THE MINERAL INDUSTRY OF WASHINGTON

This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Washington Division of Geology and Earth Resources for collecting information on all nonfuel minerals.

In 1996, Washington rose in rank from 21st to 20th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $626 million, a more than 7% increase from that of 1995. This followed a 1% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 1.5% of the U.S. total nonfuel mineral production value.

Gold and magnesium metal, the only metals to be produced from Washington's natural resources, represented nearly one-third of the State's nonfuel mineral value. About 62% of the remaining value came from construction sand and gravel, portland cement, and crushed stone. The State's increased nonfuel mineral value in 1996 resulted mainly from estimated increases in three nonfuel minerals: construction sand and gravel was up $28 million; magnesium metal, $10 million; and crushed stone, about $9 million. Relative to these increases, other value changes were small. Lime, olivine, common clays, natural gemstone, peat, and dimension stone values increased in 1996; while those of portland cement, gold, diatomite, industrial sand and gravel, and masonry cement decreased. In 1995, gold production decreased by a significant amount, the result of the shutdown of Asamera Minerals Inc.'s Cannon Mine at Wenatchee in December 1994 and Hecla Mining Co.'s gold and silver Republic unit in January 1995. But the State's drop in gold value plus a moderate decrease in the value of construction sand and gravel in 1995 were more than offset by substantial increases in magnesium metal and portland cement values.

Based on USGS estimates of the quantities produced in the 50 States in 1996, Washington climbed from fourth to third in diatomite production. The State remained 2d of the three States that produce magnesium metal, 6th in construction sand and gravel, and 10th in the production of gold. Approximately the same quantity of olivine was mined and processed in Washington as was in North Carolina, the only other State that produced the mineral. Additionally, significant quantities of portland cement and crushed stone were produced in the State. In 1996, Washington continued to lead the Nation in the production of primary aluminum with an estimated 1.11 million metric tons,[2] a nearly 13% increase from that of 1995. The State accounted for about 31% of the U.S. total primary aluminum production. Raw steel was also produced in the State, both metals being processed from materials received from foreign and other domestic sources.

The following narrative information was provided by the Washington State Division of Geology and Earth Resources[3] (DGER). Production data in the following text are those reported by the DGER, based on its own surveys and estimates. They differ from some production figures reported to the USGS. As was the case in 1995, Echo Bay Minerals Co. operated the only major gold mine in the State in 1996, the Kettle River Mine in the Republic district, Ferry County. According to the DGER, Echo Bay milled about 544,000 tons of ore and recovered 3,885 kilograms of gold. The company's ore came from the Lamefoot deposit (about 87%), from the K-2 deposit (10%), and the remainder from stockpiled ore of the Overlook deposit, which was mined out in 1995.

In mid-February, Santa Fe Pacific Gold Corp. completed an extensive drilling program and exercised its option to purchase the Golden Eagle gold deposit at Republic from Hecla Mining Co. Santa Fe, however, has put on hold any decision to develop the property.

An Environmental Impact Statement for Battle Mountain Gold Co.'s Crown Jewel gold deposit at Chesaw was scheduled to be released in February 1997. The company planned to complete permit applications for the operation during 1997. This process is expected to take about 1 year.

Cominco American Inc., through its parent company Cominco Ltd., acquired the Pend Oreille Mine in the northeast corner of the State. The company assisted in an extensive, ongoing surface and underground exploration program with hopes of identifying additional reserves of zinc and lead ore to justify a production decision.

A significant portion of the planned reclamation occurred at the Cannon gold mine of Asamera Minerals (U.S.) Inc. in Wenatchee and at the Key West gold mine (Republic district) of Echo Bay Minerals Co. Asamera proceeded with reclamation of the Cannon mill site in 1996. The mill had been sold, dismantled, and moved for

use at another mine location in 1995. The mine workings were backfilled to eliminate access and minimize subsidence, after which the portal was sealed and underground mine reclamation was complete. The mill area, stockpile sites, borrow pits, and exploration roads were recontoured to appear more natural; and revegetation of the project area was commenced. The tailings impoundment area had been allowed to dry during much of 1996 so that equipment could gain access. Reclamation consisted of first covering the impoundment with a woven polypropylene geotextile to stabilize the soft tailings and allow laying of a permeable gravelly sand layer at least 0.76 meters thick directly on top of the geotextile. This was covered by 0.6 meters of silty, clay-like material that provides a growth medium for vegetation. Wetlands were constructed below the tailings impoundment.

