



# MINERAL INDUSTRY SURVEYS

U. S. DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES  
WASHINGTON, D.C. 20241



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Iron Ore, Monthly

## IRON ORE IN JANUARY, FEBRUARY, AND MARCH 1988

U.S. mine production of iron ore was 8% less than that of the last 3 months of 1987, according to the Bureau of Mines, U.S. Department of the Interior. Mine shipments and exports both declined by more than 70% because of the restraining effects of winter on Great Lakes shipping. The Corps of Engineers kept the Soo Locks open until January 15, the latest since 1979, so that dangerously low ore stocks at blast furnaces could be built up and last-minute grain orders from overseas filled. Iron ore shipping resumed on March 24 with the loading of a total of 63,118 long tons of Minntac pellets onto two vessels at the docks of the Duluth, Missabe & Iron Range Railway Co. in Two Harbors, MN. Mine stocks climbed from 2.6 million tons to 10.4 million tons during the 3 month period, while combined stocks at consuming plants and U.S. receiving docks fell correspondingly from 18.3 million to 10.0 million. Consumption of ore and agglomerates rose slightly to 17.2 million tons - an amount 31% greater than that of the first 3 months of 1987. On March 31, 50 blast furnaces were in operation, 1 more than on December 31, 1987.

Electric power rates for taconite mining operations on the Mesabi Range were reduced by about 4.5% as the result of a decision reached by the Minnesota Public Utilities Commission on February 17.

Hourly employees of the LTV Steel Mining Co. ratified a new 25-month labor contract on February 26 that reduced wages and benefits by \$2.19 an hour. However, the 1,170 employees at the Hoyt Lakes, MN, mining complex should be able to recover part of the lost income through profit-sharing and stock-option plans that were incorporated into the agreement. In return for the wage and benefit concessions, restrictions were placed on the amount of work that the company can contract out to non-union workers.

LTV Steel Mining was the last of the six active taconite operations on the Mesabi Range to come to terms with the United Steelworkers of America. The old contract, a master agreement covering all of the Steelworkers on the Range, expired on July 31, 1986, but was extended for the bargaining period. The new contract, which was approved by a four-to-one margin, expires in April 1990. Negotiations were lengthy and difficult because the parent company, LTV Corp., filed for bankruptcy 2 weeks before the old contract expired and has been under court supervision ever since.

On March 11, the principal partners in the Tilden Mine formalized their plan to develop a magnetite ore body about 3,000 feet north of the existing pit. The ore presently being mined is a mixture of fine-grained martite and hematite. Development of the Cliffs Drive 111 ore body would enable the upper Michigan mining complex to reduce its production costs by at least \$3 per ton while improving pellet quality. The switchover from hematite to magnetite was expected to cost \$25 million.

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Prepared in the Branch of Ferrous Metals, August 3, 1988.

Conversion of the pelletizing plant would require \$7.5 million; development of the new pit, about \$6 million. The remaining \$10 million would be used to buy new equipment and upgrade existing facilities. The costs would be shared between The Algoma Steel Corporation Ltd. (50%), Cleveland-Cliffs Inc. (33.3%), and Stelco Coal Co. (16.7%). The other three partners in the Tilden Mining Co. have all filed for protection under Chapter 11 of the Federal Bankruptcy Code. One of the latter, Sharon Steel Corp., would have an indirect interest in the magnetite project through a separate arrangement with Cliffs, which has managed the present Tilden operation since its startup in 1974. The remaining two bankrupt partners, LTV Steel Corp. and Wheeling-Pittsburgh Steel Corp., were being reorganized and were not expected to participate in the magnetite project. Both have defaulted on their Tilden obligations and have stopped taking pellets. A wage deferral agreement with the United Steelworkers of America will help finance the project.

It is technically easier to beneficiate magnetite-rich taconite than hematite-rich taconite. Relatively simple magnetic separators can be used to recover the magnetite, while the hematite must be ground down to a liberation size of about 25 micrometers, selectively flocculated to float siliceous slimes from the pulp, and then passed through a series of cationic flotation cells to remove the coarser, residual silicates. Until now, the operation of this flocculation-flotation circuitry and the accompanying consumption of expensive flotation reagents made Tilden a higher cost producer than the adjacent Empire Mine which recovers only magnetite.

