Mineral Aggregates

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Total Canadian shipments of mineral aggregates (mainly crushed stone and sand and gravel) decreased about 2% to 316 Mt in 1995, when preliminary statistics for the year are compared with final figures for 1994. By way of contrast, during the prerecessionary period from 1987 to 1990, total annual shipments were in excess of 350 Mt.

Unit values generally continued to increase in pace with the rate of inflation with selling prices varying considerably depending on proximity to consumers. Non-residential construction, as well as engineering construction, helped counter the fall in housing starts, which are normally a broad indicator of demand for most primary construction materials.

The $6 billion cost-shared program for infrastructure renewal, supported by all three levels of government, has contributed to total construction activity. The related program expenditures have been extended an additional two years to 1998/99.

CANADIAN DEVELOPMENTS

The importance of mineral aggregates to the economic competitiveness of Canada's urban areas is gaining increasing recognition. In the case of Ontario, the province's new *Aggregate Resources Act*, which in 1990 replaced two related acts and the applicable portion of Ontario's *Mining Act*, is probably the most comprehensive document of its kind in Canada.

In September 1995, AGGPAC Canada '95, a major North American meeting of aggregate producers and equipment suppliers, was held at the Milton quarry located in southwestern Ontario and owned by Dufferin Aggregates Ltd. This event featured a major demonstration of operating equipment and provided an unprecedented opportunity to raise public awareness of the importance of having primary materials relatively accessible to major urban areas.

Because of its relatively high degree of urbanization, the need for aggregate resources planning is particularly important in southern Ontario. This point is made in a study of the issues that was released in late 1993 entitled *Aggregate Resources of Southern Ontario – A State of the Resource Study*. This report, commissioned by the Ontario Ministry of Natural Resources, includes a comprehensive review of supply/demand factors, costs, questions concerning legislation and planning, and issues concerning recycling and re-use.

Demand for mineral aggregates is mainly local or regional and is influenced strongly by trends in domestic construction. However, in some populated regions, markets are not self-sufficient; in addition, international bulk shipping of aggregates has proven to be feasible in some areas.

Martin Marietta Materials Inc. purchased the granite aggregates quarry at Porcupine Mountain on the Strait of Canso near Port Hawkesbury, Nova Scotia. This operation had previously been operated by Construction Aggregates Ltd., a subsidiary of Lone Star Industries Inc. The annual capacity of the operation is about 2.0 Mt, and production will continue to serve local markets as well as some markets on the eastern and Gulf coasts of the United States and in the Caribbean Islands.

Major concerns by aggregates producers' associations in Canada relate to the environment and resource planning. More efforts are being directed toward government and public consultations, especially those related to provincial regulations and land-use planning. The Aggregate Producers' Association of Ontario is the largest and most active association in Canada; others becoming more active include the British Columbia Aggregate Producers Association and the Alberta Sand & Gravel Association.

Sand and Gravel

The diverse range of entities involved in mineral aggregates has presented challenges in efforts to capture complete production and consumption data. As a consequence, some estimates of output reported from some regions prior to 1992 may in fact be 25-30% higher than official statistics indicate. Included in these all-source estimates are designated areas, wayside sources, provincial transportation ministry sites, Crown lands, and private lands.

As existing land-based sources are depleted, there is growing potential for the economically viable marine dredging of sand and gravel in Canada. Offshore sand and gravel resources in Canada have been used to meet special job requirements in the Beaufort Sea, the Prince Rupert area, and at the Roberts Bank port facility near Vancouver. In Atlantic Canada it has been established that there is a good possibility of defining sufficient quantities of sand and gravel for marine dredging.

Crushed Stone

Many operations producing crushed stone are part-time or seasonal; others are operated as subsidiaries of construction or manufacturing establishments not classified with the stone industry. In addition, some operations are operated by municipal or provincial government departments producing stone only for their own use. Quarries removing rock by drilling, blasting and crushing are generally associated with large construction companies; in contrast, gravel pits are usually associated with smaller, more local needs. Depending on cost and availability, crushed stone competes with gravel and crushed gravel as an aggregate in concrete and asphalt, and as railway ballast and road-base aggregates (road metal). In these applications it is subject to the same physical and chemical-testing procedures as gravel and sand aggregates.

In **Atlantic Canada**, construction continued at Bull Arm, Trinity Bay, Newfoundland, on the $6.2 billion Hibernia offshore oilfield project. It is expected that work on the concrete gravity-based system for supporting the drilling and production platform will be completed in 1997, with drilling scheduled to begin the following year.

The Newfoundland Resources and Mining Company (NRMC), owned by a subsidiary of Explaura Holdings plc., was placed into bankruptcy in August 1995. The limestone/dolomite assets at Lower Cove on the Port au Port Peninsula in Newfoundland were purchased by North Star Cement Limited; the new operating company is expected to be called Atlantic Minerals Limited. Specialty markets relating to a high-purity limestone deposit near the main site, in addition to large-volume aggregates markets, are being re-evaluated. The aggregates plant, with a capacity to produce about 4.3 Mt/y, was designed mainly for long-distance bulk shipping and distribution.

