1964
	short tons				
Pulp and paper	178,449	192,912	200,166	221,107	242,858
Glass, including glass wool	2,813	2,756	3,026	3,035	3,264
Medicinals	54	16	56	71	151
Soaps	1,394	517	1,136	958	2,393
Mineral wool	352	204	259	306	301
Explosives and ammunition	—	—	—	200	..
Totals accounted for	183,062	196,405	204,643	225,677	248,967

See footnote Table 13.

SULPHUR

Native sulphur deposits of commercial grade have not been found in Canada, but large tonnages of metal sulphide ores are smelted. In smelting these ores sulphur dioxide gas is produced, some of which is recovered to make sulphuric acid or liquid sulphur dioxide. At Trail, British Columbia, the sulphur dioxide generated by smelting lead-zinc sulphide ores is converted into sulphuric acid. At Copper Cliff, Ontario, the Canadian Industries Limited uses the smelter gases from the International Nickel plant to make sulphuric acid and sulphur dioxide. Zinc sulphide concentrates are shipped to Arvida where the concentrates are calcined to produce sulphur dioxide which is used to make sulphuric acid. The roasted material is exported to smelters for the recovery of zinc and other metals. Concentrates are similarly processed at the

Sherbrooke Metallurgical Co. Limited, Port Maitland, Ontario and at Allied Chemical Canada Ltd. Valleyfield, Quebec.

Sour natural gas in the western provinces is processed to remove the hydrogen sulphide. The treatment of large volumes of natural gas means that there are large tonnages of elemental sulphur produced as a by-product. The output of sulphur has exceeded the market demand. Statistics on the operations of the sulphur plants are shown in Petroleum and Gas Wells, Standard Industrial Classification, — 064.

Elemental sulphur is also produced in the processing of nickel sulphides at the nickel refinery.

TABLE 68. Sulphur in Smelter Gases, 1955 - 64

Year	Quantity ¹	Value	Year	Quantity	Value
	tons	\$		tons	\$
1955	224,457	2,244,570	1960 ²	289,620	2,854,623
1956 ²	236,088	2,323,590	1961 ²	277,056	2,708,110
1957 ²	235,123	2,322,067	1962 ²	292,728	3,089,537
1958 ²	241,055	2,361,252	1963 ²	353,243	3,488,181
1959 ²	277,030	2,716,416	1964 ²	443,448	4,261,912

¹ Does not include in 1955 sulphur in acid made from roasting zinc sulphide concentrates at Arvida.² Includes sulphur in acid made from zinc sulphide at Arvida, Port Maitland and Valleyfield.**TABLE 69. Sulphur (Elemental)¹ Made from Natural Gas and Nickel Sulphide, 1955 - 64**

Year	Output	Shipments	
		Quantity	Value
	short tons	tons	\$
1955	29,093	25,976	..
1956	33,464	34,784	..
1957 ²	107,478	93,338	..
1958 ²	186,055	94,377	1,872,832
1959 ²	294,775	145,656	2,620,787
1960 ²	454,045	274,359	4,298,906
1961 ²	550,101	394,762	7,287,881
1962 ²	1,167,999	695,098	9,286,999
1963 ²	1,440,802	1,249,887	13,380,182
1964 ²	1,664,413	1,788,165	18,637,597

¹ Does not include sulphur made from imported crude petroleum.² Includes sulphur produced at nickel refineries.

TABLE 70. Imports of Sulphur, 1955 - 64

Year	Tons	Value	Year	Tons	Value
		\$			\$
1955.....	373,373	9,386,983	1960.....	328,765	6,629,239
1956.....	474,117	11,857,556	1961.....	329,555	7,094,216
1957.....	416,930	9,752,368	1962.....	195,089	4,637,588
1958.....	380,331	8,324,191	1963.....	150,637	3,505,395
1959.....	332,430	6,924,938	1964.....	149,567	3,474,521

Source: Trade of Canada "Imports by Commodities", Catalogue No 65-007.

TABLE 71. Available Data on the Consumption of Sulphur (Brimstone), 1960 - 64

	1960	1961	1962	1963	1964
	tons of 2,000 pounds				
By industries:					
Pulp and paper.....	286,293	299,736	315,279	332,550	349,568
Industrial chemicals.....	197,212	213,190	243,318	257,669	243,696
Rubber footwear.....	3,200	3,221	108	102	120
Rubber tire & tube.....	...	...	...	...	2,209
Rubber industries.....	...	...	...	...	994
Miscellaneous foods.....	282	301	323	416	22
Fruit and vegetable preparations.....	...	5	1	1	—
Sugar refining.....	113	126	169	147	338
Petroleum refining.....	198	120	186	160	156
Steel and iron.....	1,224	1,548	1,349	1,407	238
Miscellaneous chemicals, explosives.....	19,273	25,047	27,880	30,537	30,137
Medicinal.....	15	14	—	—	—
Malt products.....	...	109	127	...	...
Totals accounted for.....	507,810	543,417	588,740	622,989	627,478
By provinces:					
Newfoundland.....	22,624	24,122	21,998	23,115	25,337
Nova Scotia.....	5,236	5,802	11,883	11,456	13,661
New Brunswick.....	36,586	38,227	42,722	44,942	44,920
Quebec.....	156,397	171,665	165,364	174,867	166,874
Ontario.....	141,044	153,862	188,197	207,656	229,638
Manitoba and Saskatchewan.....	22,679	26,457	27,959	25,175	6,875
Alberta.....	63,030	66,487	68,188	71,904	73,213
British Columbia and Northwest Territories.....	60,214	56,795	62,429	63,874	66,960
Canada.....	507,810	543,417	588,740	622,989	627,478