In addition, the hematite at Tilden has a much higher phosphorus content than the magnetite from either Empire or Cliffs Drive III. The lowering of phosphorus levels in the indurated pellets to less than 0.020% (on a wet elemental basis) has been an ongoing challenge for Tilden's engineering staff. In 1980, Tilden acid pellets averaged 0.043% P. Since then, the average phosphorus level of the acid pellets has been reduced to 0.036% P. Tilden's new flux pellets contain only 0.033% P. However, blast furnace managers around the world continue to tighten their raw material specifications for phosphorus. If the unwanted phosphorus is not removed, it will dissolve in the molten iron during smelting and markedly increase the brittleness of the final steel product.

Pellet production from the redesigned operation is scheduled to peak at 4 million tons per year, which is half of Tilden's present capacity. If this downsizing schedule is followed, the reserves of Cliffs Drive III should last about 14 years. After that, hematite production could be resumed at a relatively small reconversion cost. All of the existing flocculation and flotation equipment would be left intact. Production of pellets from the first magnetite concentrates is scheduled to begin in the second quarter of 1989.

Excavation of the new pit will require the draining of two lakes - Foster and Schoolhouse - and the damming of the southeast end of Ogden Lake. All three lakes are part of the Lake Sally watershed, which is the primary source of drinking water for the city of Ishpeming. Ishpeming, the neighboring city of Negaunee, and the Michigan Dept. of Commerce were working with Cliffs to develop a replacement water source.

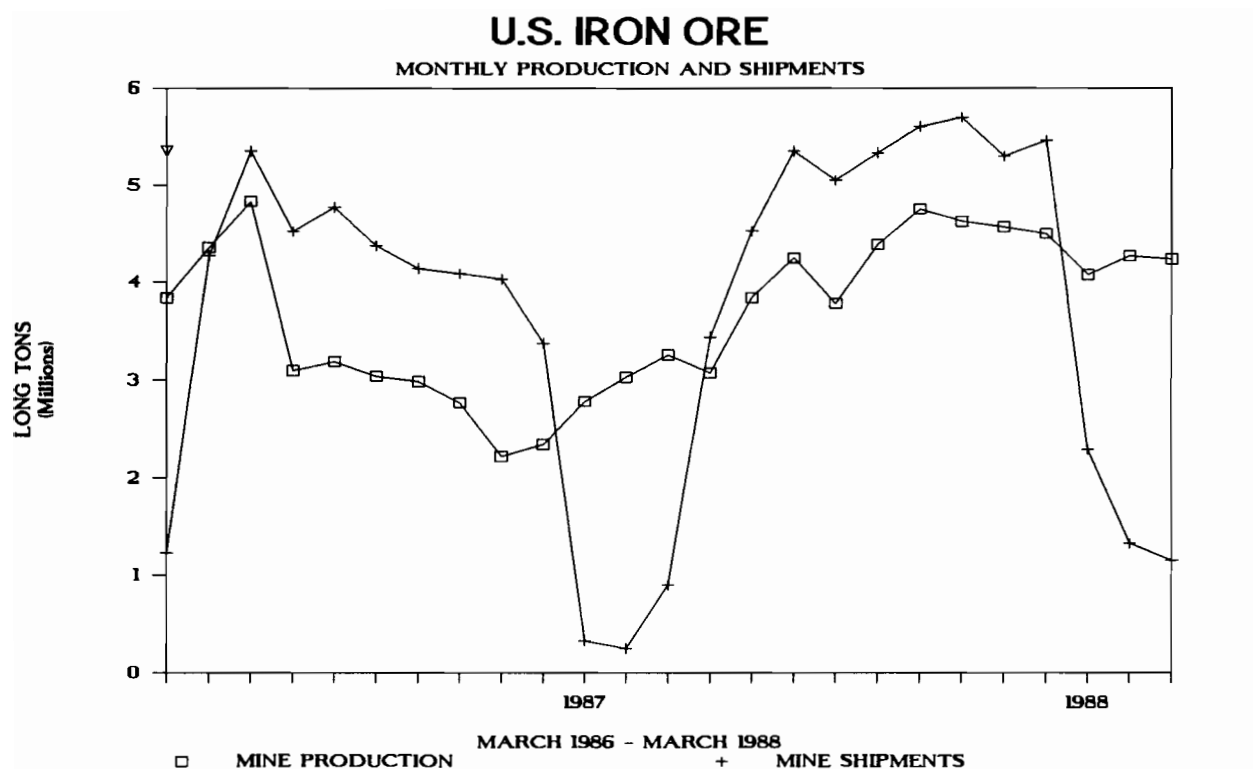


Table 1. - U.S. production and shipments of iron ore, by districts 1/  
(Exclusive of ore containing 5% or more manganese)  
(Thousand long tons)