Atlantic Industrial Minerals continued to supply limestone from its Glen Morrison deposit in Cape Breton to Nova Scotia Power Corporation's Point Aconi thermal-electric station, which uses circulating fluidized bed technology.

Plans by Kelly Rock Limited and an associate to develop a major coastal marine quarry for construction aggregates remained on hold pending an environmental review. The company plans to develop a site on deep water at Kelly's Mountain, about 40 km north of Sydney.

In **Quebec**, Marconi Quarries Ltd., situated on the north shore of the St. Lawrence River at Pointe-Noire near Sept-Îles, continued to produce a wide range of construction aggregates for widespread distribution. Reserves of anorthositic gabbro are said to be very large.

In **Ontario**, Dufferin Aggregates (a subsidiary of St. Lawrence Cement Inc.), operating near Milton with a capacity to produce up to 7 Mt/y, remains the largest quarrier in Canada. Following a growing pattern in the industry, the progressive and ongoing rehabilitation of the company's sites has become a major priority.

Manitoulin Dolomite, owned by Standard Aggregates Inc., is situated on Manitoulin Island in Lake Huron. Approximately 2.2 Mt/y of white-to-grey, fine-grained dolomite is shipped for construction, chemical and metallurgical markets in Canada and the United States.

Emphasis continued to be placed on the search in some areas for new sources of skid-resistant aggregates. Natural materials that have attracted attention, particularly in Ontario, include metavolcanic rocks, quartzite, granitic and igneous gravel, and hard, durable sandy carbonates and sandstones.

In **western Canada**, large-volume ocean transportation facilities have been used for many years in British Columbia to supply high-quality aggregates or high-calcium limestone. For example, limestone producers on Texada Island, situated about 100 km northwest of Vancouver in the Strait of Georgia, supply raw material to cement and lime producers on the lower mainland and in the state of Washington. Holnam West Materials Ltd. and its predecessor have been shipping from Texada since 1957. Road-base material and riprap for use in the lower mainland are also important products; special orders for related materials may be for destinations extending as far away as Alaska or northern California. Imasco Minerals Inc. (formerly International Marble & Stone Co. Ltd.), now owned by Sacks Industrial Group, continued to produce a wide range of minerals for filler and other applications.

RECYCLING

The recycling of concrete and other construction materials is expected to increase because of limitations on the use of landfill sites, as well as growing expertise in materials management within the construction industry. Again looking at Ontario as an example, more than 90 of about 145 asphalt plants in the province are producing some recycled hot-mix asphalt material, according to a recent study. In the future, the recycling of old pavement is expected to

increase, provided that quality control and engineering specifications are followed. With varying degrees of success, reclaimed glass, ceramics, brick, and crumb rubber have been investigated as potential aggregates.

There has been more emphasis in some regions of the province on developing sources of natural materials since the Ontario Ministry of Transportation stopped the use of steel slag as an aggregate in asphalt pavements. Moreover, it is believed that suitable substitutes are not available in large enough quantities to moderate the trend toward diminishing accessible reserves of primary construction aggregates.

WORLD DEVELOPMENTS

Large-scale coastal marine quarrying of aggregates for international markets continues to attract considerable attention. In the United Kingdom, environmental and land-use pressures have resulted in relatively less production from inland quarries and more production from large coastal super-quarries. In Ireland, a new coastal marine quarry known as the Wimpey Fleming Adrigole Quarry started production in 1993. Annual production is expected to rise to 2.0 Mt by the end of the decade. The project is only the second large-scale operation of its kind in Europe; it is expected that markets in the United Kingdom and continental Europe will be convenient for backhaul cargo. This scale of aggregates operation was first pioneered in 1986 by Foster Yeoman Ltd. at its Glensanda quarry on the west coast of Scotland. The Glensanda operation has been followed by the Vulcan Materials Co. joint venture on Mexico's Yucatan Peninsula, as well as by NRMC's large project described earlier.

Tarmac plc is establishing a 5-Mt/y coastal quarry at Jossingfjord in Norway, while Schweden Splitt AB is developing a granite aggregate quarry close to the south coast of Sweden, primarily for the Berlin and German Baltic coast markets. An anorthosite superquarry planned by Redlands Aggregates Limited on South Harris Island, Scotland, continues to be delayed due to environmental concerns about development in a natural scenic area.

Seabed mining of aggregates is currently the principal ocean-mining activity related to non-fuel minerals. In Japan, seabed sands account for about 40% of total domestic production of fine aggregates needed for concrete. As a general trend, more consideration is being given to the need for offshore dredging for aggregates because of growing demand and environmental and zoning constraints associated with on-shore developments. This is particularly true in the United States, although several factors have contributed to difficulties in drafting a seabed mining law that would alleviate major industry and environmental concerns.

LIGHTWEIGHT AGGREGATES

The classification of lightweight aggregates is based on source, processing methods, and end uses. Source rocks include pumice, scoria, volcanic cinders, and tuff. Manufactured lightweight aggregates are bloated or expanded products commonly obtained by heating certain clays, shales, and slates. Ultralightweights, produced mainly from perlite and vermiculite, are expanded or exfoliated by heating. Fly ash (produced mainly as a by-product of the combustion of coal and coke in thermal power plants), ground pelletized slag (resulting from metallurgical processes), and condensed silica fume (a by-product of the smelting process used to produce silicon metal and ferrosilicon alloys) are generally classified as supplementary cementing materials because of their pozzolanic characteristics.

