Mineral Aggregates

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INTRODUCTION

Mineral aggregate production in Canada consists of natural sand and gravel and crushed stone products. These products are used in the construction, manufacturing, chemical and metallurgical industries. Production of construction aggregates is a very important part of the Canadian economy with operations near most communities. These urban mining activities are largely invisible to the general public when in operation; however, public interest increases when new or expanded quarries are proposed. Total volumes of sand, gravel and crushed stone extracted in Canada each year make this commodity the largest by volume of any mineral mined in Canada.

Natural sands and gravels are unconsolidated deposits that are extracted from glacially derived materials and river channels. Limestone, granite and shale are also mined and crushed to provide aggregates for the construction, chemical and metallurgical industries.

This report also includes data on the production and use of lightweight aggregates comprising vermiculite, perlite, pumice, and expanded clays and shale.

CANADIAN INDUSTRY

In Canada, total production of sand and gravel in 2004 was 248.2 Mt valued at $1.079 billion. This represents an increase of 1.5% over 2003 production. Production of crushed stone in 2003 used for aggregate, road metal, ballast and miscellaneous uses totalled 114.7 Mt (Table 1, by use). Table 2 shows production of sand and gravel by province. Use of crushed limestone in cement plants increased 11.5% in 2003 while crushed limestone production for Canadian lime plants increased 11.1%. When comparing 2004 against 2003 sand and gravel production, Quebec saw a decrease of 9.4%, Ontario production increased by 3.5%, Alberta's production was unchanged, and British Columbia saw the largest increase in production at 11.8%. Figure 1 shows the sand and gravel production trend for the largest producing provinces for the period 1994-2004. Sand and gravel production in Ontario has almost returned to the 1999 peak of 105.7 Mt, while trends for the other provinces remain relatively flat. Figure 2 shows the relative percentage of chemical stone and crushed stone produced in Canada since 1992. Chemical stone production, mainly for cement and lime, has remained steady while crushed construction aggregate steadily increased to 2001 before levelling off in recent years. The sand and gravel industry in Canada employed 4142 workers at 396 reporting establishments in 2003 (Statistics Canada Catalogue no. 26-226-XIB).

According to *Aggregates and Roadbuilding Magazine*, the top five quarries in Canada in 2004 were: Manitoulin quarry in Ontario (Lafarge Canada Inc.) - 5.39 Mt; the Texada Island Ltd. quarry in British Columbia (Texada Quarrying) - 5.0 Mt; the Dundas quarry in Ontario (Lafarge Canada) - 4.76 Mt; the Milton quarry in Ontario (Dufferin Aggregates) - 4.04 Mt; and Porcupine Mountain quarry in Nova Scotia (Martin Marietta Materials, Inc.) - 3.8 Mt. The production levels reported at the Manitoulin quarry represent an increase of 25% over 2003 while, at the Texada Island quarry, production increased 38% over the previous year.

INDUSTRY DEVELOPMENTS

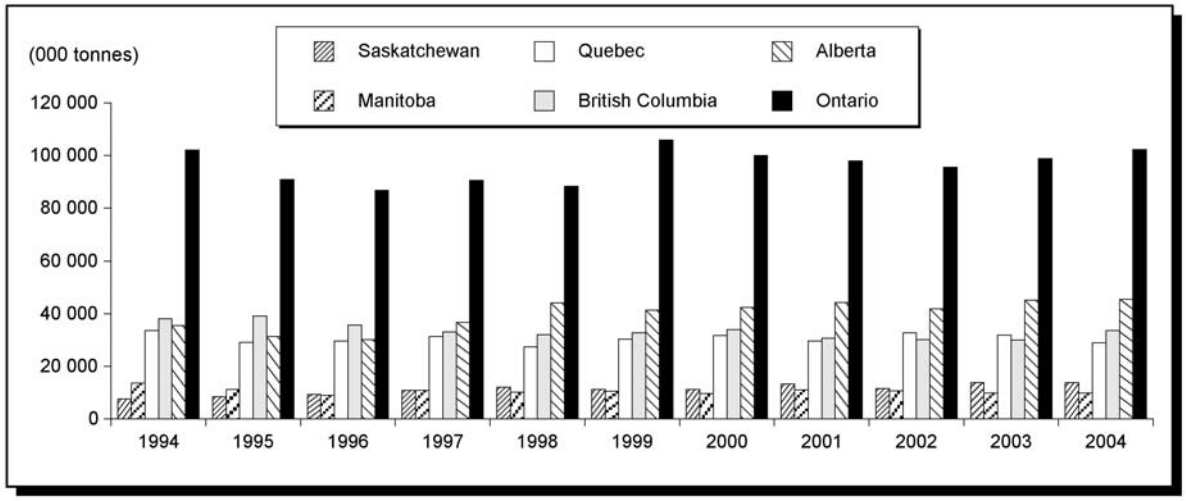
Birch Mountain Resources Ltd. of Calgary, Alberta, conducted a pre-feasibility drilling program on its Muskeg Valley limestone project located 60 km north of Fort McMurray, Alberta. The company is developing a quarry that would produce crushed limestone for construction uses, as well as high-quality chemical-grade limestone for quicklime production. In a technical report filed by the company, the forecast demand is for 6.5 Mt of base aggregates and 0.4 Mt of concrete aggregates per year beginning in 2005. Late in the year, the company completed an environmental impact assessment for the project.

Martin Marietta Materials, Inc. announced plans to expand capacity at its Porcupine Mountain quarry near Aulds Cove,

Nova Scotia, to 4.35 Mt/y from 2.9 Mt/y. The crushed granite from the quarry is shipped to the eastern seaboard states, the Gulf Coast and the Caribbean. In 2003, the quarry reported production of 3.2 Mt of aggregate.