TABLE 72. Exports of Sulphur and Pyrite, 1959 - 64

Year	Pyrite		Sulphur
	Value	Tons	Value
	\$		\$
1959.....	1,018,608	26,526	504,961
1960.....	1,259,151	143,040	2,762,372
1961.....	899,755	217,866	3,967,884
1962.....	890,055	400,026	6,649,943
1963.....	937,883	820,929	11,972,346
1964.....	878,545	1,294,587	19,525,661

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

TABLE 73. World Production of Elemental Sulphur, by Countries

Country	1960	1961	1962	1963	1964
	long tons				
Frasch:					
Mexico.....	1,261,574	1,148,494	1,350,375	1,456,656	1,635,773
United States.....	4,942,935	5,385,468	4,984,578	4,881,512	5,228,207
Total.....	6,204,509	6,533,962	6,334,953	6,338,168	6,863,980
From sulphur ores:					
Argentina.....	39,265	22,183	22,303	22,338	21,955
Bolivia (exports).....	1,175	4,896	7,247	9,793	10,635
Canary Islands.....	4,000	4,921	5,905	6,889	6,900 ¹
Chile.....	30,901	43,994	63,228	56,405	58,612
China, mainland ¹	120,000	120,000	120,000	120,000	120,000
Columbia.....	8,899	9,941	10,046	12,795	11,942
Italy.....	79,703	68,668	53,354	41,128	28,472
Japan ²	243,684	238,456	220,438	219,095	237,413
Mexico.....	17,700 ¹	25,116	26,751	28,968	..
Philippines.....	43	158	926	47	68
Poland.....	25,885	130,900	206,684	231,486	289,948
Spain.....	1,336	—	—	—	—
Taiwan.....	5,725	5,732	7,462	7,144	6,389
Turkey.....	16,830	15,506	18,247	19,123	21,849
U.S.S.R. ¹	800,000	900,000	950,000	950,000	950,000
United Arab Republic (Egypt).....	3,543	8,858	5,900 ¹	490 ¹	..
United States.....	94,357	92,025	40,840	415	158
Totals¹.....	1,490,000	1,690,000	1,760,000	1,725,000	1,790,000
Totals, native sulphur.....	7,700,000	8,220,000	8,100,000	8,060,000	8,650,000
Other elemental:					
Recovered:					
Austria ⁴	—	—	—	—	5,905
Bulgaria ⁵	5,310	4,949	5,502	6,291	6,720
Canada (Sales) ⁶	244,963	352,465	620,622	1,115,968	1,596,574
China ^{1,4,5}	130,000	130,000	130,000	130,000	130,000
Finland.....	—	—	—	37,611	67,063
France ⁷	778,157	1,080,013	1,325,538	1,386,285	1,486,846
Germany:					
East.....	110,232	115,153	118,105	118,105	118,110 ¹
West.....	82,807	82,861	89,268	84,949	76,602
Iran ^{1,3,4}	20,000	20,000	15,000	20,000	20,000
Italy.....	3,200	1,968	2,067	1,279	787
Japan ⁴	8,326	8,163	8,549	11,429	18,499
Mexico ⁷	33,487	51,086	46,545	43,308	36,296
Netherlands ⁵	30,018	27,952	30,511	34,472	28,444
Netherlands Antilles: Aruba, Curacao ⁴	40,000	40,000	40,000	30,000	30,000
Norway ⁵	71,254	61,156	45,175	—	—
Portugal ⁵	10,915	8,813	6,677	2,963	..
South Africa, Republic of ⁴	—	2,163	1,913	1,981	5,701
Spain ⁵	40,194	48,324	41,836	68,036	75,452
Sweden ⁸	39,368	30,491	29,980	25,885	26,967
Taiwan ⁴	876	1,968	2,130	2,310	2,780
Trinidad ^{1,4}	5,000	5,000	5,000	7,000	7,000
U.S.S.R. ¹	210,000	275,000	370,000	400,000	400,000
United Arab Republic (Egypt).....	2,369	2,545	2,039	4,394	2,427
United Kingdom ⁹	62,402	58,406	51,929	46,529	53,701
United States.....	766,566	858,169	899,598	946,753	1,021,358
Totals other elemental¹.....	2,700,000	3,270,000	3,890,000	4,530,000	5,220,000
World totals¹.....	10,400,000	11,490,000	11,990,000	12,590,000	13,870,000

¹ Estimate.² Includes sulphur from mixed sulphur-sulfide ore.³ In some years Iran produces mined sulphur equivalent to 250–1,500 tons sulphur. No estimate in total.⁴ From refinery gases.⁵ From sulphide ores.⁶ Produced from natural gas, includes a small quantity derived from treatment of nickel sulfide matte at Port Colborne, Ontario.⁷ From natural gas.⁸ From shale oil.⁹ Including sulphur recovered from petroleum refineries.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

STRONTIUM MINERALS

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 were mined from a deposit in Bagot township, Renfrew county, and after grinding in a small mill erected on the property, were 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 were 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.