Perlite

Perlite is a glassy volcanic rock containing 2-5% of combined water; after crushing and rapid heating to 760°-1100°C, perlite expands its volume from 4 to 20 times. Through attention to pre-blending of kiln feed and retention time in the kiln, expanded material weighing as little as 30-60 kg/m^3 can be produced.

Imported perlite is expanded at numerous locations for use mainly in horticultural peat mixes as well as in lightweight and fire-resistant construction products. Other uses relate to loose insulation and insulating media in concrete products. Imports of crude perlite are mainly from New Mexico and Colorado, with production from companies such as Grefco, Inc., Manville Corporation, USG Corporation, and United Perlite Corp. Perlite has not been produced in Canada since Aurun Mines Ltd. closed its processing plant in Surrey, British Columbia, in 1990. With improved markets over a wider range of grades, there is a possibility that other deposits may be developed in the future.

Production at the Otavi Minen perlite mine on the island of Milos, Greece, is expected to increase about 50% to 120 000 t/y following an expansion program that was completed in 1995. Otavi is a subsidiary of U.K.-based Cookson Matthey Ceramics. New shipping facilities will allow ships of up to 10 000 t to be loaded, and the company plans to deliver cost-competitive perlite to the east coast of North America.

Pumice

Numerous concrete product manufacturers, mainly block producers, use pumice imported from Greece or the northwestern United States. In Canada, a major potential use for this durable and angular material is in highway asphalt overlay as a highly skid-resistant ingredient.

In British Columbia, Great Pacific Pumice Inc. announced plans to develop its Mt. Meager pumice property situated about 150 km north of Vancouver.

Vermiculite

Vermiculite refers to a small group of minerals, physically resembling the lamellar structure of the micas, which expand or exfoliate greatly when heated rapidly. Canadian consumption is mainly for horticultural uses, with lesser amounts being used for insulation and other products.

The United States is the world's leading producer of vermiculite, with W.R. Grace and Company being the major supplier from the Enoree region of South Carolina. In addition to the United States, Canada also imports crude vermiculite from the Republic of South Africa where Palabora Mining Co. Ltd. is the major producer. Vermiculite occurrences have been reported in British Columbia, and deposits near both Perth and Peterborough in Ontario have attracted attention in the past.

Clay, Shale and Slag

Common clays and shale are used throughout Canada for manufacturing lightweight aggregates. Raw clay materials, usually quarried adjacent to plant sites, receive little beneficiation other than drying before going to the kiln where they are expanded. Shales are crushed and screened before burning. Slag, a porous, glassy, nonmetallic by-product resulting from controlled cooling conditions at the end of the steel-making process, may be crushed and sized for many construction-related applications.

Ongoing research, sponsored through the Canada Centre for Mineral and Energy Technology (CANMET), relating to supplementary cementing materials led to the successful use of ground granulated blast furnace slag for use as a cementitious material in concrete. Lafarge Canada Inc. now produces this type of material, commonly referred to as "slag cement," at a grinding plant at Spragge, Ontario. The granulated slag is from a plant owned by Algoma Steel Inc. at Sault Ste. Marie. Plant capacity is about 150 000 t/y of slag cement for complete or partial replacement of Portland cement, depending on requirements. The current primary use is for mine backfill.

PRICES

In addition to supply/demand factors, prices of the various aggregates are determined locally or regionally on the basis of production and transportation costs, the degree of processing prior to final use, and by site-specific volume requirements.

USES

Canada is one of the world's leading consumers of construction aggregates on a per capita basis. During peak years of construction, consumption of aggregates for all uses amounted to about 16 t per capita. In comparison, peak aggregates consumption in three leading Scandinavian countries has been estimated to be about 11 t per capita. Recently, aggregates consumption in Canada has decreased to about 11 t per capita based on the rather depressed 1995 shipments data.

According to a recent study by the Ontario Ministry of Natural Resources, the construction of single-family homes triggers an overall demand of about 300 t of aggregate per unit, while apartment construction requires about 50 t per unit.

More than 90% of the total stone output used by the construction industry is for crushed material used as aggregates for concrete and asphalt, as granular materials for highway and railway construction, and as granular materials for a broad range of other uses such as construction fill. Specifications vary greatly depending on intended uses, and many tests are required to determine the acceptability of aggregates for certain applications. Also of importance are tests concerning: organic impurities or other deleterious materials; resistance of the aggregate to abrasion and freeze-thaw cycles; the effects of thermal expansion, porosity and absorption; reactivity with associated materials; and surface texture.

Lightweight concrete used in commercial and institutional projects has facilitated the construction of taller buildings and the use of longer clear spans in bridges and buildings. Other advantages of using lightweight aggregates relate to their thermal and acoustical properties, fire resistance, freeze-thaw properties, and low water-absorption characteristics.