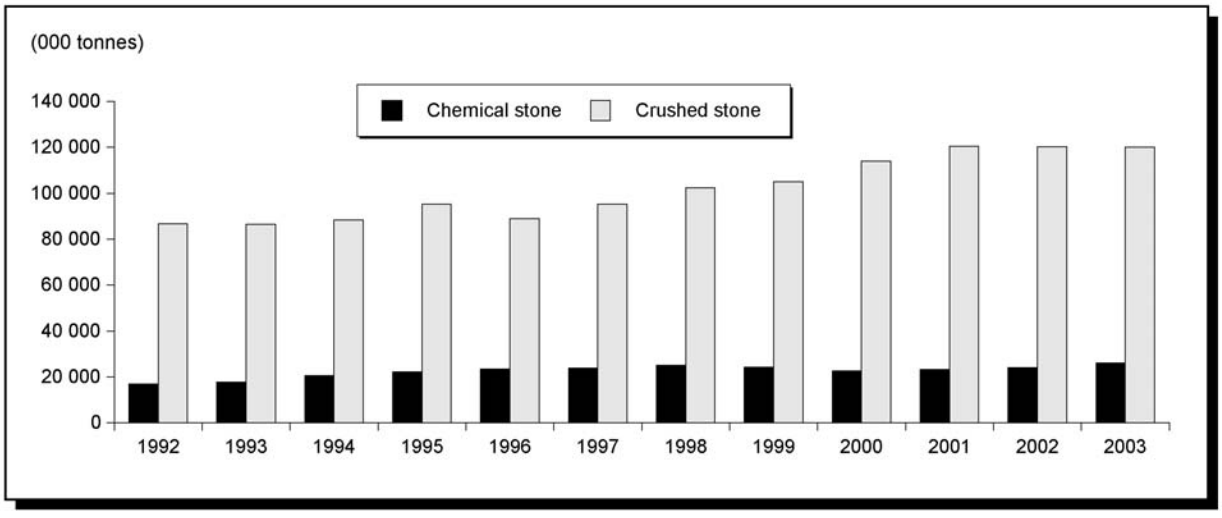
Superior Aggregates Company of Michigan is planning to start a trap rock quarrying operation at Michipicoten Harbour, near Wawa, Ontario, about 230 km north of Sault Ste. Marie. The project would see about 23 000 t per week (1.2 Mt/y) of crushed basalt transported by lake freighter to markets in Ontario and the U.S. Midwest. The area in which the project lies has been designated under the *Ontario Aggregate Resources Act*, which spells out the regulations governing the operation and closure of pits and quarries in Ontario. The provincial government subsequently announced that the project will not have to undergo a full environmental assessment.

Figure 1
Canadian Sand and Gravel Production, 1994-2004



Source: Natural Resources Canada.

Figure 2
Canadian Crushed Stone Production, 1992-2003



Source: Natural Resources Canada.

Construction Aggregates Ltd., part of the Lehigh Northwest Materials/Heidelberg Cement Group, continued to ship quality aggregates to the San Francisco-Oakland Bay Bridge project from its Sechelt, B.C. quarry. Some of the aggregates are being used in precast concrete sections for the Skyway portion of the project that call for stringent concrete specifications, including 58 MPa compressive strengths. To date, the quarry has shipped over 60 ocean freighters of aggregate to the San Francisco Bay area.

A new quarry proposal in southern Ontario is seeing opposition from local area residents. The proposal by Lowndes Holdings Corp. is to establish a 3-Mt/y limestone aggregate quarry in Flamborough Township near the community of Carlisle (60 km southwest of Toronto). However, the planned development may oppose provisions in the proposed Ontario Greenbelt protection plan. Current operating quarries in the area are being depleted of their permitted resources and demand is still high for good-quality limestone as a construction aggregate within a relatively short haul of the Greater Toronto area.

USE

High-quality aggregates, including sand, gravel and crushed stone, are key ingredients in ready-mix concrete, precast concrete products, asphalt pavements and subsurface fill. Aggregate is usually described as either coarse aggregate (greater than 4.75 mm) or fine aggregate (passing 4.75 mm). Aggregates generally make up about 95% of the total mass of hot-mix asphalt and 90% by mass of concrete. Hot-mix asphalt contains about equal amounts of coarse and fine aggregates whereas concrete contains more coarse than fine aggregate. Construction aggregate specifications deal with such parameters as particle shape and size distribution, strength and hardness, durability and porosity, as well as chemical reactivity.

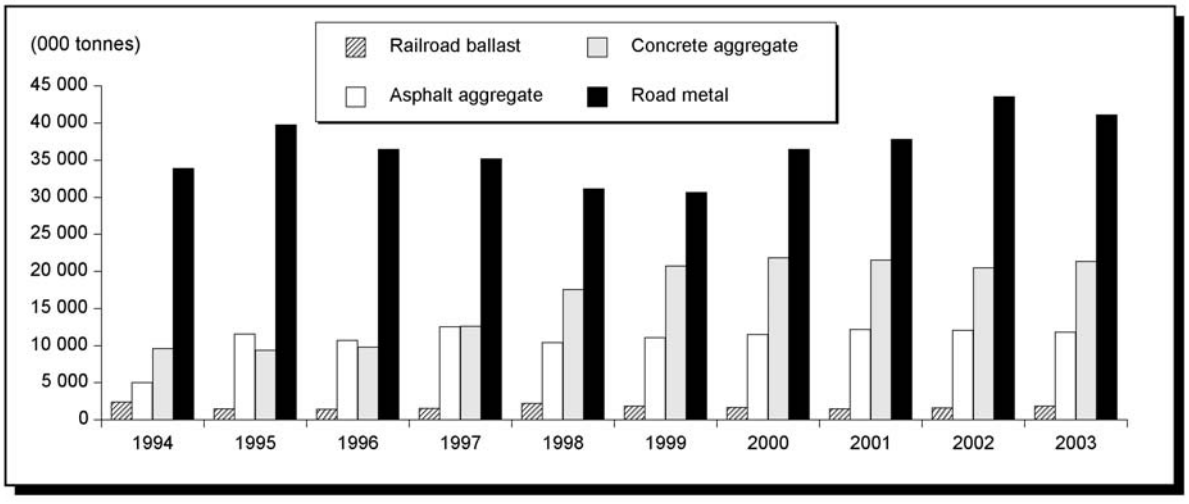
Statistics on the use of crushed stone for 2002 and 2003 are provided in Table 1. The production trend for the period 1994-2003 is shown in Figure 3, which shows a steady increase in the production of road metal (sub-base material) since 1999 and a levelling off in the production of concrete and asphalt aggregates. A breakdown of sand and gravel use by region for 2002 and 2003 can be found in Table 3. In a typical concrete mixture, one cubic metre of concrete contains about 800 kg of sand and 1300 kg of crushed stone. One kilometre of six-lane expressway requires about 52 000 t of aggregate while a new home typically uses 440 t (Aggregate Producers' Association of Ontario).