Period	Lake Superior	Other U.S.	Total 2/	
			1988	1987
Production:				
1987 p/-----	46,194	700	--	46,894
1988:				
January-----	4,014	70	4,083	2,782
February-----	4,232	47	4,278	3,029
March-----	4,151	95	4,245	3,258
1st Quarter----	12,396	211	12,607	9,069
Shipments:				
1987 p/-----	46,523	734	--	47,257
1988:				
January-----	2,209	80	2,289	330
February-----	1,254	73	1,327	254
March-----	1,094	59	1,153	900
1st Quarter----	4,557	212	4,769	1,484

p/ Preliminary.

1/ Excludes byproduct ore, except where noted.

2/ Data may not add to totals shown because of independent rounding.

Table 2a. - U.S. mine production, shipments, and stocks of iron ore 1/  
(Exclusive of ore containing 5% or more manganese)  
(Thousand long tons)

District	Production January		Shipments January		Mine Stocks January 31	
	1988	1987	1988	1987	1988	1987
Lake Superior:						
Michigan-----	1,111	1,184	780	23	1,073	1,814
Minnesota----	2,903	1,541	1,429	273	3,137	<u>r/</u> 3,267
Other U.S.-----	70	57	80	34	200	272
Total <u>2/</u> -----	4,083	2,782	2,289	330	4,410	<u>r/</u> 5,353

r/ Revised.

1/ Excludes byproduct ore.

2/ Data may not add to totals shown because of independent rounding.

Table 2b. - U.S. mine production, shipments, and stocks of iron ore 1/  
(Exclusive of ore containing 5% or more manganese)  
(Thousand long tons)

District	Production February		Shipments February		Mine Stocks February 28	
	1988	1987	1988	1987	1988	1987
Lake Superior:						
Michigan-----	1,076	1,058	135	8	2,014	2,864
Minnesota----	3,156	1,918	1,119	198	5,163	4,986
Other U.S.-----	47	53	73	48	174	277
Total <u>2/</u> -----	4,278	3,029	1,327	254	7,351	8,127

1/ Excludes byproduct ore.

2/ Data may not add to totals shown because of independent rounding.

Table 2c. - U.S. mine production, shipments, and stocks of iron ore 1/  
(Exclusive of ore containing 5% or more manganese)  
(Thousand long tons)

District	Production March		Shipments March		Mine Stocks March 31	
	1988	1987	1988	1987	1988	1987
Lake Superior:						
Michigan-----	1,016	1,044	174	396	2,808	3,513
Minnesota-----	3,135	2,152	919	444	7,382	6,695
Other U.S.-----	95	61	59	60	209	278
Total <u>2/</u> -----	4,245	3,258	1,153	900	10,398	10,485

1/ Excludes byproduct ore.

2/ Data may not add to totals shown because of independent rounding.

Table 3. - U.S. exports of iron ore  
(Thousand long tons)

Period	Canada	Other	Total <u>1/</u>	
			1988	1987
1987 p/-----	5,011	2	--	5,013
1988:				
January-----	223	--	223	71
February-----	27	( <u>2/</u> )	27	( <u>2/</u> )
March-----	84	1	84	21
1st Quarter-----	334	1	335	92

p/ Preliminary.

1/ Data may not add to totals shown because of independent rounding.

2/ Less than one-half unit.

Source: Bureau of the Census.

Table 4. - Canada: Shipments of iron ore  
(Thousand dry long tons)

Period	Newfound- land	Quebec	Ontario	British Columbia	1988 Total <u>1/</u>	1987 Total <u>1/</u>
1987 p/-----	18,368	15,621	3,184	33	--	37,206
1988:						
January-----	635	1,189	321	2	2,147	2,472
February-----	1,371	990	253	3	2,616	1,801
March-----	705	1,233	238	2	2,178	1,808
1st Quarter----	2,710	3,413	812	6	6,941	6,081

p/ Preliminary.

