tonnage contributed to increased costs.

Pit Operating Costs: $0.053 over the budget and $0.036 over 1956 costs. Structure drilling, not anticipated in the budget, amounted to over $30,000 and increased costs by $0.028 a ton. Pit pumping, shown in the budget as split between the Canisteo and Sally, was all charged to the Canisteo.

Beneficiation Costs: $0.013 under the budget and $0.001 under 1956 costs. The cost setup in the budget anticipated use of the scrubber during the entire operating season, but because of the delay in delivery, costs were actually less than anticipated.

Fine Ore Concentration Costs: $0.174 under the budget and $0.231 under 1956 costs because of increased recovery on both the classifier overflows and basin tails and plant improvements which reduced downtime.

General Mine Expense: $0.056 over the budget and $0.094 over 1956 costs because of increased costs in engineering, insurance, SUB, and because of the decreased tonnage.

Winter & Idle: $0.352 over the budget and $0.406 over 1956 costs, due mainly to cost allocation between the Sally and Canisteo. The budget was set up on the assumption that Winter & Idle costs would be split on a tonnage basis starting January 1, 1957. Since the Sally was not charged with any Winter & Idle expense until after the end of ore season, Canisteo's Winter & Idle increased considerably. Actual Winter & Idle increased because of the early shutdown and the increased repair work during the fall of 1957 in anticipation of a complete shutdown after January 1, 1958.

11. EXPLORATION & FUTURE EXPLORATION

During 1957, the Henry Schultz Company drilled 13 structure drill holes in the Canisteo pit totalling 1821 feet, mainly to check the pit bottom in the west Snyder and in the east and west Bovey forties. Several holes were drilled to a sufficient depth to be of value for laboratory work on taconite concentration. Two holes were drilled to quartzite. In general, no appreciable change in ore reserves resulted from this drilling.

Additional drilling will be necessary along the east and south sides of the pit and on the Bovey forties to the north before ultimate pit limits and actual reserves can be determined.

12. TAXES

	1957		1956		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$561,406	$114,789.38	$650,208	$112,685.35	-$88,802	↗$ 2,104.03
Land,Bldgs,Machinery	80,269	16,660.05	80,289	14,194.29	- 20	↗ 2,465.76
Personal Property						
Equipment	117,998	24,049.17	99,556	17,206.26	↗ 18,442	↗ 6,842.91
Stockpile	5,314	1,083.05	2,155	372.45	↗ 3,159	↗ 710.60
Tailings Basin Stockpile	32,197	6,562.07	42,141	7,283.23	- 9,944	- 721.16
	$797,184	$163,143.72	$874,349	$151,741.58	-$77,165	↗$ 11,402.14
Average Mill Rate		204.65		173.55		

Mill rate increase of 17.92 per cent offset reduction in mineral valuation of $88,802; mineral valuation at 47 per cent of full and true value same as 1956. Personal property increased flat 15 per cent by State. Tailings basin valuation per ton increased by State from $0.406 to $0.431. Of the above taxes, $17,344.19 was charged to Sally as its proportionate share for use of plant and equipment.

13. ACCIDENTS & PERSONAL INJURY

On October 3, 1957, Ralph Trout suffered fractured left clavicle and multiple upper rib fractures on left and right side when greasing front idler of left side of shovel. The bucket was brought back to start a pass up the bank, squeezing Trout between bucket and shovel pads. Lost 12 weeks and 4 days. Compensation paid: $576.

14. PROPOSED NEW CONSTRUCTION

E&A No. CC-937 in the amount of $4360 authorizes raising of building and installing new doors on pit service shop. The work is to be done by Abe Mathews Engineering Company during January and February of 1958.

E&A No. CC-952 in the amount of $21,150 authorizes installation of a rock pocket at the end of the existing 5-foot pan conveyor. The work is to be done by mine crews and is scheduled to start in February of 1958.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Equipment Received

1 TD-18 Tractor
2 Fresh Water Pumps for Washing Plant
340 feet 30" Conveyor Belting for Out of Surge Conveyor in Heavy-Media Plant

b. Proposed New Equipment

2 Tailings Pumps for Fine Ore Plant
1 34-ton Euclid Truck
1 Blasthole Drill
2 Pickup Trucks

CUSHING MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

There was no stripping, ore production, drilling, or activity on the Cushing mine proper in 1957.