OUTLOOK

Shipments of aggregates in 1996 in Canada are expected to increase moderately based on continuing strength in engineering construction and a moderate increase in housing starts. Engineering-related construction will continue to benefit from the federal-led, cost-shared program for infrastructure renewal involving the cooperative efforts of all three levels of government. Also, the outlook for the office and industrial building sectors is expected to continue to improve.

In Atlantic Canada, most construction for the Hibernia offshore oil project will be completed by late 1996; the bridge between Prince Edward Island and New Brunswick is expected to meet its maximum needs for aggregates in 1996, with completion scheduled in 1997.

The demand for aggregates in the United States is forecast to increase about 3% in 1996 based on the continuing strength of expenditures related to all types of building construction, as well as engineering construction. The signing of the *National Highway System Designation Act* will allow about $6 billion in federal funds for road and bridge repair in both 1996 and 1997.

Urban expansion has greatly increased the demand for aggregates in support of major construction. Paradoxically, urban spread has not only tended to overrun operating pits and quarries, but has also extended into areas containing potentially valuable reserves and resources. In this context, and in view of advancements in rehabilitation techniques, municipal and regional zoning can be expected to become more coordinated and balanced concerning land planning and management.

Prices for delivered aggregates will continue to rise with increasing land values, the depletion of more accessible reserves, and higher rehabilitation expenditures. However, from the perspective of many producers, the costs associated with the permitting process have become barriers to entry; therefore, new acquisitions rather than new projects have been favoured.

Estimates suggest that available sand and gravel supplies in some regions will be depleted during the 1990s, resulting in a need to develop outlying deposits. Predicted shortages could encourage the exploitation of offshore deposits and even underground mining in some regions.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 70. (2) Information in this review was current as of February 1, 1996.

TABLE 1. CANADA, TOTAL PRODUCTION OF STONE, 1993-95

	1993		1994		1995p	
	(000 t)	($000)	(000 t)	($000)	(000 t)	($000)
BY PROVINCE[1]						
Newfoundland	1 871	7 186	1 416	11 924	1 178	12 357
Nova Scotia	5 179	24 563	5 454	29 271	5 681	31 761
New Brunswick	3 217	18 553	3 057	19 195	3 416	17 910
Quebec	33 294	202 708	34 069	208 128	32 413	195 400
Ontario	37 934r	221 984r	39 445	236 483	39 303	247 694
Manitoba	2 476	10 948	2 861	12 032	2 453	9 547
Alberta	325	3 176	382	3 996	201	1 112
British Columbia	4 253	32 265	4 904	35 530	6 318	37 806
Northwest Territories and Yukon	821	4 560	913	3 332	1 261	4 991
Total	89 370r	525 942r	92 502	559 890	92 224	558 577
BY USE[2]						
Dimensional stone						
Rough	196	19 855	199	22 924	..	..
Monumental and ornamental stone (n.f.)	42	4 724	45	4 900	..	..
Other (flagstone, curbstone, paving blocks, etc.)	33	3 336	69	3 699	..	..
Lining open-hearth furnaces	5	46	–	–	..	..
Chemical and metallurgical						
Cement plants, Canada	11 472	35 993	13 321	42 044	..	..
Cement plants, foreign	1 329	5 643	1 654	7 274	..	..
Flux in iron and steel furnaces	198	1 446	190	1 359	..	..
Flux in nonferrous smelters	230	1 601	154	956	..	..
Clay plants, Canada	623	1 951	–	–	..	..
Glass factories	184	3 491	158	3 158	..	..
Lime plants, Canada	2 893	21 897	2 367	20 565	..	..
Lime plants, foreign	420	2 474	1 124	4 541	..	..
Pulp and paper mills	224	2 355	234	1 900	..	..
Sugar refineries	14	64	16	75	..	..
Other chemical uses	244	1 810	1 400	8 290	..	..
Pulverized stone						
Whiting	41	2 909	41	3 122	..	..
Asphalt filler	54	205	124	484	..	..
Dusting coal mines	7	321	57	1 171	..	..
Agricultural purposes and fertilizer plants	844	13 006	1 002	14 141	..	..
Other uses	999	14 612	1 125	21 888	..	..
Miscellaneous stone						
Manufacture of artificial stone	18	185	21	184	..	..
Roofing granules	388	8 048	450	11 169	..	..
Poultry grit	48	954	57	1 163	..	..
Stucco dash	15	1 147	24	1 475	..	..
Terrazzo chips	2	308	3	279	..	..
Rock wool	18	440	13	125	..	..
Rubble and riprap	997	7 035	827	4 137	..	..
Other uses	1 357	9 162	1 247	8 934	..	..
Crushed stone for						
Concrete aggregate	10 253	57 962	9 592	55 842	..	..
Asphalt aggregate	10 130	57 070	8 025	47 200	..	..
Road metal	32 928	162 634	33 974	170 880	..	..
Railroad ballast (includes traprock)	1 876	14 243	2 390	20 209	..	..
Other uses	26 280	127 919	29 101	141 668	..	..
Total	104 359	587 295	109 003	625 756	..	..