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.

VERMICULITE

Vermiculite, a hydrated magnesium aluminum silicate, resembles mica closely but is softer and inelastic. Colours range from black through brown and dark green to almost colourless. Its principal characteristic is its ability to expand many times on heating, and in its expanded form it possesses low bulk density, low thermal conductivity, high heat resistance, chemical inertness and acoustic properties. Vermiculite is generally regarded as a product of alteration and is usually associated with metamorphosed ultra-basic rocks.

Known deposits of vermiculite in Canada are located at Stanleyville, near Perth, Ontario and

at Blue River, Kamloops mining division, British Columbia.

The principal uses for vermiculite are loose insulation in buildings; concrete and plaster aggregate; lightweight fire-resistant and acoustic tile and wallboard; rooting medium and soil amendment. It is also used in lubricants, dry chemicals, (as a diluent), combination refractory and insulating brick, as a pigment and extender in paint and as decorative filler in wallpaper. Vermiculite has been used as fireproof deck covering and partitions on ships, as loose insulation in fire and sound-proof partitions in vehicles and aircraft, as filler for life jackets and in finely-powdered forms, for oilless bearings.

TABLE 74. World Production of Vermiculite, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons				
Argentina	349	3,919	2,962	3,064	4,031
India	17	697	475	746	473
Kenya	283	—	22	101	37
South Africa, Republic of	69,022	71,118	85,534	98,758	111,872
Sudan	—	55	55	—	—
Tanzania	20	157	72	30	144
United Arab Republic (Egypt) ²	121	85	313	33	459
United States (sold or used by producers)	199,072	206,637	205,749	226,278	226,299
Totals ^{1,2}	268,884	282,668	295,182	329,010	343,315

¹ Vermiculite is produced in Brazil and U.S.S.R., but data are not available, and no estimates are included in the total.

² Includes mica.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

VOLCANIC DUST

Volcanic dust (pumice 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.

During 1924 to 1932 the annual production varied from 30 to 485 tons. There has been no production in recent years. The last recorded shipments were 50 tons in 1943.

Volcanic dust deposits have been found in Alberta, Saskatchewan and British Columbia. Pumice dust is used for concrete aggregate, acoustic plaster, cleansing compounds, paint fillers, absorbents, etc.

TABLE 75. World Production of Pumice, by Countries¹

Country ¹	1960	1961	1962	1963	1964
	short tons				
Argentina ²	16,573	32,321	12,585	7,790	5,712
Austria:					
Trass.....	38,581	40,846	30,696	23,349	25,223
Canary Islands (Spain).....	1,614	1,585	1,918	1,685	2,528
Cape Verde Islands:					
Pozzolan.....	7,094	7,361	7,503	13,035	11,296
Chile:					
Pozzolan.....	—	62,790	120,315	142,012	155,885
France:					
Pumice	995	1,455	1,876	849	1,010
Pozzolan.....	475,484	485,504	521,751	601,488	645,547
Germany, West (marketable).....	4,742,138	5,898,461	6,290,883	7,043,761	6,416,547
Greece:					
Pumice	88,185	77,162	87,938	88,000 ³	88,000 ³
Santorin Earth	198,416	209,439	207,273	220,000 ³	220,000 ³
Iceland	9,000 ³	9,000 ³	7,200 ³	13,779	11,023
Italy:					
Pumice	345,390	310,893	349,862	722,917	} 1,025,000 ³
Pumicite.....	124,671	161,488	160,607	309,000 ³	
Pozzolan.....	3,494,273	3,212,787	3,322,318	4,765,354	4,740,000 ³
Kenya	2,711	779	1,243	1,245	1,585
New Zealand	49,204	36,637	36,425	18,599	22,980
United Arab Republic (Egypt Region)	3,307	4,335	2,276	9,614	23,779
United States (sold or used by producers):					
Pumice and pumicite.....	601,315	936,039	583,716 ⁴	1,050,178	1,165,379
Volcanic cinder	1,609,050	1,526,546	1,737,587	1,567,825	1,611,093
World totals⁴	11,900,000	13,150,000	13,600,000	16,730,000	16,300,000

¹ Pumice is also produced in Japan, Mexico and U.S.S.R. (sizable quantity), but data on production are not available; no estimates are included in total, except for Japan.

² Included volcanic ash and cinders, and pozzolan.

³ Estimate.