TRADE

Export and import data for sand and gravel and crushed stone products are given in Table 4. Included are natural sands and gravel, granules and chippings, uncalcined and calcined dolomite, and crushed limestone. In 2004, Canada exported 6.2 Mt of gravel and crushed stone valued at $60 million, of which 93% went to the United States. In addition, exports of crushed, uncalcined dolomite amounted to 3.8 Mt valued at $33.5 million and exports of crushed limestone for the cement and lime industries totalled 2.7 Mt valued at $17.2 million.

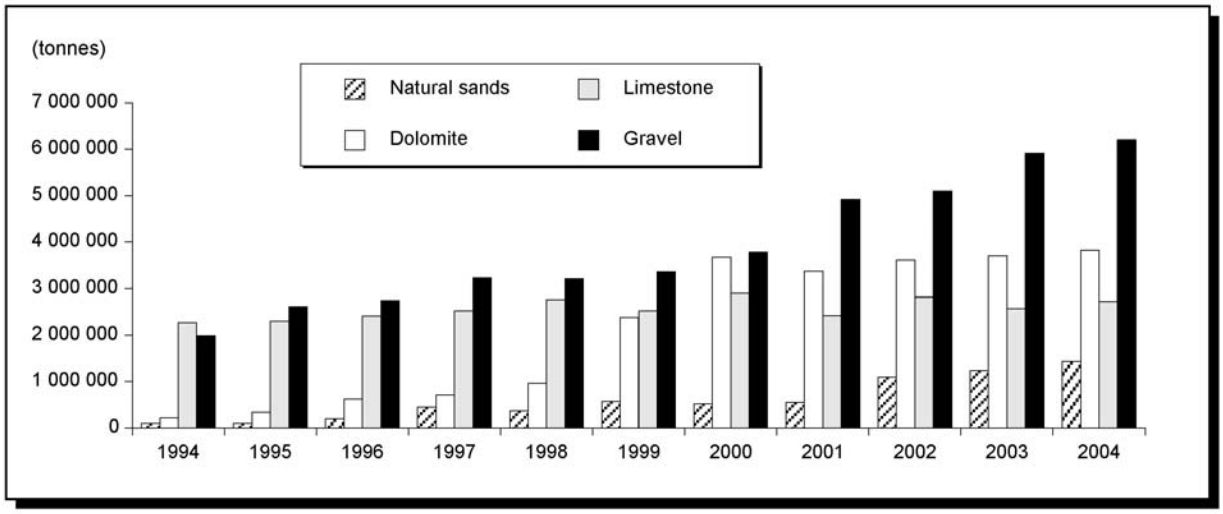
The two largest imports in terms of aggregate were crushed stone (2.3 Mt valued at $15.7 million) and limestone for lime or cement (1.5 Mt valued at $14.3 million).

Figure 3
Canadian Crushed Stone Production by Use, 1994-2003



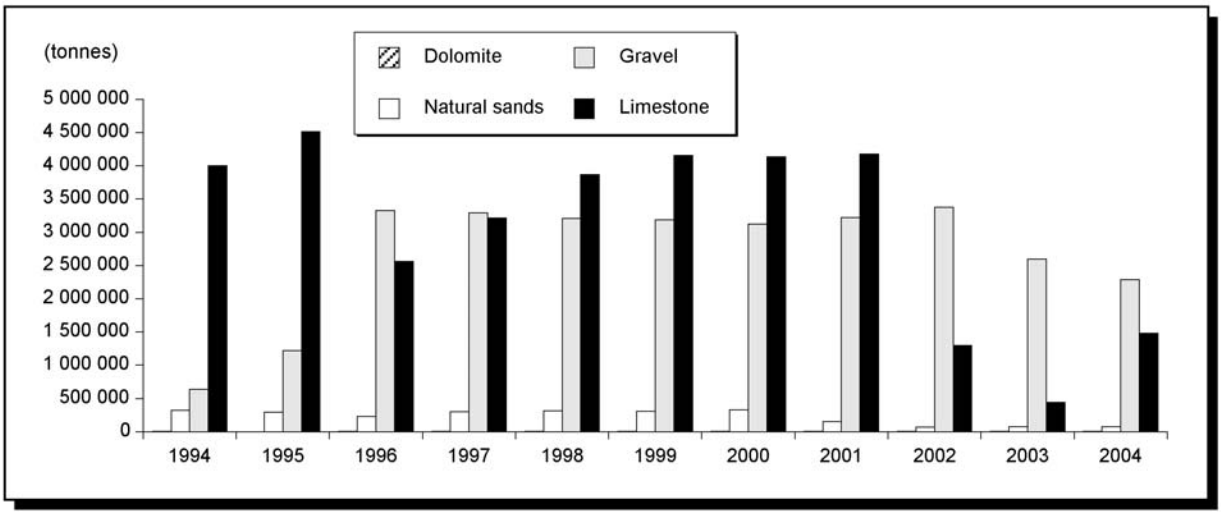
Source: Natural Resources Canada.

Figure 4
Canadian Aggregate Exports, 1994-2004



Source: Natural Resources Canada.

Figure 5
Canadian Aggregate Imports, 1994-2004



Source: Natural Resources Canada.
Note: Dolomite imports are less than 11 000 t per year.

Aggregate exports and imports for the period 1994-2004 are shown in Figures 4 and 5, respectively. Annual gravel exports, primarily to the United States and the Caribbean, have increased 64% since 2000 while imports have decreased by 32% since 2002. Three of the top five producing quarries in 2004 ship bulk tonnages by water, and these operations increased their collective production by 28% in the current year. Imports of gravel and construction stone have been consistent over the last number of years at around 2.5 Mt/y. Limestone imports for lime and cement manufacture have also been variable over the period ranging from 500 000 t to over 4 000 000 t.