Sources: Natural Resources Canada; Statistics Canada.
.. Not available; n.f. Not finished or dressed; p Preliminary; r Revised.
1 Data exclude stone used in the Canadian cement and lime industries. 2 Data include stone used in the Canadian cement and lime industries.
Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, PRODUCTION OF SAND AND GRAVEL[1] BY PROVINCE, 1993-95

	1993		1994		1995[p]	
	(000 t)	($000)	(000 t)	($000)	(000 t)	($000)
Newfoundland	3 257	14 509	2 728	16 200	2 778	16 025
Prince Edward Island	295	1 076	272	1 190	263	1 181
Nova Scotia	4 656	20 227	3 832	19 271	3 747	18 720
New Brunswick	4 427	12 612	4 445	x	4 376	x
Quebec	33 987	100 298	33 595	104 075	28 423	96 894
Ontario	94 033	325 526	101 926	363 198	102 358	365 771
Manitoba	13 112	33 679	13 587	x	13 452	x
Saskatchewan	5 872	16 211	7 430	x	7 593	x
Alberta	34 324	127 718	35 403	137 996	33 655	131 595
British Columbia	40 241	135 398	38 101	146 932	38 334	142 629
Yukon	2 597	7 764	2 420	7 010	2 417	7 000
Northwest Territories	1 337	4 221	1 541	7 737	2 474	13 405
Total	238 137	799 240	245 278	870 107	239 870	860 084

Sources: Natural Resources Canada; Statistics Canada.
p Preliminary; x Confidential.
1 Production represents shipments of natural gravel, sand and crushed gravel, and quartz-silica, excluding silica used in Canadian cement plants.
Note: Numbers may not add to totals due to rounding.

TABLE 3. AVAILABLE DATA ON CONSUMPTION OF SAND AND GRAVEL,[1] BY PROVINCE, 1993 AND 1994

		Atlantic Provinces	Quebec	Ontario	Western Provinces[2]	Canada
				(000 tonnes)		
Road bed, surface	1993	7 609	20 562	56 187	58 015	142 373
	1994	6 104	20 525	56 760	55 595	138 984
Roads, ice control	1993	575	1 158	3 454	1 268	6 455
	1994	496	972	3 976	1 359	6 802
Concrete aggregate	1993	1 202	3 897	9 315	13 048	27 462
	1994	1 501	3 796	10 639	12 961	28 897
Asphalt aggregate	1993	1 672	3 423	6 148	7 195	18 438
	1994	1 278	3 431	6 992	8 892	20 593
Railroad ballast	1993	11	53	11	386	461
	1994	9	14	211	572	806
Mortar sand	1993	61	234	657	239	1 191
	1994	65	264	810	302	1 441
Backfill for mines	1993	. . .	198	502	68	768
	1994	. . .	262	406	27	696
Fill	1993	824	2 275	7 917	6 144	17 160
	1994	740	2 181	9 214	7 800	19 935
Other special uses[3]	1993	97	616	549	489	1 751
	1994	97	597	622	400	1 716
Other purposes	1993	583	1 636	9 399	10 815	22 433
	1994	1 020	1 640	12 650	11 018	26 328
Total	1993	12 635	34 053	94 139	97 667	238 494
	1994	11 309	33 682	102 280	98 926	246 197

Sources: Natural Resources Canada; Statistics Canada.
– Nil; **. . .** Amount too small to be expressed.
1 Data include natural silica sand, silica sand manufactured from quartz or silica rock, and silica used in Canadian cement plants. **2** The western provinces include the Yukon and Northwest Territories. **3** Includes glass manufacture, ferrosilicon carbide manufacture, silica brick manufacture, chemical manufacture, smelter flux, sand blasting, and moulding and core sands.