The following land purchases were consummated:

Purchased from	Description		Acres	Cost
Oscar Gross	SE¼-SW¼	Section 27, 56-25	40	$ 3,400
Jones & Laughlin	N½-NW¼	Section 27, 56-25	80	4,000
Jones & Laughlin	NE¼	Section 27, 56-25	160	8,000
Jones & Laughlin	W½-NW¼	Section 26, 56-25	80	4,000
Jones & Laughlin	SE¼-NW¼	Section 27, 56-25	40	2,000
			400	$21,400

The above described lands are northwest of the Cushing mine and are designated for use as auxiliary forties.

A Great Northern Railway crew surveyed a proposed relocation for its Canisteo yards and Danube spur which are presently on Cushing lands.

4. ESTIMATE of ORE RESERVES

	Bessemer				Non-Bessemer				
Concentrates	Tons	Iron	Phos	Silica	Tons	Iron	Phos	Silica	Total
NE-SW 36-56-25									
Wash					118,009	57.50	.045	8.08	118,009
Retreat	71,552	56.50	.025	11.00	157,414	57.00	.050	10.00	228,966
	71,552	56.50	.025	11.00	275,423	57.21	.048	9.18	346,975
NW-SW 36-56-25									
Wash					584,285	58.02	.045	8.74	584,285
Retreat	403,813	56.50	.032	11.00	853,227	57.00	.046	10.00	1,257,040
	403,813	56.50	.032	11.00	1,437,512	57.82	.046	9.49	1,841,325
SW-SW 36-56-25									
Wash					392,152	58.91	.045	8.81	392,152
Retreat	126,141	56.50	.030	11.00	69,860	57.00	.048	10.00	196,001
	126,141	56.50	.030	11.00	462,012	58.62	.045	8.99	588,153

Total Concentrates	Bessemer Tons	Bessemer Iron	Bessemer Phos	Bessemer Silica	Non-Bessemer Tons	Non-Bessemer Iron	Non-Bessemer Phos	Non-Bessemer Silica	Total
Wash					1,094,446	58.28	.045	8.69	1,094,446
Retreat	601,506	56.50	.031	11.00	1,080,501	57.00	.047	10.00	1,682,007
	601,506	56.50	.031	11.00	2,174,947	57.64	.046	9.34	2,776,453

12. TAXES

Real Estate	1957 Assessed Value	1957 Taxes	1956 Assessed Value	1956 Taxes	Increase-Decrease Assessed Value	Increase-Decrease Taxes
Mineral	$188,051	$47,202.68	$188,051	$45,891.94		+$1,310.74
Land	4,281	1,074.58	2,474	603.75	+$1,807	+$ 470.83
	$192,332	$48,277.26	$190,525	$46,495.69	+$1,807	+$1,781.57
Average Mill Rate		251.01		244.04		

Note: Increase mill rate 2.86% increased mineral tax. Nine additional forties purchased from Jones & Laughlin in 1956 increased land valuation and tax.

HAWKINS MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

Stripping operations at the close of the 1956 season continued until March 13 when crews were reduced for pit and plant repairs. Pit and plant repairs consisted of complete overhaul of two shovels, general repair to trucks and tractors, replacing chute liners and worn pipe line, and electrical repairs. Plant changes under E&A's Nos. CC-953 and CC-954 consisted of installation of coarse-fines split facilities and relocation of dewatering screens from the cyclone plant to the lower floor of the washing plant for dewatering the fines product before conveying. The air compressor from the pit was relocated at the plant area. The pit power line was relocated during the operating season for better distribution of power to make way for stripping.

Ore operations began on April 29 on a 2-shift, 5-day schedule, using a small crew in the plant on the third shift for plant maintenance. Pit crude production averaged 7749 tons per shift for a total of 1,945,045 tons; plant concentrate production averaged 2508 tons per shift for a total of 629,442 tons. Pit recovery was 32 per cent. Ore operations were completed on October 24 and crews were then shifted to stripping operations.

The International Harvester fines plant went into operation on the 30th of April and completed production on September 23.

After the close of the 1957 ore season, stripping was started on a 3-shift, 5-day schedule, using one shovel and eight trucks in surface material along the east side of the pit. This material was placed on dykes, extending the Hawkins tailings pond to the east.