⁴ Includes American Samoa.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

List of Establishments classified to Miscellaneous Non-metal Mines, 1964

Name of operator	Head office address	Plant or mine location
Miscellaneous Non-metal Mines — Standard Industrial Classification 0799		
Barite:		
Nova Scotia:		
Magnet Cove Barium Corp.	Walton.....	Pembroke
British Columbia:		
Baroid of Canada Ltd.	Box 250, Onoway, Alberta	Spillimacheen
Mountain Minerals Ltd.	Box 700, Lethbridge, Alberta	Brisco
Brucite:		
Quebec:		
Aluminium Company of Canada Ltd.	Box 6090, Montreal.....	Wakefield
Fluorspar:		
Newfoundland:		
Newfoundland Fluorspar Ltd.	327 Duckworth St., St. John's.....	St. Lawrence
Graphite:		
Quebec:		
Clot, Oscar Graphite Mining Ltd.	St. Jovite	Canton Joly
Iron oxide:		
Quebec:		
Sherwin-Williams Co. of Canada (The)	2875 Centre St., Montreal	Red Mill, Champlain Co.
Lithium minerals:		
Quebec:		
Quebec Lithium Corp.	1403 Edifice Aldred, Montreal	Barraute
Magnesitic dolomite:		
Quebec:		
Canadian Refractories Ltd.	540 Canada Cement Bldg., Montreal	Kilmar
Mica:		
Quebec:		
Blackburn Bros. Ltd.	85 Sparks St., Ottawa, Ontario	Cantley
Cross, W.C.	7 Hadley Blvd., Hull	Hull
Potash:		
Saskatchewan:		
International Minerals & Chemical Corp.	Esterhazy.....	Esterhazy
Kallium Chemical, Ltd.	400 Bank of Canada Bldg., Regina	Pense
Sodium sulphate (natural):		
Saskatchewan:		
Midwest Chemicals Ltd.	Palo	Palo
Ormiston Mining & Smelting Co. Ltd.	Ormiston.....	Ormiston
Sybouts Sodium Sulphate Co. Ltd.	Box 191, Wilmington, Delaware, U.S.A.	Gladmar
Saskatchewan Minerals (Sodium Sulphate Div.)	Chaplin.....	Chaplin, Bishopric

SUPPLEMENT

(The following establishments classified to other industries e.g. smelting and Refining, recover the commodities indicated and are included for information purposes to support the statistical material relevant to these commodities which is presented in this report.)

Arsenious oxide:

Ontario:

Cobalt Refinery Ltd.	25 Adelaide St. W., Toronto	Cobalt
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Diatomite:

British Columbia:

Fairey and Co. Ltd.	661 Taylor St., Vancouver.....	Quesnel
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List of Establishments classified to Miscellaneous Non-metal Mines, 1964 - Concluded

Name of operator	Head office address	Plant or mine location
SUPPLEMENT - Concluded		
Fluorspar:		
British Columbia:		
Pacific Silica Ltd.	Oliver	Oliver
Gemstones (Jade)		
British Columbia:		
Bell, Art	1190-2nd Ave., Prince George	Prince George
Osterlund, Ed	Lillooet	Lillooet
Seyward, Josef	226-2nd Ave., Chilliwack	Chilliwack
Mica:		
Quebec:		
Desormeaux, Gaudias	St. Pierre de Wakefield	Portland West
Gagne, C.	Cascades	Wentworth
Lavigne, E.	Wilson Corner	Wakefield
Poirier, C.	St-Pierre de Wakefield	Portland West
Whalen, H.	Quyong	Quyong
Zimmerling, A. & McNeely, J.	Otter Lake	Cawood
Ontario:		
Arvay, Robt. & John McConnell	1370 Montreal St., Kingston	Loughborough
Pozzolan:		
British Columbia:		
Holdfast Pozzolan, Ltd.	1253 Burrard St., Vancouver	Saltspring Island
Pyrite, Pyrrhotite:		
Quebec:		
Noranda Mines Ltd.	44 King St. W., Toronto, Ontario	Noranda
Normetal Mining Corp. Ltd.	44 King St. W., Toronto, Ontario	Normetal
Quemont Mining Corp. Ltd.	44 King St. W., Toronto, Ontario	Rouyn Twp.
Ontario:		
International Nickel Company of Canada Ltd. ¹	Copper Cliff	Copper Cliff
British Columbia:		
Anaconda Co. (Canada) Ltd. (Britannia Mine)	Britannia Beach	Britannia Beach
Consolidated Mining & Smelting Company of Canada Ltd.	Trail	Kimberley
Sulphur (in smelter gas):		
Quebec:		
Allied Chemical Canada Ltd. ¹	Valleyfield	Valleyfield
Aluminum Co. of Canada Ltd. ¹	Sun Life Bldg., Montreal	Arvida
Ontario:		
Canadian Industries Ltd.	Box 10, Montreal, Quebec	Copper Cliff
Sherbrooke Metallurgical Ltd. ¹	Dunnville	Dunnville
British Columbia:		
Consolidated Mining & Smelting Company of Canada Ltd. ¹	Trail	Trail

¹ Produces acid by oxidizing zinc sulphide concentrates.

EXPLANATORY NOTES

(Including Concepts and Definitions)

INTRODUCTION

The *Census of Mines, Quarries and Oil Wells* is an annual mail survey covering Canada's Mineral Industries based on the Standard Classification of Industries. While principal statistics are collected and compiled for all mineral industries not all can be published separately by province because of the confidential nature of the data in certain provinces.