Crushed limestone continues to be exported from quarries in Newfoundland and Labrador, Nova Scotia and British Columbia, mainly to markets in New England, Florida, the Pacific northwest and California. In B.C., Texada Quarrying Ltd. and Ash Grove Cement Company shipped an estimated 6 Mt of aggregate in 2004 from operations at Gilles Bay and Blubber Bay, respectively. Martin Marietta Materials shipped 3.8 Mt of crushed granite from a quarry at Porcupine Mountain, Nova Scotia.

LIGHTWEIGHT AGGREGATES

Most lightweight aggregate products are produced by rapidly heating clay or shale to high temperatures, causing the rock to expand and become less dense. These expanded products are then used in the manufacture of lightweight concrete products, such as precast blocks, which are less costly to produce and transport. Low compressive strength concrete can be made using perlite or vermiculite as an aggregate, while expanded clays, shale, pumice and slag are used for lightweight structural concretes. A list of lightweight aggregate producers is given in Table 5. Trade data are found in Table 6. Use data for various lightweight aggregates can be found in Tables 8-11. Canada is a net importer of lightweight aggregates, mainly perlite and vermiculite, which are processed at expansion plants in Canada. Vermiculite ore is imported from South Africa, the United States and Uganda. IBI Corporation has commenced mining of vermiculite ore from the Namekara mine in Uganda. Unexpanded perlite is imported from the United States and Greece. Smaller amounts of expanded perlite and vermiculite are imported into Canada from U.S. expansion plants.

Pumice

Pumice is a light, porous, glassy volcanic rock that forms during explosive eruptions. When used as an aggregate in the manufacture of lightweight concrete products, it provides a lower thermal conductivity and a higher fire rating than conventional concrete. It also has six times the flexural strength of normal concrete. It is also used as a filler in paint and asphalt mixes, as an absorbent and chemical carrier, and for filtration purposes. In Canada, pumice is produced by Great Pacific Pumice Inc. from Mt. Meager in British Columbia and by Canada Pumice Corporation at the Nazko quarry near Quesnel, B.C. The latter company provides its Tephralite brand product to the construction industry and also ships larger product to the landscaping sector. Pumice is also imported from the United States and Turkey.

Perlite

Perlite is a natural volcanic glass that contains 2-5% chemically combined water. When quickly heated to above 1600^{o}F, perlite expands its volume from 4 to 20 times. Under careful kiln retention times, the expanded product can weigh as little as 30-60 kg/m^3. Perlite is widely used as a loose-fill masonry insulation and as an aggregate in concrete, where it imparts lightweight, fire-resistant and insulating properties. It is also a constituent of ceiling tiles. Perlite insulating concrete is one-third the weight of regular concrete and has 20 times the insulating value. Horticultural applications include an additive in soilless growing mixes and as a chemical carrier. Industrial uses include abrasives, fillers and refractory brick manufacture. Perlite is imported to Canada primarily from the island of Milos, Greece and the United States.

Vermiculite

Vermiculite is a general term applied to mica-like, platy minerals that contain up to 4% water, chemically trapped between the mica sheets. Upon rapid heating to temperatures in excess of 900^{o}C, the trapped water changes to steam, forcing the mineral sheets to expand, forming an exfoliated vermiculite product. The expanded vermiculite is very lightweight and displays excellent fire-resistance and sound-insulating properties. Its uses in Canada are mainly for horticultural and other industrial applications. Crude vermiculite ore is imported into Canada for processing from mines owned by W.R. Grace and Co. in Enoree, South Carolina, and Virginia Vermiculite, Ltd. in Woodruff, South Carolina, and Louisa County, Virginia, and from the Palabora region of South Africa and Uganda (Table 6, imports). Vermiculite processing plants are located in New Brunswick, Quebec, Ontario, Manitoba and Alberta (Table 5).

Expanded Clays, Shale

Raw clay materials are dried and heated in a kiln to produce a lightweight aggregate suitable for use in concrete applications and in the manufacture of lightweight concrete blocks. Shale is mined, crushed and screened, and then heated. Concrete made from expanded clays and shale has special thermal and acoustical properties and can be used in special applications such as highway bridges with longer single spans.

RECYCLED CONCRETE

A growing trend in major urban areas is for new construction projects to re-use concrete and asphalt from existing infrastructure by crushing, cleaning and screening the material on site and transporting it to new construction sites in the same area. This trend is growing due to a number of factors: quarries near urban areas are becoming depleted of virgin materials, higher fuel costs put pressure on contractors to seek out local sources of material, landfill tipping costs often preclude disposal of the old concrete, and new building owners are becoming more aware of "green building" initiatives that feature the use of recycled materials in new construction.

As the old concrete is processed, steel rebar is removed and is sold as scrap metal. Current practice in many areas is to re-use the recycled concrete as a coarse sub-base material under concrete slabs or new roads or as a fill material around sewer pipes. If the recycled material is being used for road sub-base, concrete and recycled asphalt can be combined. The recycled aggregate is usually sold in 37.5-mm or 50-mm sizes. Recycled concrete generally has a higher absorption and lower density than conventional crushed stone aggregate. Up to 30% of natural crushed stone aggregate can be replaced by recycled concrete aggregate without significantly altering the mechanical properties of the concrete.

It is estimated that about 2.5 Mt of concrete is recycled in the Greater Toronto area each year. In addition, Quebec contractors, mainly in the Montréal area, recycled an estimated 1.2 Mt of old concrete in 2004. According to the U.S. Portland Cement Association, 38 states use recycled concrete as an aggregate base and 11 states use the material as an aggregate in new concrete applications.

The top 20 recycled aggregate producers in the United States used about 29.4 Mt of concrete and asphalt material in 2003, according to *Construction and Demolition Recycling* magazine. The largest recycled aggregate producer in the United States was Vulcan Materials Co., who processed 3.7 million tons.

PRICES

Prices for sand and gravel and crushed stone aggregates are set by producers and customers and vary depending on product specifications, region, and distance to markets. Prices for construction aggregates in Ontario ranged from $3.60/t for sub-base material to $11.50/t for quarry stone. The average value of sand and gravel, taken from Table 2, is $4.35/t. Construction aggregates used in concrete, asphalt and road-base applications had an average value of $7.02/t, according to 2003 data.