1/ Data may not add to totals shown because of independent rounding.

Source: Energy, Mines, and Resources Canada.

Table 5a. - U.S. imports for consumption of iron ore, by country  
(Exclusive of ore containing 10% or more manganese)

Country of origin	January 1988			January 1987
	Thousand long tons	Value <u>1/</u> (thousand dollars)	Value <u>1/</u> (dollars per ton)	Thousand long tons
Australia-----	126	2,720	21.59	--
Brazil-----	396	6,464	16.31	r/274
Canada-----	610	20,625	33.79	r/318
Chile-----	--	--	--	r/182
Liberia-----	--	--	--	60
Mauritania-----	62	1,004	16.11	66
Peru-----	22	457	20.43	(2/)
Spain-----	--	--	--	1
Sweden-----	--	--	--	--
Venezuela-----	299	6,350	21.24	--
Other-----	(2/)	1	82.56	r/58
Total <u>3/</u> -----	1,516	37,621	24.81	r/959

r/ Revised.

1/ Customs value. Excludes international freight, insurance, and other c.i.f. charges.

2/ Less than one-half unit.

3/ Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census data reported under item 601.24 of the Tariff Schedules of the United States.

Table 5b. - U.S. imports for consumption of iron ore, by country  
(Exclusive of ore containing 10% or more manganese)

Country of origin	February 1988		Year to date 1988			Year to date 1987 (thousand long tons)
	Thousand long tons	Value <u>1</u> / (thousand dollars)	Thousand long tons	Value <u>1</u> / (thousand dollars)	Value <u>1</u> / (dollars per ton)	
Australia-----	117	1,809	243	4,529	18.64	--
Brazil-----	143	2,239	540	8,702	16.12	572
Canada-----	607	21,509	1,218	42,134	34.60	371
Chile-----	54	1,235	54	1,235	23.00	182
Liberia-----	--	--	--	--	--	128
Mauritania-----	--	--	62	1,004	16.11	66
Peru-----	--	--	22	457	20.43	20
Spain-----	--	--	--	--	--	1
Sweden-----	--	--	--	--	--	--
Venezuela-----	64	1,014	363	7,364	20.28	--
Other-----	--	--	( <u>2</u> /)	1	82.56	58
Total <u>3</u> /-----	986	27,805	2,502	65,426	26.15	1,397

1/ Customs value. Excludes international freight, insurance, and other c.i.f. charges.

2/ Less than one-half unit.

3/ Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census data reported under item 601.24 of the Tariff Schedules of the United States.

Table 5c. - U.S. imports for consumption of iron ore, by country  
(Exclusive of ore containing 10% or more manganese)

Country of origin	March 1988		Year to date 1988			Year to date 1987 (thousand long tons)
	Thousand long tons	Value <u>1</u> / (thousand dollars)	Thousand long tons	Value <u>1</u> / (thousand dollars)	Value <u>1</u> / (dollars per ton)	
Australia-----	--	--	243	4,529	18.64	--
Brazil-----	215	3,718	755	12,421	16.45	972
Canada-----	457	17,778	1,675	59,911	35.77	371
Chile-----	--	--	54	1,235	23.00	329
Liberia-----	--	--	--	--	--	286
Mauritania-----	--	--	62	1,004	16.11	66
Peru-----	56	852	78	1,308	16.76	41
Spain-----	--	--	--	--	--	1
Sweden-----	--	--	--	--	--	--
Venezuela-----	143	3,077	506	10,440	20.64	204
Other <u>2</u> /-----	--	--	( <u>3</u> /)	1	82.56	58
Total <u>4</u> /-----	871	25,425	3,373	90,850	26.93	2,327

1/ Customs value. Excludes international freight, insurance, and other c.i.f. charges.

2/ Excludes 28,466 tons of crude iron sulfate crystals reported in March from the Fed. Rep. of Germany. The material had a Customs value of \$318,651.

3/ Less than one-half unit.

4/ Data may not add to totals shown because of independent rounding.

Source: Bureau of the Census data reported under item 601.24 of the Tariff Schedules of the United States.