Winter & Idle repairs were started immediately after 1957 ore operations and were completed by January 1, 1958.

Experimental loading of ammonium nitrate into cans for wet hole shooting was carried on throughout the year and results proved very encouraging.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Hawkins	Wash	Retreat	Total
Crude	37,751	1,654,429	1,692,180
Concts.	19,131	610,311	629,442
IHC Fines			
Crude			141,609
Concts.			43,806

b. Shipments by Grades

	Bessemer			Non-Bessemer				
			Stockpile			Stockpile		
Ore	Wash	Retreat	Retreat	Wash	Retreat	Wash	Retreat	Total
Hawkins	117	215,163	15,088	10,694	380,024	134	47,447	668,667
IHC Fines								43,806

c. Stockpile Inventories

Concentrates	Tons
Wash	8,320
Retreat	15,123
	23,443

d. Production by Months

Crude

Month	Hawkins Wash	Hawkins Retreat	Total	IHC Fines
April		15,723	15,723	909
May		251,786	251,786	27,072
June	37,751	250,869	288,620	31,788
July		294,469	294,469	28,815
Aug		292,761	292,761	31,950
Sept		284,637	284,637	21,075
Oct		264,184	264,184	
	37,751	1,654,429	1,692,180	141,609

Concentrates

April		4,622	4,622	250
May		78,120	78,120	9,075
June	19,131	84,087	103,218	10,712
July		108,459	108,459	12,540
Aug		110,854	110,854	4,612
Sept		106,793	106,793	6,617
Oct		117,376	117,376	
	19,131	610,311	629,442	43,806

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

Hawkins	Tons	Iron	Silica
Wash	37,751	48.62	24.46
Retreat	1,654,429	38.00	40.34
	1,692,180	38.24	39.99

b. Tonnage & Analysis of Concentrates Produced

Hawkins	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Bessemer Wash	117	55.90	.042	12.35	.55	.74	10.90
Non-Bessemer Wash	19,014	56.63	.045	11.80	.28	.90	9.91
Bessemer Retreat	215,163	56.87	.032	11.47	.41	.50	6.51
Non-Bessemer Retreat	395,148	56.05	.037	11.81	.79	.44	6.40
	629,442	56.35	.035	11.70	.64	.48	6.53
IHC Fines	43,806	57.06	.034	13.13	.27	.60	8.81

c. Tonnage & Complete Analysis of Concentrates Shipped

Hawkins Concentrates	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist
Bessemer Wash	117	55.90	.042	12.35	.55	.74	.10	.20	.007	5.79	10.90
Non-Bessemer Wash	10,694	56.64	.045	11.80	.28	.90	.10	.20	.007	5.51	9.91
Bessemer Retreat	215,163	56.87	.032	11.47	.41	.50	.10	.20	.007	5.82	6.51
Non-Bessemer Retreat	380,024	56.05	.037	11.81	.79	.44	.10	.20	.007	6.09	6.40
Non-Bess Wash Stockpile	134	56.90	.034	10.95	1.03	.46	.10	.20	.007	5.37	4.90
Bess Retreat Stockpile	15,088	56.31	.034	11.29	.38	.50	.10	.20	.007	6.77	5.88
Non-Bess Retreat Stockpile	47,447	56.53	.039	11.42	.58	.45	.10	.20	.007	6.07	5.13
	668,667	56.36	.035	11.66	.64	.47	.10	.20	.007	5.98	6.39

d. Tonnage & Analysis of Ore in Inventory

Hawkins	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Wash	8,320	56.40	.042	12.33	.32	1.04	8.99
Retreat	15,123	56.24	.032	11.87	.55	.49	6.34
	23,443	56.30	.036	12.03	.47	.69	7.28