Raw vermiculite ore (ex-U.S. plant) is US$170-$250 per short ton or US$160-$260/t f.o.b. Rotterdam for South African ore (*Mineral Price Watch*). Crude perlite ore has a price range of US$32-$60/t f.o.b. Turkey. Expanded perlite sells for US$145-$400/t depending on the end use, quality and other product specifications. Pumice sells for around US$24/t, according to the U.S. Geological Survey.

OUTLOOK

Mineral aggregate demand in 2005 is expected to maintain current levels or to decrease slightly. Canada Mortgage and Housing Corporation has predicted a drop in new home starts, which will weaken demand; however, exports may rise due to a continued strong economic outlook in the United States.

The problem of accessing quality gravel and crushed stone close to urban markets will continue. Although efforts are being made to expand existing quarries (e.g., Milton, Ontario) or to bring new resources on stream, demand continues to outpace local supply, at least in major urban centres such as Toronto. As aggregate demand in these urban areas continues to increase, supply will have to come from more remote quarries, increasing the environmental costs (more CO_2 from fuels), the impact on existing infrastructure, and new construction costs. The use of recycled concrete aggregate will offset some new material in the large urban centres.

In the United States, a new surface transportation reauthorization bill, to replace the former TEA-21 legislation, is under negotiation in Congress. An estimated funding level of US$290 billion over five years will be directed towards federal highway infrastructure projects. New funding for highway construction in the U.S. coastal states may have a positive impact on Canadian exports of sand, gravel and crushed stone.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of June 30, 2005. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.

TABLE 1. CANADA, STONE PRODUCTION, 2002-04

Item No.	2002		2003		2004 (p)	
	(000 t)	($000)	(000 t)	($000)	(000 t)	($000)
BY PROVINCE/TERRITORY (1)						
Newfoundland and Labrador	4 936	34 585	3 678	24 014	4 069	26 484
Nova Scotia	8 407	56 740	9 744	64 582	9 618	65 202
New Brunswick	4 824	28 147	5 802	34 590	5 683	32 524
Quebec	38 122	292 743	38 963	303 529	38 142	299 691
Ontario	55 945	504 246	54 622	512 297	57 093	562 869
Manitoba	3 931	18 611	3 804	18 535	3 417	17 887
Alberta	435	5 542	511	6 374	366	6 063
British Columbia	7 324	56 585	7 099	57 509	8 226	55 297
Northwest Territories	823	6 588	304	2 446	944	4 613
Total	124 746	1 003 786	124 528	1 023 876	127 559	1 070 631
BY USE (2)						
Stone (Dimension)						
Dimension stone						
Rough	453	52 265	538	59 864	..	..
Monumental and ornamental stone (n.f.)	78	6 844	90	5 872	..	..
Other (flagstone, curbstone, paving blocks, etc.)	169	21 294	169 142	21 294 13 680	..	..
Total dimension stone	700	80 403	769	79 417	..	..
Stone (Crushed)						
Crushed stone for						
Concrete aggregate	20 519	138 836	21 320	164 154	..	..
Asphalt aggregate	12 051	77 728	11 798	78 211	..	..
Road metal	43 545	263 761	41 076	263 301	..	..
Railroad ballast (includes traprock)	1 605	13 458	1 833	15 181	..	..
Other uses	37 243	228 336	38 683	235 232	..	..
Chemical and metallurgical						
Cement plants, Canada	16 104	50 095	17 968	55 936	..	..
Cement plants, foreign	459	2 015	382	1 876	..	..
Flux in iron and steel furnaces	258	2 485	282	1 449	..	..
Flux in nonferrous smelters	55	869	46	623	..	..
Glass factories	46	836	19	146	..	..
Lime plants, Canada	2 742	17 147	3 048	17 447	..	..
Lime plants, foreign	2 024	15 037	1 942	15 012	..	..
Pulp and paper mills	57	574	62	567	..	..
Sugar refineries	–	–	2	10	..	..
Other chemical uses	2 207	11 853	2 334	11 821	..	..
Miscellaneous stone						
Manufacture of artificial stone	42	194	134	626	..	..
Roofing granules	807	36 214	657	28 290	..	..
Poultry grit	199	2 316	195	2 361	..	..
Stucco dash	17	3 799	18	2 897	..	..
Terrazzo chips	7	714	10	801	..	..
Rock wool	34	435	57	814	..	..
Rubble and riprap	873	4 799	769	5 112	..	..
Other uses	895	7 268	1 172	9 277	..	..
Pulverized stone						
Whiting	46	3 963	46	4 471	..	..
Asphalt filler	144	257	141	189	..	..
Agricultural purposes and fertilizer plants	807	13 719	807 749	13 719 14 200	..	..
Other uses	1 387	98 137	1 425	92 202	..	..
Total crushed stone	144 172	994 844	146 169	1 022 206	..	..
Total all stone	144 872	1 075 247	146 939	1 101 623	..	..

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

TABLE 2. CANADA, PRODUCTION OF SAND AND GRAVEL, (1) BY PROVINCE AND TERRITORY, 2001-04

	2001		2002		2003		2004 (p)	
	(000 t)	($000)	(000 t)	($000)	(000 t)	($000)	(000 t)	($000)
Newfoundland and Labrador	2 594	10 249	2 805	8 892	2 629	7 391	2 504	6 903
Prince Edward Island	167	781	x	x	x	x	x	x
Nova Scotia	2 959	14 096	x	x	x	x	x	x
New Brunswick	2 529	9 748	2 550	10 187	3 448	12 395	3 227	11 343
Quebec	29 487	85 553	32 600	103 503	31 878	104 584	28 865	90 464
Ontario	97 878	433 403	95 464	405 317	98 726	437 893	102 204	456 735
Manitoba	10 952	32 982	10 642	33 990	9 735	32 185	9 712	33 277
Saskatchewan	13 195	48 106	11 448	42 063	13 743	48 827	13 629	44 846
Alberta	44 214	255 313	41 894	242 702	45 077	275 219	45 386	228 106
British Columbia	30 687	165 213	30 102	173 956	29 983	168 791	33 510	172 236
Yukon	1 226	3 646	5 475	10 628	3 238	7 096	3 270	7 178
Northwest Territories	598	3 143	247	1 121	489	3 813	387	3 153
Total	236 486	1 062 232	238 120	1 053 676	244 532	1 122 716	248 159	1 078 763

Sources: Natural Resources Canada; Statistics Canada.
(p) Preliminary; x Confidential.
(1) Production represents shipments of natural gravel, sand and crushed gravel. It does not include shipments to Canadian cement plants. Production values for quartz are excluded from the sand and gravel production.
Note: Numbers may not add to totals due to rounding.