Table 6a. - U.S. consumption and stocks of iron ore and agglomerates  
at consuming plants and production of pig iron  
(Thousand long tons)

State or Region	Consumption		Stocks	
	January 1988	January 1987	January 31 1988	January 31 1987
Alabama, Kentucky, Tennessee, Texas, and Missouri-----	309	311	820	1,234
California, Colorado, and Utah- Delaware, Maryland, and West Virginia-----	NA	--	NA	89
Illinois and Indiana-----	720	747	1,889	1,637
Michigan and Minnesota-----	2,372	1,531	6,895	6,159
New York, Ohio, Pennsylvania, New Jersey, and Rhode Island-	481	472	1,955	1,546
	1,869	1,181	3,422	3,668
Total 1/-----	5,751	4,242	14,980	14,334
Stocks at U.S. receiving/transfer docks-----			1,944	2,136
Consuming Sector	Consumption by process		Pig iron produced	
	January 1988	January 1987	January 1988	January 1987
Blast furnaces-----	4,882	3,543	4,182	2,869
Steel furnaces-----	13	2	--	--
Agglomerating plants 2/-----	855	697	--	--
Miscellaneous 3/-----	(4/)	(4/)	--	--
Total 1/-----	5,751	4,242	4,182	2,869

NA Not available.

1/ Data may not add to totals shown because of independent rounding.

2/ Iron ore and iron ore concentrates consumed in agglomerating plants not located at the mine site.

3/ Sold to nonreporting companies or used for purposes not listed.

4/ Less than one-half unit.

Source: American Iron Ore Association (consumption of iron ore).  
American Iron and Steel Institute (production of pig iron).

Table 6b. - U.S. consumption and stocks of iron ore and agglomerates  
at consuming plants and production of pig iron  
(Thousand long tons)

State or Region	Consumption			Stocks	
	February	Year to date		February	28/29
	1988	1988	1987	1988	1987
Alabama, Kentucky, Tennessee, Texas, and Missouri-----	320	629	601	663	911
California, Colorado, and Utah- Delaware, Maryland, and West Virginia-----	NA	NA	--	NA	--
Illinois and Indiana-----	670	1,390	1,373	1,523	1,145
Michigan and Minnesota-----	2,218	4,590	2,927	4,916	5,365
New York, Ohio, Pennsylvania, New Jersey, and Rhode Island-	481	962	942	2,429	1,286
	1,815	3,684	2,327	2,659	2,953
Total <u>1/</u> -----	5,504	11,255	8,170	12,190	11,660
Stocks at U.S. receiving/transfer docks-----				1,720	1,963
Consuming Sector	Consumption by process			Pig iron produced	
	February	Year to date		February	Year to date 2/
	1988	1988	1987	1988	1988 1987
Blast furnaces-----	4,807	9,690	6,873	3,967	8,148 5,609
Steel furnaces-----	23	36	7	--	-- --
Agglomerating plants <u>3/</u> --	674	1,529	1,280	--	-- --
Miscellaneous <u>4/</u> -----	( <u>5/</u> )	( <u>5/</u> )	9	--	-- --
Total <u>1/</u> -----	5,504	11,255	8,170	3,967	8,148 5,609

NA Not available.

1/ Data may not add to totals shown because of independent rounding.

2/ Includes revisions for previous month.

3/ Iron ore and iron ore concentrates consumed in agglomerating plants not located at the mine site.

4/ Sold to nonreporting companies or used for purposes not listed.

5/ Less than one-half unit.

Source: American Iron Ore Association (consumption of iron ore).  
American Iron and Steel Institute (production of pig iron).

Table 6c. - U.S. consumption and stocks of iron ore and agglomerates  
at consuming plants and production of pig iron  
(Thousand long tons)

State or Region	Consumption			Stocks	
	March 1988	Year to date		March 31	
		1988	1987	1988	1987
Alabama, Kentucky, Tennessee, Texas, and Missouri-----	345	975	927	652	964
California, Colorado, and Utah- Delaware, Maryland, and West Virginia-----	NA	NA	--	NA	--
Illinois and Indiana-----	712	2,102	1,955	1,179	1,331
Michigan and Minnesota-----	2,359	6,949	4,910	2,878	3,747
New York, Ohio, Pennsylvania, New Jersey, and Rhode Island-	517	1,479	1,436	2,613	1,121
	1,969	5,653	3,833	1,917	2,359
Total <u>1</u> /-----	5,903	17,158	13,060	9,239	9,522