TABLE 4. CANADA, EXPORTS AND IMPORTS OF SAND AND GRAVEL AND CRUSHED STONE, 1993-95

Item No.		1993		1994		1995p	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
EXPORTS							
2505.90	Natural sands n.e.s., excluding metal-bearing sands						
	United States	118 636	918	95 466	875	61 863	662
	Bermuda	7 397	72	–	–	25 129	214
	Netherlands	–	–	–	–	11 353	89
	St. Pierre and Miquelon	–	–	–	–	1 554	24
	St. Helena	69 544	723	–	–	–	–
	Taiwan	–	–	900	68	–	–
	Hong Kong	–	–	100	16	–	–
	Other countries	49	14	42	7	20	6
	Total	195 626	1 727	96 508	966	99 919	995
2517.10	Pebbles, gravel, broken or crushed stone used for aggregates, etc.						
	United States	1 991 839	14 498	1 989 060	17 573	2 473 367	19 416
	Netherlands	–	–	–	–	56 162	845
	Grenada	–	–	–	–	9 572	530
	Bermuda	15 296	139	4 705	53	28 262	242
	France	–	–	6	18	44 730	138
	Other countries	1 879	19	79	7	–	–
	Total	2 009 014	14 656	1 993 850	17 651	2 612 093	21 171
2517.41	Marble granules, chippings and powder of 25.14 or 25.16, heat-treated or not						
	United States	33 673	4 361	50 401	6 496	80 258	8 806
	Other countries	–	–	–	–	148	18
	Total	33 673	4 361	50 401	6 496	80 406	8 824
2517.49	Granules, chippings and powder, n.e.s., of 25.15 or 25.16, heat-treated or not						
	United States	27 505	168	3 011	179	180 336	622
	Other countries	40	6	3	1	61	33
	Total	27 545	174	3 014	180	180 397	655
2518.10	Dolomite, not calcined						
	United States	294 857	1 397	198 991	1 229	310 873	1 857
	Trinidad and Tobago	–	–	20 892	289	24 252	280
	Other countries	20	4	83	15	8 635	128
	Total	294 877	1 401	219 966	1 533	343 760	2 265
2518.20	Calcined dolomite						
	United States	33 237	5 075	38 590	5 137	62 132	9 201
	Trinidad and Tobago	17 465	236	–	–	49 544	588
	Netherlands	–	–	–	–	34 513	473
	Japan	20	2	39	15	–	–
	Total	50 722	5 313	38 629	5 152	146 189	10 262
2518.30	Agglomerated dolomite (including tarred dolomite)						
	Trinidad and Tobago	76 598	954	70 681	1 031	26 041	301
	Other countries	–	–	40	8	334	49
	Total	76 598	954	70 721	1 039	26 375	350
2521.00	Limestone flux; limestone and other calcareous stone used for lime or cement						
	United States	1 943 174	10 507	2 270 836	16 766	2 286 651	15 631
	Other countries	–	–	4 022	15	18 282	10
	Total	1 943 174	10 507	2 274 858	16 781	2 304 933	15 641
IMPORTS							
2505.90	Natural sands n.e.s., excluding metal-bearing sands						
	United States	399 008	4 303	317 468	3 881	286 623	4 749
	Norway	–	–	1 066	65	3 272	116
	United Kingdom	616	42	110	29	1 949	63
	France	36	7	–	–	66	20
	Other countries	1 350	253	465	108	194	28
	Total	401 010	4 605	319 109	4 083	292 104	4 976

TABLE 4 (cont'd)

Item No.		1993		1994		1995p	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
IMPORTS (cont'd)							
2517.10	Pebbles, gravel, broken or crushed stone used for aggregates, etc.						
	United States	948 150	7 426	634 409	6 826	1 214 711	10 939
	France	437	6	800	12	1 175	19
	Indonesia	–	–	–	–	108	13
	Belgium	267	4	526	4	488	5
	Germany	1 061	16	2 342	21	246	4
	Other countries	94	3	723	7	439	12
	Total	950 009	7 455	638 800	6 870	1 217 167	10 992
2517.20	Macadam of slag, dross or similar industrial waste, etc.						
	United States	832	12	492	7	339	5
	Total	832	12	492	7	339	5
2517.30	Tarred macadam						
	United States	261	12	95	7	552	31
	Total	261	12	95	7	552	31
2517.41	Marble granules, chippings and powder of 25.15 or 25.16, heat-treated or not						
	United States	54 928	7 270	50 507	7 230	77 592	10 467
	France	600	71	284	56	150	30
	Italy	149	21	150	21	105	16
	Other countries	–	–	197	39	–	–
	Total	55 677	7 362	51 138	7 346	77 847	10 513
2517.49	Granules, chippings and powder, n.e.s., of 25.15 or 25.16, heat-treated or not						
	United States	176 178	2 200	221 045	3 508	264 552	3 366
	France	298	37	568	71	742	92
	Other countries	–	–	79	9	770	75
	Total	176 476	2 237	221 692	3 588	266 064	3 533
2518.10	Dolomite, not calcined						
	United States	10 619	2 071	4 643	1 031	2 141	377
	United Kingdom	28	9	30	10	90	29
	Germany	–	–	–	–	2	1
	Total	10 647	2 080	4 673	1 041	2 233	407
2518.20	Calcined dolomite						
	United States	5 911	470	11 968	791	7 242	749
	Total	5 911	470	11 968	791	7 242	749
2518.30	Agglomerated dolomite (including tarred dolomite)						
	United States	54	29	299	159	47	25
	United Kingdom	–	–	–	–	1	. . .
	Total	54	29	299	159	48	25
2521.00	Limestone flux; limestone and other calcareous stone used for lime or cement						
	United States	4 022 341	17 767	3 962 535	18 146	4 499 620	20 917
	Portugal	–	–	7 681	45	5 701	33
	Lebanon	–	–	3 228	19	3 098	18
	Germany	–	–	117	1	2 759	16
	France	–	–	26 892	426	1 090	6
	Other countries	865	5	200	1	2 535	14
	Total	4 023 206	17 772	4 000 653	18 638	4 514 803	21 004

Source: Statistics Canada.
– Nil; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; p Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 5. LIGHTWEIGHT AGGREGATE PRODUCERS IN CANADA, 1994