TABLE 3. AVAILABLE DATA ON USE (2) OF SAND AND GRAVEL, BY REGION, 2002 AND 2003

	Year	Atlantic Provinces	Quebec	Ontario	Western Provinces (1)	Canada
				(000 tonnes)		
Fill	2002	547	2 207	7 299	5 571	15 624
	2003	332	2 639	6 864	6 268	16 102
Road bed, surface	2002	4 499	19 057	31 789	47 709	103 054
	2003	5 482	17 793	33 536	47 574	104 385
Roads, ice control	2002	597	1 063	1 920	3 076	6 657
	2003	619	1 386	2 086	2 796	6 887
Concrete aggregate	2002	1 626	4 323	12 769	19 782	38 500
	2003	2 171	3 747	12 742	21 065	39 725
Asphalt aggregate	2002	812	3 337	8 774	9 277	22 201
	2003	773	2 982	6 882	10 968	21 605
Railroad ballast	2002	–	19	1	132	152
	2003	1	144	32	159	336
Backfill for mines	2002	1 043	124	1 530	40	2 737
	2003	1 153	17	1 257	2	2 430
Mortar sand	2002	41	453	2 000	123	2 617
	2003	53	434	2 315	140	2 943
Other purposes	2002	1 251	2 017	29 711	14 137	47 116
	2003	1 259	2 737	33 661	13 354	51 012
Total	2002	10 416	32 600	95 795	99 847	238 657
	2003	11 843	31 878	99 377	102 326	245 426

Sources: Natural Resources Canada; Statistics Canada.
– Nil.
(1) The western provinces include the Yukon, the Northwest Territories and Nunavut. (2) Data include shipments by producers regardless of industrial classification. Data include sand and gravel used in Canadian cement plants. Data exclude production of natural silica sand and of silica sand manufactured from quartz or silica rock.
Note: Numbers may not add to totals due to rounding.

TABLE 4. CANADA, SAND AND GRAVEL AND CRUSHED STONE TRADE, 2002-04

Item No.		2002		2003		2004 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
EXPORTS							
2505.90	Natural sands n.e.s., excluding metal-bearing sands						
	United States	1 017 546	9 156	1 232 557	8 864	1 431 687	9 117
	France	10	4	38	12	53	8
	St. Pierre and Miquelon	36	7	414	31	25	5
	Bermuda	11 571	232	–	–	8	1
	Cuba	–	–	–	–	105	1
	Honduras	–	–	–	–	80	1
	Hungary	–	–	–	–	192	1
	Bahamas	67 829	1 923	–	–	–	–
	Other countries	40	14	50	11	242	–
	Total	1 097 032	11 336	1 233 059	8 918	1 432 392	9 134
2517.10	Pebbles, gravel, broken or crushed stone used for aggregates, etc.						
	United States	5 078 843	62 467	5 669 294	57 982	5 795 879	56 862
	Barbados	10 126	139	29 878	342	351 660	2 153
	Trinidad and Tobago	–	–	164 959	2 981	53 451	988
	Bahamas	–	–	25 962	503	–	–
	Turks and Caicos Islands	–	–	13 451	288	–	–
	Other countries	10 825	160	5 154	56	3812	45
	Total	5 099 794	62 766	5 908 698	62 152	6 204 802	60 048
2517.41	Marble granules, chippings and powder of 25.15 or 25.16, heat-treated or not						
	United States	32 365	6 864	45 972	7 196	45 054	8 140
	Italy	–	–	–	–	30	4
	Total	32 365	6 864	45 972	7 196	45 084	8 144
2517.49	Granules, chippings and powder, n.e.s., of 25.15 or 25.16, heat-treated						
	United States	4 692	434	22 499	285	9 039	505
	Latvia	–	–	–	–	9 452	35
	Other countries	27	12	570	46	199	18
	Total	4 722	446	23 069	331	18 690	558
2518.10	Dolomite, not calcined						
	United States	3 095 736	34 002	3 197 514	28 888	3 428 194	28 488
	Venezuela	297 485	2 997	324 609	3 482	345 711	4 294
	Trinidad and Tobago	84 517	995	70 046	560	43 633	764
	United Kingdom	–	–	–	–	14	3
	Mexico	134 722	1 258	58 471	518	–	–
	Brazil	–	–	46 667	333	–	–
	Total	3 612 460	39 252	3 697 307	33 781	3 817 552	33 549
2518.20	Calcined dolomite						
	United States	9 785	1 214	9 913	1 151	21 590	2 743
2521.00	Limestone flux; limestone and other calcareous stone used for lime or cement						
	United States	2 713 242	18 191	2 568 400	17 746	2 717 654	17 184
	Bermuda	–	–	–	–	1 554	9
	Bahamas	–	–	–	–	358	2
	France	–	–	70	. . .	23	. . .
	China	10 671	430	7 243	128	–	–
	Mexico	91 616	989	–	–	–	–
	Sweden	509	2	–	–	–	–
	Total	2 816 038	19 612	2 575 713	17 874	2 719 589	17 195
	Total exports	12 672 196	141 490	13 493 731	131 403	14 259 699	131 371
IMPORTS							
2505.90	Natural sands n.e.s., excluding metal-bearing sands						
	United States	65 655	6 883	69 248	7 727	73 913	6 612
	China	1 136	393	1 562	413	1 928	487
	Australia	434	113	1 134	122	1 478	99
	United Kingdom	146	30	193	36	164	44
	Other countries	2 533	386	1177	212	667	63
	Total	69 904	7 805	73 314	8 510	78 150	7 305

TABLE 4 (cont'd)