The recontouring of the Key West Mine waste rock dumps was completed. Wetlands constructed below the Key West pit enhance wildlife habitat and can accommodate water that may overflow the pit lake. Most of the site has been revegetated with grasses and a variety of evergreen trees.

Surface mining laws were modified in 1996. Legislation now allows miners to have what is termed a "technical assistance" visit before enforcement actions are taken by agencies. Regulatory reform also allows industry to request what is referred to as a "coordinated permit" process to establish a timeline for permit issuance.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2]All tons are metric unless otherwise specified.

[3]Robert E. Derkey, Geologist, authored the text of mineral industry information submitted by the Washington State Division of Geology and Earth Resources.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays	246 3/	1,140 3/	220	1,040	234	1,160
Gemstones	NA	1,050	NA	53	NA	W
Gold 4/ kilograms	7,410	91,800	W	W	W	W
Lime	239	W	W	W	W	W
Peat	3	111	2 5/	87 5/	W	W
Sand and gravel (construction)	39,600	165,000	37,700	155,000	41,500	183,000
Stone (crushed)	14,700	91,900	15,800 6/	76,800 6/	15,200 6/	85,900 6/
Combined value of cement, clays [fire (1994)], diatomite, magnesium metal, olivine, sand and gravel (industrial), silver (1994), stone [crushed dolomite, limestone and marble (1995-96), dimension miscellaneous],and values indicated by symbol W	XX	225,000	XX	350,000	XX	356,000
Total	XX	576,000	XX	582,000	XX	626,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain clays; kind and value included with "Combined value" data.
4/ Recoverable content of ores, etc.
5/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.
6/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
WASHINGTON: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$7.10
Riprap and jetty stone	368	$2,320	6.29
Filter stone	W	W	2.47
Other coarse aggregate	W	W	7.50
Coarse aggregate, graded:			
Concrete aggregate, coarse	18	75	4.17
Bituminous aggregate, coarse	170	686	4.04
Bituminous surface-treatment aggregate	39	206	5.28
Railroad ballast	140	801	5.72
Fine aggregate (-3/8 inch):			
Stone sand, concrete	18	75	4.17
Stone sand, bituminous mix or seal	109	426	3.91
Screening, undesignated	132	547	4.14
Coarse and fine aggregates:			
Graded road base or subbase	2,910	13,000	4.47
Unpaved road surfacing	1,050	2,510	2.40
Terrazzo and exposed aggregate	124	975	7.86
Crusher run or fill or waste	352	1,760	4.99
Other coarse and fine aggregates	36	148	4.11
Other construction materials	146	860	5.89
Agricultural: Agricultural limestone	7	138	19.71
Chemical and metallurgical:			
Cement manufacture	809	4,040	5.00
Flux stone	40	536	13.40
Special:			
Asphalt fillers or extenders	3	10	3.33
Whiting or whiting substitute	(3/)	(3/)	113.00
Other fillers or extenders	(3/)	(3/)	73.47
Other miscellaneous uses: Paper manufacture	(3/)	(3/)	193.13
Unspecified: 4/			
Actual	3,570	12,700	3.57
Estimated	5,720	21,700	3.79
Total	15,800	76,800	4.85