Company	Location	Commodity	Remarks
ATLANTIC PROVINCES			
Fafard Peat Moss Company Ltd.	Shippagan, N.B.	Perlite, vermiculite	Processed for use in horticulture.
Sun Gro Horticulture Canada Ltd.	Maisonnette, N.B.	Perlite	Processed for use in horticulture.
QUEBEC			
Premier Peat Moss Ltd.	Rivière du Loup	Perlite, vermiculite	Processed for use in horticulture.
Vermi-lite Inc.	Baie-du-Febvre	Perlite	Processed for use in horticulture and loose insulation.
ONTARIO			
National Slag Limited	Hamilton	Slag	Used in concrete products industry and as slag cement.
V.I.L. Vermiculite Inc.	Woodbridge	Vermiculite, perlite	Vermiculite processed for use in loose insulation, horticulture and concrete products. Perlite processed for use in horticulture.
W.R. Grace & Co. of Canada Ltd.	Ajax	Vermiculite, perlite	Vermiculite processed for use in horticulture, as loose insulation, in refractories, and in friction materials. Perlite processed for use in gypsum plaster, horticulture, refractories and as loose insulation.
PRAIRIE PROVINCES			
Cindercrete Products Limited	Saskatoon, Sask.	Expanded clay	Processed for concrete products industry.
Inland Cement Limited	Calgary, Alta.	Expanded shale	Processed for concrete products industry and for loose insulation.
	Edmonton, Alta.	Expanded clay	Processed for concrete products industry, loose insulation and as bedding for oil and gas pipelines.
Kildonan Concrete Ltd.	Winnipeg, Man.	Expanded clay	Processed for concrete products industry and horticulture.
Sun Gro Horticulture Canada Ltd.	Elma, Man.	Perlite	Processed for use in horticulture.
Sun Gro Horticulture Canada Ltd.	Seba Beach, Alta.	Perlite	Processed for use in horticulture.
W.R. Grace & Co. of Canada Ltd.	Winnipeg, Man.	Vermiculite, perlite	Perlite processed for use in gypsum plaster and in horticulture.
	Edmonton, Alta.	Vermiculite, perlite	Vermiculite processed for use in horticulture and as loose insulation.
BRITISH COLUMBIA			
Ocean Construction Supplies Limited	Vancouver	Pumice	Purchased for concrete products industry.
W.R. Grace & Co. of Canada Ltd.	Vancouver	Vermiculite, perlite	Mainly for horticulture.

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."

TABLE 6. CANADA, IMPORTS OF VERMICULITE, PERLITE AND PUMICE, 1993-95

Item No.		1993		1994		1995p	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
2513.11	Pumice stone, crude or in irregular pieces, including crushed pumice						
	United States	7 095	700	7 428	776	5 066	625
	Turkey	3 602	636	4 591	741	3 980	605
	Greece	511	84	697	103	266	38
	Zaire	–	–	–	–	40	14
	Other countries	11	2	21	5	46	17
	Total	11 219	1 422	12 737	1 625	9 398	1 299
2513.19	Pumice stone, other						
	United States	3 754	719	3 345	737	2 699	579
	Turkey	105	17	144	21	815	171
	Germany	123	43	104	37	87	30
	South Korea	36	12	8	3	76	27
	Taiwan	29	10	48	17	64	22
	United Kingdom	444	155	–	–	1	. . .
	Ecuador	358	118	168	29	–	–
	Other countries	25	9	12	5	33	4
	Total	4 874	1 083	3 829	849	3 775	833
2530.10.10.10	Vermiculite, unexpanded						
	South Africa	7 917	1 488	10 734	2 038	11 446	2 482
	United States	7 479	1 022	6 610	1 189	7 067	1 254
	Greece	79	7	–	–	1 257	120
	Brazil	–	–	100	14	100	12
	Other countries	–	–	72	19	2	1
	Total	15 475	2 517	17 516	3 260	19 872	3 869
2530.10.10.20	Perlite, unexpanded						
	United States	21 908	3 531	26 231	4 017	29 714	4 477
	Greece	8 735	708	11 324	1 004	7 855	768
	Mexico	19	3	–	–	–	–
	Morocco	–	–	50	2	–	–
	Total	30 662	4 242	37 605	5 023	37 569	5 245
3802.90.20	Activated perlite, excluding expanded perlite ground to be employed in filtering						
	United States	158	91	266	170	197	182
	Total	158	91	266	170	197	182
6806.20.00.10	Exfoliated (expanded) vermiculite						
	United States	266	576	274	621	319	664
	Other countries	–	–	. . .	1	2	4
	Total	266	576	274	622	321	668
6806.20.00.20	Expanded perlite						
	United States	4 251	2 404	5 149	3 198	6 140	4 360
	Other countries	–	–	1	4	19	15
	Total	4 251	2 404	5 150	3 202	6 159	4 375

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed; p Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 7. CANADA, LIGHTWEIGHT AGGREGATES PRODUCED, SOLD AND USED, 1993 AND 1994

	1993				1994			
	Produced		Sold and Used		Produced		Sold and Used	
	(m^3)	($)	(m^3)	($)	(m^3)	($)	(m^3)	($)
From domestic and/or imported raw materials								
Expanded clay, shale and slag[1]	173 782	5 058 380	177 438	5 193 838	185 549	6 185 970	184 189	6 171 086
From imported crude materials								
Expanded perlite and exfoliated vermiculite[1]	380 436	19 233 050	402 927	20 510 149	383 749	19 372 046	397 657	20 118 815
Total	554 218	24 291 430	580 365	25 703 987	569 298	25 558 016	581 846	26 289 901

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada" (see Table 5 for list of establishments surveyed).
[1] Combined to avoid disclosing confidential company data.