Item No.		2002		2003		2004 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
IMPORTS (cont'd)							
2517.10	Pebbles, gravel, broken or crushed stone used for aggregates, etc.						
	United States	3 311 008	19 283	2 526 886	15 059	2 266 769	15 171
	China	6 400	128	21 605	259	41 216	336
	India	284	62	479	15	5 430	51
	Brazil	192	27	278	32	2 115	29
	Phillippines	3 271	32	649	34	3 784	24
	France	1 717	17	1 914	21	1 990	22
	United Kingdom	26	1	12 362	151	80	18
	Portugal	–	–	–	–	3 635	15
	Mexico	1	. . .	15	7	398	11
	Indonesia	615	6	70	29	738	7
	Taiwan	38	4	9	. . .	403	5
	Belgium	46	. . .	90	1	489	4
	Japan	10	. . .	46	1	111	4
	Other countries	49 802	356	34 316	506	328	12
	Total	3 373 410	19 916	2 598 719	16 115	2 327 486	15 709
2517.20	Macadam of slag, dross or similar industrial waste, etc.						
	United States	2 613	17	542	3	2 748	24
	Other countries	614	2	9	–	–	–
	Total	3 227	19	551	3	2 748	24
2517.30	Tarred macadam						
	United States	259	12	201	8	620	29
2517.41	Marble granules, chippings and powder of 25.15 or 25.16, heat-treated or not						
	United States	82 761	16 946	80 668	15 242	97 995	18 662
	Italy	104	16	157	25	56	9
	Other countries	15	2	528	59	33	7
	Total	82 881	16 964	81 353	15 326	98 084	18 678
2517.49	Granules, chippings and powder, n.e.s., of 25.15 or 25.16, heat-treated						
	United States	25 530	2 180	20 840	1 638	15 971	1 487
	China	273	16	734	68	860	47
	France	315	36	345	32	922	44
	Italy	1	. . .	107	5	459	11
	Brazil	328	29	116	15	63	10
	Other countries	790	63	945	84	471	44
	Total	27 237	2 324	23 087	1 842	18 746	1 643
2518.10	Dolomite, not calcined						
	United States	2 566	534	2 711	512	3 350	569
	Germany	6	2	46	9	99	31
	United Kingdom	32	9	104	9	102	27
	Other countries	65	13	6	2	16	4
	Total	2 669	558	2 867	532	3 567	631
2518.20	Calcined dolomite						
	United States	46 590	6 938	48 774	6 462	52 861	6 747
	Other countries	25	18	–	–	–	–
	Total	46 615	6 956	48 774	6 462	52 861	6 747
2518.30	Agglomerated dolomite (including tarred dolomite)						
	United States	857	307	1 223	438	893	337
	Austria	149	54	135	59	79	34
	Other countries	25	11	–	–	–	–
	Total	1 031	372	1 358	497	972	371
2521.00	Limestone flux; limestone and other calcareous stone used for lime or cement						
	United States	1 290 519	20 814	442 065	15 704	1 369 001	14 223
	Portugal	–	–	539	105	108 107	57
	Israel	111	22	530	29	871	24
	Jordan	–	–	–	–	240	22
	Other countries	7421	70	301	86	235	17
	Total	1 298 051	20 906	443 435	15 924	1 478 454	14 343
	Total imports	4 905 284	75 832	3 273 659	65 219	4 061 688	65 480

Sources: Natural Resources Canada; 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, 2003

Company	Location	Commodity	Remarks
ATLANTIC PROVINCES			
Fafard Peat Moss Company Ltd.	Inkerman, N.B.	Perlite, vermiculite	Processed for use in horticulture.
Le Groupe Berger Ltée	Escuminac, N.B.	Vermiculite, perlite	Processed for use in horticulture.
Perlite Canada Inc.	Lameque, N.B.	Vermiculite	Processed for use in horticulture.
Sun Gro Horticulture Canada Ltd.	Maisonnette, N.B.	Perlite	Processed for use in horticulture.
QUEBEC			
Le Groupe Berger Ltée	Saint-Modeste	Perlite, vermiculite	Processed for use in horticulture.
Normiska Corp.	Lachine (plant)	Vermiculite, perlite	Vermiculite processed for use in loose insulation, horticulture and concrete products; perlite processed for use in horticulture
Premier Horticulture	Rivière-du-Loup	Perlite, vermiculite	Processed for use in horticulture.
Perlite Canada Inc.	Baie-du-Febvre	Perlite, vermiculite	Processed for use in horticulture.
ONTARIO			
Grace Canada, Inc.	Ajax	Vermiculite, perlite	Vermiculite processed for use in horticulture, as loose insulation, and in friction materials; perlite processed for use in gypsum plaster, horticulture, refractories and as loose insulation.
Lafarge Canada Inc., Hamilton Slag Division	Hamilton	Slag	Used in concrete products industry.
PRAIRIE PROVINCES			
Cindercrete Products Ltd.	Saskatoon, Sask.	Expanded clay	Processed for concrete products industry.
Grace Canada, Inc.	Winnipeg, Man.	Vermiculite, perlite	Perlite processed for use in gypsum plaster, loose insulation and in horticulture.
	Edmonton, Alta.	Vermiculite, perlite	Vermiculite processed for use in horticulture and in fricton material and loose insulation.
Inland Cement Limited	Calgary, Alta.	Expanded shale	Plant closed in 2002.
	Edmonton, Alta.	Expanded clay	Processed for concrete products industry, for use in horticulture and for loose insulation.
Sun Gro Horticulture Canada Ltd.	Elma, Man.	Perlite	Processed for use in horticulture.
	Seba Beach, Alta.	Perlite	Processed for use in horticulture.
BRITISH COLUMBIA			
Basalite Concrete Products Limited	Vancouver	Pumice	Purchased for concrete products industry.
Canada Pumice Corporation	Quesnel	Pumice, shale	A range of pumice and shale products for construction, horticulture and landscaping material.
Great Pacific Pumice Inc.	Mt. Meager	Pumice	Used in horticulture, concrete products industry and as loose insulation.

Source: Natural Resources Canada, reported from NRCan 2003 annual survey questionnaire "Production of Lightweight Aggregates in Canada."