The reporting unit for the Census is designated as the establishment (see definition of Establishment in following section) and a return is requested from every establishment classified to a mineral industry. When an establishment is operated for only part of a year a report is required covering the period of operation.

There are four different questionnaires used in this Census: (a) short form (introduced in 1965) (h) long form (c) head office questionnaire and (d) commodity questionnaire. The short and long forms are used to obtain principal statistics and commodities shipped from establishments classified to mineral industries and differ only in the amount of detail requested.

The head office questionnaire is generally used for company head offices and/or auxiliary units separately located from the mineral establishment(s), (see following notes on Head offices and auxiliary units). The Commodity questionnaire is used to survey certain establishments to collect information on the quantity and value of goods of own production shipped or used by such establishments in order to achieve full coverage of domestically produced commodities. (See the following note under Value of production).

General

This report is one in a series of 18 publications which relate to the operations of industries comprising Major Groups 1, 2, and 4 of Division 4, Mines (including Milling) Quarries and Oil Wells of the revised Standard Industrial Classification (S.I.C.). These groups are respectively Metal Mines, Non-metal Mines and Quarries and Sand Pits. Industries comprising Major Group 2 (Mineral Fuels) are covered in a separate series of reports. The industries included in Major Group 5, Services Incidental to Mining are not covered by separate reports. However, certain relevant statistics are published in various publications, for example, "Contract Drilling for the Mining Industry" (Catalogue No. 26-207), "Construction in Canada" (Catalogue No. 64-201) and a special report "Private and Public Investment in Canada" (available on request from the Bureau or the Queen's Printer). The Bureau has also developed a new survey "Annual Survey of Mining and Exploration Companies". This survey is being introduced for the 1967 reporting period and will attempt to bring together details on exploration, development and capital and repair expenditures for the mining universe (excluding oil and gas).

The publication of this series of 18 reports constitutes the final phase of the implementation of the revised Standard Classification for these three Major Groups (see above). Because of its size and complexity, this project has to be carried out in several stages and over a period of years. These stages were as follows: (a) reclassification of establishments according to the revised S.I.C. (b) implementation of a new establishment definition (c) an extension of the establishment definition to cover the non-mining activities of mining establishments. The first stage was completed with the 1960 Census of Mines, etc. and the results were published in the 1960 and 1961 reports on the basis of the revised Standard Industrial Classification. This part of the project was confined entirely to a re-coding of existing reporting units. Under the revised Standard Industrial Classification reporting establishments are classified or allotted to specific industries in the classification system on the basis of the value of principal products made or shipped. Full details concerning the revised classification system are contained in the "Standard Industrial Classification Manual", Catalogue No. 12-501, which is available from either the Queen's Printer or the Dominion Bureau of Statistics.

The second stage in the project consisted of the implementation of the new definition of the reporting unit i.e. "establishment" as it applied to **mining activities** of mining establishments (see following note on Establishment). Results of the 1962 Census of Mining reflected this change in concept and, in order to provide comparability of data for previous years, the 1962 reports contained principal statistics on the basis of the new establishment definition for years back to 1957. This naturally included the projection of stage one.

The third stage in the project which was the extension of the definition of the establishment to cover **total activities** of mining establishment, is reflected in the 1964 data presented in the present report. By definition "total activity" relates to all operational data and excludes such non-operational items as rent, interest and dividends. Statistics on man-hours included in the earlier publications for the mining industry will continue to be included as part of the regular series but will be confined to production and related workers as in the reports for the Census of Manufactures. Adjustments and revisions made in the statistics for mining activities covering the period 1961-63 and carried in the mining series of publications for this period were further revised in the course of the final stage of the programme to bring them in line with reporting procedures followed in the 1964 Census of Mining which reflect the final application of the new concept. The 1961-63 statistics on mining statistics on the new basis are thus not comparable with those published in earlier issues in this series. However, the 1961-63 statistics are shown in this publication in both their previously published and revised forms in order to provide a link with the immediate past.

Reference has already been made to changes implemented and in the course of implementation in the mining industries in reports published in this series prior to the 1964 issues; however a more complete account of the changes and additions and brief descriptions of the principal industry statistics are given in the following sections of those notes. This latter includes as well a special section dealing specifically with the impact of a new concept in the treatment of the Smelting and Refining industry on the metal mines industries. A description of conceptual and definitional changes appropriate to the statistics for Major Group 4, Mineral Fuels will be included in the relevant industry reports for this group.