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."
1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone, traprock, and volcanic cinder and scoria; excludes limestone-dolomite from State total to avoid disclosing company proprietary data.
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Withheld to avoid disclosing company proprietary data; included in "Total."
4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994 Number of quarries	1994 Quantity (thousand metric tons)	1994 Value (thousands)	1994 Unit value	1995 Number of quarries	1995 Quantity (thousand metric tons)	1995 Value (thousands)	1995 Unit value
Limestone	10 2/	2,140 2/	$23,600 2/	$11.01 r/ 2/	7 3/	1,220 3/	$19,200 3/	$15.77 3/
Dolomite	4	281	1,120	3.99	5	W	W	W
Marble	2	W	W	W	(4/)	(4/)	(4/)	(4/)
Granite	11	234	1,030	4.38	9	270	1,100	4.08
Traprock	116 r/	10,600 r/	47,700 r/	4.48	133	12,100	47,000	3.88
Sandstone	4	W	W	W	5	W	W	W
Volcanic cinder and scoria	3	W	W	9.02	3	207	1,190	5.77
Miscellaneous stone	8	475	2,560	5.40	13	802	3,440	4.28
Total	XX	14,700 r/	91,900 r/	6.24 r/	XX	15,800	76,800	4.85

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes limestone-dolomite, reported with no distinction between the two.
3/ Excludes limestone-dolomite from State total to avoid disclosing company proprietary data.
4/ Excludes marble from State total to avoid disclosing company proprietary data.

TABLE 4
WASHINGTON: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1 Quantity	District 1 Value	District 2 Quantity	District 2 Value	District 3 Quantity	District 3 Value	Unspecified within all districts Quantity	Unspecified within all districts Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	441	2,850	W	W	W	W	--	--
Coarse aggregate, graded 4/	157	876	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 5/	185	757	74	291	--	--	--	--
Coarse and fine aggregate 6/	3,950	15,800	306	1,620	216	974	--	--
Other construction materials	37	266	85	267	159	682	--	--
Agricultural 7/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Chemical and metallurgical 9/	809	4,040	--	--	40	536	--	--
Special 10/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Other miscellaneous uses 11/	--	--	(8/)	(8/)	--	--	--	--
Unspecified: 12/								
Actual	1,580	6,520	490	1,370	1,300	3,670	195	1,170
Estimated	4,480	17,000	184	755	1,050	3,920	--	--
Total	11,600	48,100	1,220	17,600	2,780	9,930	195	1,170

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."
1/ Excludes limestone-dolomite and marble from State total to avoid disclosing company proprietary data.
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.
4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.
5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).
6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.
7/ Includes agricultural limestone.
8/ Withheld to avoid disclosing company proprietary data; included in "Total."
9/ Includes cement manufacture and flux stone.
10/ Includes asphalt fillers or extenders, other fillers or extenders, and whiting or whiting substitute.
11/ Includes paper manufacture.
12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	10,300	$49,200	$4.79
Plaster and gunite sands	255	983	3.85
Concrete products (blocks, bricks, pipe, decorative, etc.)	299	2,070	6.92
Asphaltic concrete aggregates and other bituminous mixtures	1,510	7,430	4.92
Road base and coverings 2/	7,140	31,200	4.37
Fill	6,130	16,800	2.74
Snow and ice control	138	595	4.31
Railroad ballast	77	506	6.57
Other 3/	818	2,370	2.90
Unspecified: 4/			
Actual	3,450	12,200	3.54
Estimated	7,640	31,400	4.11
Total or average	37,700	155,000	4.10

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes road and other stabilization (cement).
3/ Includes filtration.
4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified within all districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	7,580	42,700	1,110	4,090	2,140	5,380	2	9
Asphaltic bituminous mixtures	1,300	6,550	175	757	33	119	--	--
Road base and coverings 3/	5,730	26,200	756	3,000	647	1,970	--	--
Fill	5,990	16,300	32	98	9	64	99	374
Other miscellaneous uses 4/	895	3,010	104	315	34	151	--	--
Unspecified: 5/								
Actual	1,750	6,330	540	2,260	956	2,750	201	847
Estimated	5,850	25,000	1,560	5,560	229	807	--	--
Total	29,100	126,000	4,270	16,100	4,050	11,200	303	1,230

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes plaster and gunite sands.
3/ Includes road and other stabilization (cement).
4/ Includes filtration, railroad ballast, and snow and ice control.
5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.