TABLE 6. CANADA, EXPORTS AND IMPORTS OF VERMICULITE, PERLITE AND PUMICE, 2002-04

Item No.		2002		2003		2004 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
EXPORTS							
2513.11	Pumice stone, crude or in irregular pieces, including crushed pumice						
	Mexico	–	–	–	–	10	8
	France	–	–	–	–	...	...
	Colombia	1	1	–	–	–	–
	United States	27	10	–	–	–	–
	Cambodia	–	–	3	4	–	–
	Finland	–	–	20	12	–	–
	Total	28	11	23	16	10	8
2513.19	Pumice stone, other						
	Germany	–	–	–	–	2	2
	Australia	–	–	–	–	...	...
	United States	–	–	13	52	–	–
	Total	–	–	13	52	2	2
2530.10	Vermiculite, perlite and chlorites, unexpanded						
	United States	47	49	1 116	167	565	155
	Chile	4	3	8	3	10	5
	South Korea	28	20	–	–	–	–
	Saint Vincent and the Grenadines	1	...	2	1	–	–
	Total	80	72	1 126	171	575	160
6806.20	Exfoliated vermiculite, expanded clays, foamed slag and similar expanded mineral materials (including intermixtures thereof)						
	United States	1 682	1 361	998	859	10 502	7 718
	Cuba	–	–	–	–	4	106
	China	–	–	25	52	24	29
	Other countries	–	–	7	29	17	38
	Total	1 682	1 361	1 030	940	10 547	7 891
	Total exports	1 790	1 444	2 192	1 179	11 134	8 061
IMPORTS							
2513.11	Pumice stone, crude or in irregular pieces, including crushed pumice						
	United States	5 277	695	5 935	720	6 595	634
	Taiwan	...	...	304	83	500	189
	Turkey	3 881	393	2 306	204	1 659	156
	China	1	...	18	4	46	11
	Other countries	23	3	120	31	75	16
	Total	9 182	1 096	8 683	1 042	8 875	1 006
2513.19	Pumice stone, other						
	United States	5 236	921	3 636	918	3 861	776
	China	151	42	165	41	80	45
	Taiwan	378	106	1 342	311	59	44
	Russia	167	43	–	–	15	41
	Greece	762	31	–	–	378	26
	Germany	66	14	273	28	10	7
	Spain	–	–	–	–	...	4
	France	81	20	66	17	7	3
	Philippines	–	–	14	3	1	3
	South Korea	246	55	213	43	8	3
	Other countries	364	62	548	107	22	8
	Total	7 451	1 294	6 257	1 468	4 441	960
2530.10.00.10	Vermiculite, unexpanded						
	South Africa	15 713	4 266	12 119	2 954	9 686	2 164
	United States	14 593	3 037	12 270	2 331	9 827	1 866
	Uganda	168	59	1 513	379	5 189	1 453
	Zimbabwe	4 630	947	134	27	42	12
	Morocco	–	–	–	–	2	2
	Greece	173	22	–	–	1	...
	Iran	–	–	–	–	2	...
	India	24	3	–	–	–	–
	China	–	–	2 486	349	–	–
	Total	35 301	8 334	28 522	6 040	24 749	5 497

TABLE 6 (cont'd)

Item No.		2002		2003		2004 (p)	
		(tonnes)	($000)	(tonnes)	($000)	(tonnes)	($000)
IMPORTS (cont'd)							
2530.10.00.20	Perlite, unexpanded						
	United States	28 239	5 207	27 735	4 324	24 210	3 636
	Greece	44 495	4 002	37 869	3 459	30 741	3 211
	Other countries	1	. . .	123	40	49	9
	Total	72 735	9 209	65 727	7 823	55 000	6 856
3802.90.00.20	Activated perlite, excluding expanded perlite ground to be employed in filtering						
	United States	268	145	186	101	256	144
	Other countries	–	–	1	–	. . .	. . .
	Total	268	145	187	101	256	144
6806.20.00.10	Exfoliated (expanded) vermiculite						
	United States	696	2 161	908	2 767	2 738	2 336
	Austria	1	4	42	110	110	256
	Other countries	9	33	4	13	14	22
	Total	706	2 198	954	2 890	2 862	2 614
6806.20.00.20	Expanded perlite						
	United States	10 229	7 800	13 777	9 127	16 445	9 868
	Other countries	54	51	89	92	58	26
	Total	10 283	7 851	13 866	9 219	16 503	9 894
	Total imports	135 926	30 127	124 196	28 583	112 686	26 971

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, 2002 AND 2003

	2002				2003 (p)			
	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)	537 553	13 321 262	482 513	12 111 107	525 399	12 872 940	366 695	9 630 411
FROM IMPORTED CRUDE MATERIALS								
Expanded perlite and exfoliated vermiculite (1)	731 958	52 512 353	772 104	55 379 080	815 707	58 109 920	812 701	57 896 416
Total	1 269 511	65 833 615	1 254 617	67 490 187	1 341 106	70 982 860	1 179 396	67 526 827

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

TABLE 8. CANADA, SALES OF EXPANDED SLAG, PERCENTAGE BY END USE, 2001-03

Use	2001	2002	2003 (p)
		(%)	
Concrete block manufacture	80.0	70.0	80.0
Ready-mix concrete	10.0	5.0	15.0
Miscellaneous uses	10.0	25.0	5.0

Source: Natural Resources Canada, reported from NRCan survey questionnaire "Production of Lightweight Aggregates in Canada."
(p) Preliminary.
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, 2001-03

Use	2001	2002	2003 (p)
		(%)	
Concrete block manufacture	54.1	64.3	77.8
Loose insulation	42.7	23.3	7.8
Ready-mix concrete	1.2	6.7	4.7
Pre-cast concrete manufacture	1.7	0.8	4.7
Horticulture and miscellaneous uses	0.3	4.9	5.1

Source: Natural Resources Canada, reported from NRCan survey questionnaire "Production of Lightweight Aggregates in Canada."
(p) Preliminary.
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, 2001-03

Use	2001	2002	2003 (p)
		(%)	
Horticulture and agriculture	94.4	95.0	96.6
Loose insulation and miscellaneous uses	4.9	3.8	2.9
Insulation			
in gypsum products	0.6	0.6	0.4
in other construction materials	–	0.6	0.1

Source: Natural Resources Canada, reported from NRCan survey questionnaire "Production of Lightweight Aggregates in Canada."
– Nil; (p) Preliminary.
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, 2001-03

Use	2001	2002	2003 (p)
		(%)	
Horticulture	83.4	75.3	87.6
Loose insulation	4.3	5.8	1.7
Miscellaneous uses	12.2	18.9	10.7

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