Metal Mines

The effect of the application of a special concept to the reporting procedures followed by plants carrying on integrated mining/smelting/refining operations will be evident in the comparison of the 1961-64 data particularly for the items Materials and supplies and Value of production shown in the publications on Metal Mines and the data published in reports prior to 1964. The industries in which the application of this concept had a major effect are those included in S.I.C. Major Group 1 - Metal Mines of the Annual Census of Mining (Mines (including Milling) Quarries and Oil Wells) but more particularly the following:

Copper-Gold-Silver Mines
Nickel-Copper Mines
Silver-Lead-Zinc Mines

These industries which are dominated by a sector of vertically integrated companies involved in mining and manufacturing (smelting and refining) operations have historically created significant distortions in the statistics for these industries. These were caused, for the most part, as a result of applying a value to the ores, concentrates, etc. which were part of the materials (inputs) of the Smelting and Refining industry. The method of valuation used was based on the recoverable metal content of these materials, that is, ores, concentrates, etc. A similar procedure was followed in valuing the output portion of these mines. Since the major output of the mines served as an input to the Smelting and

Refining industry and in turn became a part of the output of the Smelting and Refining industry there was, in effect, a duplication of values for recoverable metal content in the mining and manufacturing sector (smelting and refining). The procedure followed also tended to understate the total output value of the mines sector because the recoverable metal content was valued at a lower level in the processing operations than is, as ores, concentrates, etc. before smelting and/or refining.

Prior to the full implementation of the establishment concept to include total activities, the "Materials and supplies" section included primarily a limited number of consumable materials such as explosives, drill steel, lubricants, etc. Many kinds of supplies, for example, maintenance and repair supplies were not reported. The extension of the Materials and supplies section in accordance with the total activities concept to provide for a more complete coverage of materials and supplies accounts for a major part of the increase in the total cost of Materials and supplies used. In the case of the vertically integrated companies the procedure followed omitted treatment charges such as milling, smelting refining, etc. from the input side of the mines sector involving these companies as well as from the output side of the Smelting and Refining industry. As a result the cost of materials (inputs) reported, particularly for the industries in the mines sector mentioned above was considerably understated.

As a result of the foregoing it was necessary to find some statistical device which would eliminate the above practices and permit the derivation of more meaningful principal statistics—for both the metal mines and for the smelting and refining industry.

While it has been suggested that smelting and refining should be treated as part of the metal mines, and that the statistics should be compiled on this basis, this would be difficult to justify from the statistical viewpoint. Smelting and refining by the nature of its operations constitutes a

manufacturing activity and is considered such, not only in the Canadian and International classification systems but also in the systems of most foreign countries. To include it as part of the mining universe would not only make international comparisons virtually impossible but would affect the importance of Canada's manufacturing industries even more drastically than the changes which resulted from the approach adopted.

After a thorough study of these problems and consultations with the firms involved, it was found that the only satisfactory solution was to continue to consider smelting and refining as a manufacturing industry and to treat such operations of vertically integrated companies as "custom" operations regardless of whether or not the smelting and refining plants (establishments) of such companies were concerned solely with the smelting and refining of ore, concentrates, etc. of their own company. This procedure eliminated the need to arbitrarily value the ores, concentrates, etc. transferred to the smelter and to value the output of the smelter and refinery in terms of commodities produced. Although, for the purpose of commodity statistics, these are still valued on the basis of recoverable metal content, the revenue from integrated operations accrues to the mines concerned and is not duplicated, as in the past, in both the mining and the smelting and refining industries. Thus the revenue from smelting and refining in such integrated operations now consists primarily of treatment costs of own ores, etc. plus any revenue from toll charges of non-company ores, by-products, etc.

The effects of allocating the final revenues of the vertically integrated companies included in this industry to the metal mining industries and the broadening of coverage for materials used, as well as any changes resulting from the implementation of the revised Standard Industrial Classification and the New Establishment Concept, are reflected in the tables of principal statistics for the years 1961 to 1964. Additionally, these tables reflect the inclusion of the non-mining activities, i.e. the total activity concept.

CONCEPTS AND DEFINITIONS

Establishment

A mining establishment is typically a mine, mine/mill (concentrator), quarry, pit, bog, or plant principally engaged in commercial production activities. In many cases a mining company consists of a single establishment but it is not uncommon for a company to consist of a number of establishments some of which may be in mining i.e. mine/mill and others in manufacturing i.e. smelter, cement plant, etc. In addition a number of locations may be involved. Such firms are requested to submit a separate Census of Mining report for each mineral establishment which can meet the reporting requirements embodied in the following definition of the "establishment".

"The smallest unit which is a separate operating entity capable of reporting the following principal statistics:

- Materials and supplies used
- Goods purchased for resale as such
- Fuel and power consumed
- Number of employees and salaries and wages
- Man-hours worked and paid
- Inventories
- Shipments or sales."

Each establishment is required to report on all the activities carried out within its accounting boundaries (except non-operating revenues such as rent, interest and dividends) and data on the different activities (mining etc., trading in goods not of own manufacture, construction by own labour force, revenue from services, etc.) are requested to be reported separately. It should be noted that the statistics for separate activities are not completed consistent since some respondents cannot distinguish, in their records, materials, shipments and inventories relating solely to their own mining activities. For example, inventory of commodities purchased

for re-sale may not be distinguishable from inventory of own mineral commodities. Complete consistency, therefore, can be obtained only at the "all operations" (total activity) level and for studies or statistical measures requiring accurate co-ordinated data, the "total activity" statistics should be used.