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Concentrates	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Wash	14	0	50
Retreat	14	0	30

b. Estimated Reserves

Lease	Reserves 12-31-56	Mined 1957	Balance after Mining	Changed by Re-estimate	Reserves 12-31-57
SE-NE 31, 57-22					
Open Pit Wash	245,152		245,152	- 133,948	111,204
Open Pit Retreat	316,938	62,189	254,749	≠ 134,390	389,139
	562,090	62,189	499,901	≠ 442	500,343
NE-SE 31, 57-22					
Open Pit Wash	521,349		521,349	- 339,171	182,178
Open Pit Retreat	412,671	293,425	119,246	≠ 736,295	855,541
Underground Wash	21,372		21,372	- 21,372	
	955,392	293,425	661,967	≠ 375,752	1,037,719
SW-NW 32, 57-22					
Open Pit Wash	101,947	19,131	82,816	- 51,773	31,043
Open Pit Retreat	319,950	151,663	168,287	≠ 177,595	345,882
Underground Wash	22,172		22,172	- 22,172	
	444,069	170,794	273,275	≠ 103,650	376,925
NW-SW 32, 57-22					
Open Pit Wash	133,216		133,216	≠ 144,394	277,610
Open Pit Retreat		103,034	-103,034	≠ 197,619	94,585
Underground Wash	368,814		368,814	- 241,495	127,319
	502,030	103,034	398,996	≠ 100,518	499,514
Total Hawkins					
Open Pit Wash	1,001,664	19,131	982,533	- 380,498	602,035
Open Pit Retreat	1,049,559	610,311	439,248	≠1,245,899	1,685,147
Underground Wash	412,358		412,358	- 285,039	127,319
	2,463,581	629,442	1,834,139	≠ 580,362	2,414,501

c. Estimated Analysis of Ore Reserves

Material	Tons	Iron	Phos	Silica
SE-NE 31, 57-22				
Bessemer Wash Open Pit	72,117	61.13	.026	8.72
Non-Bessemer Wash Open Pit	39,087	61.20	.047	7.38
Bessemer Retreat Open Pit	187,333	59.38	.028	10.66
Non-Bessemer Retreat Open Pit	201,806	59.38	.050	10.66
	500,343	59.77	.038	10.12
NE-SE 31, 57-22				
Bessemer Wash Open Pit	127,205	59.95	.029	8.72
Non-Bessemer Wash Open Pit	54,973	60.58	.058	8.37
Bessemer Retreat Open Pit	738,441	57.65	.030	11.81
Non-Bessemer Retreat Open Pit	117,100	57.67	.052	11.81
	1,037,719	58.09	.034	11.25
SW-NW 31, 57-22				
Bessemer Wash Open Pit	21,370	56.60	.012	9.87
Non-Bessemer Wash Open Pit	9,673	56.76	.063	10.15
Bessemer Retreat Open Pit	208,292	57.50	.028	10.90
Non-Bessemer Retreat Open Pit	137,590	57.50	.056	10.90
	376,925	57.43	.038	10.82
NW-SW 32, 57-22				
Bessemer Wash Open Pit	71,774	59.08	.029	7.63
Non-Bessemer Wash Open Pit	205,836	56.85	.062	9.78
Bessemer Retreat Open Pit	92,776	57.50	.028	10.90
Non-Bessemer Retreat Open Pit	1,809	57.50	.056	10.90
Bessemer Wash Underground	62,974	58.00	.030	9.00
Non-Bessemer Wash Underground	64,345	57.00	.060	9.50
	499,514	57.46	.047	9.55
Total Wash Open Pit				
Bessemer	292,466	59.78	.027	8.54
Non-Bessemer	309,569	58.06	.060	9.24
	602,035	58.90	.044	8.90
Total Retreat Open Pit				
Bessemer	1,226,842	57.88	.029	11.41
Non-Bessemer	458,305	58.37	.053	11.02
	1,685,147	58.01	.035	11.31
Total Wash Underground				
Bessemer	62,974	58.00	.030	9.00
Non-Bessemer	64,345	57.00	.060	9.50
	127,319	57.49	.045	9.25
Total Hawkins Concentrates	2,414,501	58.20	.038	10.60

5. LABOR & WAGES

a. Comments

An ample labor supply existed during the year and very little turnover was experienced.

The following raises became effective in 1957: $0.03 cost-of-living on January 1; $0.04 cost-of-living on July 1; and an automatic increase of $0.07 per hour plus $0.002 per job class on July 1.

b. Comparative Statement of Production

Concentrate Tonnage	629,442
Number of Shifts	251
Number of Hours	141,033
Average Number of Men Working	140
Average Wages Per Hour	$2.810
Product Per Man Per Day	35.70
Labor Cost Per Man Per Ton	$0.6538
Total Number of Days	126
Total Amount Paid for Labor	$411,556.44

6. GENERAL SURFACE

a. Building & Repairs

Only necessary repairs to mine buildings.

b. Roads

Only operation changes.

c. Power Lines

Pit power lines were relocated to make way for future stripping and to provide better power distribution.