TABLE 8. CANADA, SALES OF EXPANDED SLAG, PERCENTAGE BY END USE, 1992-94

Use	1992	1993	1994
		(%)	
Concrete block manufacture	90.0	90.0	75.0
Ready-mix concrete	10.0	10.0	5.0
Miscellaneous uses	–	–	20.0

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."
– Nil.
Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 9. CANADA, SALES OF EXPANDED CLAY AND SHALE, PERCENTAGE BY END USE, 1992-94

Use	1992	1993	1994
		(%)	
Loose insulation	49.9	47.6	54.3
Concrete block manufacture	38.1	37.5	28.0
Precast concrete manufacture	10.3	12.9	11.0
Ready-mix concrete	1.0	2.0	1.5
Horticulture and miscellaneous uses	0.7	–	5.2

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."
– Nil.
Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 10. CANADA, SALES OF EXPANDED PERLITE, PERCENTAGE BY END USE, 1992-94

Use	1992	1993	1994
		(%)	
Horticulture and agriculture	69.5	92.3	92.4
Insulation			
in gypsum products	0.2	0.4	0.4
in other construction materials	25.4	–	–
Loose insulation and miscellaneous uses	4.8	7.3	7.2

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."
– Nil.
Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 11. CANADA, SALES OF EXPANDED VERMICULITE, PERCENTAGE BY END USE, 1992-94

Use	1992	1993	1994
		(%)	
Horticulture	82.5	84.2	81.4
Loose insulation	2.9	7.1	8.0
Miscellaneous uses	14.6	8.7	10.6

Source: Natural Resources Canada, reported from NRCan survey "Production of Lightweight Aggregates in Canada."
Notes: See Table 5 for list of establishments surveyed. Sales also imply quantities consumed for own use.

TABLE 12. CANADA, VALUE OF CONSTRUCTION BY TYPE, 1991-93

	1991[a]	1992[b]	1993[b]
		($ millions)	
BUILDING CONSTRUCTION			
Residential	34 768	33 676	32 577
Industrial	3 642	2 563	2 219
Commercial	13 436	9 331	8 479
Institutional	5 845	4 536	4 123
Other building	3 210	1 854	1 840
Subtotal	60 901	51 960	49 238
ENGINEERING CONSTRUCTION			
Marine	553	415	243
Transportation	6 334	5 113	5 340
Waterworks, sewage systems	2 660	903	793
Dams, irrigation	399	1 175	1 303
Electric power	6 859	5 944	5 347
Railway, telephones	3 135	1 561	1 587
Gas and oil facilities	9 629	7 291	9 503
Other engineering	3 686	2 055	2 188
Subtotal	33 254	24 457	26 304
Total construction	94 154	76 417	75 542

Sources: Natural Resources Canada; Statistics Canada, Catalogue no. 64-201 (1991) and Catalogue no. 61-223 (1992 and 1993).
a Expenditures include total value of new and repair work purchased.
b Expenditures include value of new as well as major renovation work purchased.
Note: Numbers may not add to totals due to rounding.

TABLE 13. CANADA, VALUE OF CONSTRUCTION BY PROVINCE,[1] 1991-93

	1991[1]			1992[2]			1993[2]		
	Building Construction[2]	Engineering Construction[2]	Total	Building Construction[2]	Engineering Construction[2]	Total	Building Construction[2]	Engineering Construction[2]	Total
	($ millions)								
Newfoundland	906	871	1 777	699	876	1 575	696	1 308	2 004
Nova Scotia	1 544	955	2 499	1 160	744	1 904	1 255	647	1 902
New Brunswick	1 150	837	1 987	948	457	1 405	939	664	1 603
Prince Edward Island	257	99	356	194	88	282	211	65	276
Quebec	14 032	6 369	20 401	11 076	4 779	15 855	10 796	5 117	15 913
Ontario	24 980	8 978	33 958	20 244	7 032	27 276	17 634	5 953	23 587
Manitoba	1 500	1 226	2 725	1 103	885	1 988	1 174	735	1 909
Saskatchewan	1 269	2 254	3 523	949	1 376	2 325	961	1 481	2 442
Alberta	5 577	7 170	12 747	5 573	5 307	10 880	5 478	7 072	12 550
British Columbia, Yukon and Northwest Territories	9 684	4 497	14 182	10 014	2 913	12 927	10 094	3 262	13 356
Total Canada	60 901	33 254	94 155	51 960	24 457	76 417	49 238	26 304	75 542

Sources: Natural Resources Canada; Statistics Canada, Catalogue no. 64-201 (1991) and Catalogue no. 61-223 (1992 and 1993).
[1] Expenditures include total value of new and repair work purchased. [2] Expenditures include value of new as well as major renovation work purchased.
Note: Numbers may not add to totals due to rounding.