The number of establishments represents the number of operating units that are principally engaged in the activities of the mineral industries to which they have been classified. These units do not necessarily represent the total number engaged in the production of a commodity mainly produced in a certain industry. Some commodities are produced as secondary products in other mineral and non-mineral industries. It should be noted that head offices and auxiliary units which are surveyed separately are not included in the establishment count, (see following notes on Head offices and auxiliary units).

Head Offices and Auxiliary Units

Head offices and auxiliary units of companies classified to the mineral industries such as sales offices, administrative offices, warehouses, laboratories, etc. are now surveyed as part of the Census of Mining.

These head offices and auxiliary units are either included in an establishment report or are surveyed by means of the head office questionnaire. The former is the most common case where a single establishment firm has its executive personnel, sales office, etc. located at the site of the mine (establishment). The special head office questionnaire is generally used where a firm, regardless of the number of establishments, has separately located offices or auxiliary units. Such offices or units do not constitute establishments within the Census of Mining as they do not normally generate operational revenues, but give rise only to cost of operations

(mainly salaries and wages) which are automatically included in the value of shipments or sales. Although not considered as establishments, and hence, not included in the "establishment" count for an industry, the operational costs are reflected in either the "Industry" statistics (3 or 4 digit level) or the "Major group" statistics (2 digit level) according to the following rules:

- (a) In the case of single establishment firms, statistics of offices and units located in a different municipality to the mining establishment are classified to the same industry (3 or 4 digit) as the mining establishment;
- (b) In the case of multi-establishment firms, the statistics for such offices and units are coded to the same industry as the establishments of the firm, when all establishments are in the same industry (3 or 4 digits). When establishments of such firms are coded (1) to different industries within a major group, (2) to industries in different major groups or (3) to industries in different divisions of the Standard Industrial Classification, then the statistics are included in the major group totals (2 digit level) in which the major part of the company's operations are classified. Although this may result in some distortion of major group statistics in the case of (2) and (3) the statistics at the industry (3 or 4 digit) level in all cases will be left free of these company-wide data.

Employees

(a) Production and related workers – Mining activities

In addition to those engaged directly in mining production activities, they include those employed in storing, inspecting handling, packing, warehousing, etc. They also include employees engaged in maintenance, repair, janitorial and watchman services and line supervisors (working foremen) engaged in similar work to that of the employees they supervise. For those establishments reporting on the "long" form, production and related workers engaged in mining activity are reported as those receiving pay during the last pay period of each month, an average for the year being obtained by summing the monthly figures and dividing by 12. This procedure is followed even though the establishment did not operate in all months in order to arrive at equivalent annual full-time employment. The numbers are somewhat affected by turnover, in that employment is overstated when an employee changes employment during a pay period. The man-hours of production and related workers in mining activity represent total man-hours paid (total hours at work during the calendar year plus hours not worked but nevertheless paid for, such as paid vacations, sick leave, statutory holidays, etc.). In reporting overtime hours, respondents are requested to report only hours actually at work. It should be noted that the division of hours paid into production and related workers payrolls results in average hourly earnings and does not represent hourly wage rates which are collected and published by the Department of Labour and which are based on selected occupations.

(b) Production and related workers – Non-mining activities

Such employees include those on mining establishments' payrolls engaged in activities such as construction undertaken for the use of these establishments and any other production workers who are not engaged directly in the production of ore and/or concentrates.

(c) Administrative and office employees

This category includes all executive and supervisory officials such as presidents, vice-presidents, comptrollers, secretaries, treasurers, etc., together with managers, professional, technical and research employees, superintendents and plant supervisors above the line supervisor or working foreman level, and clerical staff. Also included are employees in activities such as advertising, credit collections, purchasing, personnel, legal, medical, etc. It should be noted that prior to 1961 this category also included working owners and partners. Also included in this category are employees located at head offices or auxiliary units separately located from the establishment; in accordance to the rules outlined under "Head offices and auxiliary units" above.

(d) Sales and distribution workers

This category includes office personnel whose salaries are charged to selling expense, e.g. travelling salesmen. It may also include some sales employees who are reported as part of a mining establishment but are not working at the establishment. These are generally broken down by location in cases where more than 15 employees are involved in any one location. The figures exclude persons working on a commission basis who are not considered regular employees of the establishment.

(e) Total employees

This total comprises the foregoing categories including employees located at separately located head offices and auxiliary units. The numbers of employees included under categories (b), (c) and (d) are reported in the form of annual averages and represent as closely as possible full time employment; adjustments are made when reported figures indicate the existence of part-time or seasonal employment.

Working Owners or Partners

These are not now included in the statistics of employees and salaries and wages. There is some duplication in numbers when a person owns more than one establishment and is reported as a working owner on each Census return. Withdrawals of working owners are defined as amounts withdrawn by owners or partners for normal living expenses excluding withdrawals for payment of income tax.

Salaries and Wages

Salaries and wages refer to gross earnings of employees before deductions for income tax and employees contributions to social services such as sickness, accident and unemployment insurance, pensions, etc. They include all salaries, wages, bonuses, profits shared with employees, the value of room and board where provided, commissions (paid to regular employees only) as well as any other allowance forming part of the worker's earnings. Payments for over-time are included.