Stocks at U.S. receiving/transfer docks-----	726	903
--	-----	-----

Consuming Sector	Consumption by process			Pig iron produced		
	March 1988	Year to date		March 1988	Year to date <u>2</u> /	
		1988	1987		1988	1987
Blast furnaces-----	5,450	15,140	11,248	4,323	12,471	9,083
Steel furnaces-----	18	55	15	--	--	--
Agglomerating plants <u>3</u> /--	435	1,963	1,784	--	--	--
Miscellaneous <u>4</u> /-----	( <u>5</u> /)	( <u>5</u> /)	13	--	--	--
Total <u>1</u> /-----	5,903	17,158	13,060	4,323	12,471	9,083

NA Not available.

1/ Data may not add to totals shown because of independent rounding.

2/ Includes revisions for previous months.

3/ Iron ore and iron ore concentrates consumed in agglomerating plants not located at the mine site.

4/ Sold to nonreporting companies or used for purposes not listed.

5/ Less than one-half unit.

Source: American Iron Ore Association (consumption of iron ore).  
American Iron and Steel Institute (production of pig iron).

Table 7a. - U.S. imports for consumption of iron ore, by customs district  
(Exclusive of ore containing 10% or more manganese)  
(Thousand long tons)

Customs district	January 1988	January 1987
Baltimore-----	536	<u>r</u> /374
Buffalo-----	--	--
Charleston, SC-----	22	47
Chicago-----	65	65
Cleveland-----	23	--
Detroit-----	30	--
Houston-----	--	( <u>1</u> /)
Los Angeles-----	--	--
Milwaukee-----	--	--
Mobile-----	120	<u>r</u> /182
New Orleans-----	121	<u>r</u> /60
New York-----	--	--
Philadelphia-----	595	<u>r</u> /229
San Juan, PR-----	--	1
Wilmington, NC-----	--	<u>r</u> /--
Other-----	5	--
Total <u>2</u> /-----	1,516	<u>r</u> /959

r/ Revised.

1/ Less than one-half unit.

2/ Data may not add to totals shown because of independent rounding.

Table 7b. - U.S. imports for consumption of iron ore, by customs district  
(Exclusive of ore containing 10% or more manganese)  
(Thousand long tons)

Customs district	February 1988	Year to date	
		1988	1987
Baltimore-----	498	1,035	494
Buffalo-----	--	--	(1/)
Charleston, SC-----	--	22	67
Chicago-----	--	65	133
Cleveland-----	--	23	--
Detroit-----	--	30	--
Houston-----	--	--	(1/)
Los Angeles-----	--	--	--
Milwaukee-----	--	--	--
Mobile-----	115	235	182
New Orleans-----	143	265	238
New York-----	--	--	(1/)
Philadelphia-----	228	823	282
San Juan, PR-----	--	--	1
Wilmington, NC-----	--	--	--
Other-----	(1/)	5	--
Total 2/-----	986	2,502	1,397

1/ Less than one-half unit.

2/ Data may not add to totals shown because of independent rounding.

Table 7c. - U.S. imports for consumption of iron ore, by customs district  
(Exclusive of ore containing 10% or more manganese)  
(Thousand long tons)

Customs district	March 1988	Year to date	
		1988	1987
Baltimore-----	481	1,516	912
Buffalo-----	--	--	(1/)
Charleston, SC-----	46	69	88
Chicago-----	--	65	156
Cleveland-----	--	23	--
Detroit-----	--	30	--
Houston-----	--	--	(1/)
Los Angeles-----	--	--	--
Milwaukee-----	--	--	--
Mobile-----	--	235	302
New Orleans-----	2/158	2/423	382
New York-----	--	--	(1/)
Philadelphia-----	186	1,009	486
San Juan, PR-----	(1/)	(1/)	1
Wilmington, NC-----	--	--	--
Other-----	(1/)	5	--
Total 3/-----	871	3,373	2,327

1/ Less than one-half unit.

2/ Excludes 28,466 tons of crude iron sulfate.

3/ Data may not add to totals shown because of independent rounding.