Fuel and Electricity

Figures for fuel refer to amounts actually used (including fuel used in cars, trucks, locomotives, etc.), not to purchases unless the quantities are substantially the same. Any fuel and electricity produced by establishments for internal consumption are not included in the total cost. Values represent laid down cost at the establishment including freight, duty, etc. Although fuel and electricity used is considered part of mining activity it should be noted that it also includes relatively small amounts used in non-mining activities since these cannot be reported separately.

Materials and Supplies

(a) Mining activities

Figures represent quantities and laid down cost values, at the establishment, of materials, supplies and purchased components owned and used during the year in mining activities and related processes. These statistics represent only commodity items or physical goods (cost of services or overhead charges such as advertising, insurance, depreciation, etc. are not included) whether purchased from others or received as transfers (in the form of materials, components or semi-processed goods) from other establishments of the reporting company. Included are maintenance and repair supplies not chargeable to fixed assets accounts and any amounts charged by other establishments for work done on materials owned by the reporting establishment. Cost of repairs or maintenance done by outside contractors and cost of returnable containers are not included.

(b) Non-mining activities

1. Purchases for re-sale as such

Figures represent cost of materials or products purchased from others by the reporting establishment (or received as transfers from other establishments of the reporting company) for re-sale as such in the same condition as purchased. Included are any finished products received on consignment from other countries.

2. Other materials and supplies used

Figures represent the cost of materials and supplies, if any, used in new construction and in the production of machinery and equipment (for the use of the reporting establishment) by the establishment's own employees. Included are materials used for any capital repairs and alterations carried out by the establishment's employees. Amounts paid to outside contractors for construction and repair work are not included nor is the cost of purchased machinery and equipment. Also included is the cost of office supplies not chargeable to fixed assets accounts and the cost of such other items of materials and supplies used as food, beverages and supplies for establishment-operated cafeterias and lunch counters, first aid and medical supplies, laboratory supplies, etc.

Value of Production

(a) Value of production of goods produced in the establishment

These figures represent the values in Canadian dollars of products shipped by the reporting establishments adjusted by changes in value between closing and opening inventory values of goods-in-process and finished products on hand. Included are revenues from repairs and custom work performed for other establishments and the cost (book value) of any goods produced by the mining establishment and shipped on a rental basis.

All products and by-products of own production shipped from the establishment are covered, including transfer shipments to sales outlets, distributing warehouses or to other processing plants of the reporting firm, when such units are treated as separate establishments. Production values are net of returned goods, discounts, returns, allowances, sales tax, excise taxes and duties, returnable containers and charges for outward transportation by common or contract carriers. Transportation or delivery expense incurred by the reporting establishment's own carriers are included.

Shipments of goods of own production of establishments which are coded to some other division of the Standard Industrial Classification (on the basis of principal activity) but which are engaged in mining as a subsidiary activity are collected by means of the Commodity questionnaire referred to earlier. Such shipments together with shipments of goods of own production of establishments forming the universe of mineral industries are compiled and recorded under appropriate headings in the various mineral industry publications; however, operational details relating to the production of such commodities are **not** included in the **principal** statistics shown in the reports for individual mineral industries.

(b) Shipments of goods not of own manufacture

These figures represent the net selling value at establishment (net of discounts, returns, allowances, sales

taxes and excise duties and taxes and transportation charges by common or contract carriers) of all products or materials (including products transferred from other establishments of the reporting firm) sold as such in the same condition as purchased or received as transfers. **All sales of consignment goods from other countries are included.**

(c) Other revenue

Figures represent the book value of fixed assets, if any, (new construction and machinery and equipment including major repairs, alterations, additions, modifications, installation and assembly work) produced during the year for the use of reporting establishments by the establishment's own employees and for which depreciation accounts are maintained. Included also are any revenues from the sale of electricity, servicing revenues, commissions on sales (when not included in value of sales), revenue for company-operated cafeterias and lunch counters and revenue from outside installation or construction work not related to the establishment's own products, sale of used materials (excluding sale of used fixed assets) research and development work, etc. As mentioned previously the figures do not include non-operating revenue such as rent, dividends, interest, etc.

Value Added

(a) By mining activities

Figures are compiled by deducting the cost of operating materials, supplies, etc. and fuel and electricity consumed from the value of production.

(b) By non-mining activities

The figures are compiled by deducting the cost of goods purchased for re-sale (adjusted for changes in the value of inventories of goods purchased for re-sale) and the cost of non-mining materials and supplies used from the **value of shipments of goods not of own manufacture, plus other revenue.**

(c) By total activities

The figures consist of value added by mining activities plus value added by non-mining activities. "Value added" is sometimes referred to as net output or net production. However, to arrive at the National Accounts concept of net production, or Gross Domestic Product at "Factor cost" it would be necessary to subtract also the cost of advertising, insurance and other business expenses which are not collected as part of the annual Census of mining. "Value added" figures for the primary industries, manufacturing and construction are published in DBS publication Catalogue No. 61-202. "Survey of Production".

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