7. OPEN PIT

a. Stripping

Rock stripping along the east side of the pit, in progress on January 1, 1957, continued until March 13 on a 3-shift, 5-day schedule. Surface stripping in the same area was resumed on the same operating schedule upon completion of the ore season and continued into 1958, using one shovel and eight trucks. In conjunction with stripping, an extension to the plant tailings pond was completed, using material from the stripping operation.

Following is a table showing Hawkins stripping:

Cubic Yards	Shifts	Yards/Shift	Man-Hours	Cost/Yard
1,094,677	299	3,661	76,370	$0.589

b. Open Pit Mining

The 1957 ore season began on April 29 on a 2-shift, 5-day schedule using eight trucks and two shovels. Operations were conducted along the east side and in the pit bottom along the north side of the pit. To meet low phos requirements, it was necessary during the last month of the season to mine entirely from the east side of the pit. This may have some effect on grade in 1958 as original plans were to mine this area during the 1958 season. Pit operations, in general, were satisfactory. In spite of a worn crude belt which lowered production for six weeks while a new belt was being secured, crude rate to the plant was adequate.

Crude production from the pit was as follows:

	Wash Plant				Pit						
Material	Shifts	+2" Rejects	Crude	Tons Per Shift	Shifts	Screen Rock	Lean and Waste	Rock	Crude	Tons Per Shift	Cost Per Ton
Wash	6		37,751	6,292	6	4,488			42,239	7,040	$0.274
Retreat	245	146	1,654,575	6,753	245	209,415	14,726	24,090	1,902,806	7,767	0.274
	251	146	1,692,326	6,742	251	213,903	14,726	24,090	1,945,045	7,749	$0.274

c. Pumping & Drainage

Pumping from the pit was approximately 1200 gallons per minute. The water in the pit sump had to be lowered about five feet to facilitate drainage from the lowered pit bottom.

d. General Pit Activity

During the 1957 season, the pit power line was relocated and both bridges over Highway 169 were redecked. Pit activity, other than this, was normal and confined to mining ore and removal of pit rock.

8. BENEFICIATION

a. Washing Plant

The plant operated on the same shift as the pit, except for a small maintenance crew on the third shift.

Relocating the dewatering screens for cyclone feed into the plant made it possible to do a better washing job on the classifier product through the secondary machines, and in some cases lowered the silica on the classifier product as much as 4 per cent.

A satisfactory rate of crude through the plant was maintained and delays were at a minimum. Delays were not necessarily an interruption in plant production as in most instances bypassing of these units was possible. Delay time is shown as follows:

Source of Delay	Hours	Per Cent	Per Cent of 2008.0 Working Hours
Out of Ore	10.42	21.69	0.51
Pit Screening Plant	0.33	0.69	0.02
Crude Ore Conveyor	8.51	17.72	0.42
Primary Screens	2.49	5.18	0.12
Crushers	0.50	1.04	0.02
Crusher Product Conveyor	0.16	0.33	0.01
Crusher Product Screen	0.83	1.73	0.04
Crusher Screen Undersize Pump	4.58	9.54	0.23

Source of Delay	Hours	Per Cent	Per Cent of 2008.0 Working Hours
Secondary Screens	3.33	6.93	0.17
Surge Pile Conveyor	2.66	5.54	0.13
Coarse Concentrate Conveyor	1.17	2.44	0.06
Fine Concentrate Conveyor	1.13	2.35	0.06
Stockpile Conveyor	0.50	1.04	0.02
Miscellaneous Chutes & Launders	4.17	8.68	0.21
Tailings Pump	1.17	2.44	0.06
Air Compressor	0.33	0.69	0.02
Electric Power	5.75	11.97	0.29
	48.03	100.00	2.39

Recapitulation

Crude Ore to Head of Mill	19.26	40.10	0.96
Ore Processing Delays	28.77	59.90	1.43
	48.03	100.00	2.39

b. Heavy-Media Plant

The Heavy-Media plant operated satisfactorily with a minimum of downtime. No plant changes are anticipated for the coming season except for a weightometer on the plant feed to give a more complete record of plant production rate. Delays were as follows:

Source of Delay	Hours	Per Cent	Per Cent of 2073.83 Working Hours
Out of Ore	52.78	55.70	2.54
Surge Pile Feeder	1.58	1.67	0.08
Heavy-Media Feed Conveyor	1.63	1.72	0.08
Feed Preparation Screen	6.50	6.86	0.31
Akins Separator	2.24	2.36	0.11
Hardinge Separator	2.00	2.11	0.10
Coarse Concentrate Screen	1.25	1.32	0.06
Coarse Reject Screen	0.75	0.79	0.04
Fine Concentrate Screen	2.00	2.11	0.10
Dirty Media Pump	2.25	2.37	0.11

Source of Delay	Hours	Per Cent	Per Cent of 2073.83 Working Hours
Densifier	1.12	1.18	0.05
Coarse Concentrate Conveyor	0.67	0.71	0.03
Fine Concentrate Conveyor	0.50	0.53	0.02
Reject Truck	1.43	1.51	0.07
Miscellaneous Chutes & Launders	3.18	3.36	0.15
Electric Power	14.87	15.70	0.72
	94.78	100.00	4.57

Recapitulation

Crude Ore to Head of Mill	55.99	59.07	2.70
Ore Processing Delays	38.79	40.93	1.87
	94.78	100.00	4.57

c. Cyclone Plant

Relocating the dewatering screens gave a more uniform feed to the plant, improved grade, and increased plant production. Installation of demagnetizing coils on the media circuit and installation of a cleanup cyclone should reduce media losses in 1958. A dewatering classifier for cyclone tailings is being added to the flowscheme to improve tailings disposal facilities.

Cyclone plant delays are shown as follows:

Source of Delay	Hours	Per Cent	Per Cent of 1925.25 Working Hours
Out of Ore	10.00	6.88	0.52
Feed Dewatering Screens	5.53	3.80	0.29
Dewatering Screen Undersize Pump	10.00	6.88	0.52
Cyclone Feed Pumps	16.28	11.20	0.85
Cyclones	1.50	1.03	0.08
Media Return Pump	1.00	0.69	0.05
Sink Drain & Wash Screens	42.25	29.07	2.19
Concentrate Pump	4.25	2.92	0.22
Concentrate Dewatering Classifier	1.33	0.91	0.07
Float Screens	7.50	5.16	0.39

Source of Delay	Hours	Per Cent	Per Cent of 1925.25 Working Hours
Tramp Screens	9.83	6.76	0.51
Tramp Screen Feed Pump	2.50	1.72	0.13
Primary Magnetic Separator	1.00	0.69	0.05
Secondary Magnetic Separator	1.45	1.00	0.08
Thickeners	4.00	2.75	0.21
Thickener Undersize Flow Pump	5.75	3.96	0.30
Media Charging Pump	1.00	0.69	0.05
Tailings Pump	0.75	0.52	0.04
Miscellaneous Chutes & Launders	1.50	1.03	0.08
Magnetic Ore	2.00	1.38	0.10
Fresh Water Pump	2.00	1.38	0.10
Charging Plant & Tieup	3.67	2.53	0.19
Operator Illness	1.50	1.03	0.08
Electric Power	8.75	6.02	0.45
	145.34	100.00	7.55
Recapitulation			
Crude Ore to Head of Mill	25.53	16.57	1.25
Ore Processing Delays	119.81	83.43	6.30
	145.34	100.00	7.55

d. International Harvester Tailings Basin Plant

Operations at the International Harvester tailings basin plant were started on April 30 and completed on September 23. At the end of the 1957 season, the "A" pond was mined out for a total of 335,863 tons of concentrates as compared to an estimated tonnage of 301,944.

Plant repairs were completed in November and transfer of the pumping station to the "B" pond will be completed early in 1958.

141,609 tons of crude ore were processed in 1957 to produce 43,806 tons of concentrates at an average recovery of 30.93 per cent.

1957 plant production statistics are shown as follows:

Product	1957 Estimate	1957 Production	1956 Production
Concentrates	50,000	43,806	50,489
Per Cent Recovery	40.00	30.93	45.32
Average Daily Output	376	429	447
Tons Per Man Per Day		21.72	47.10
Days Operated	133	102	113

Plant delays are shown as follows:

Source of Delay	Hours	Per Cent	Per Cent of 1624.0 Working Hours
Out of Ore - Dragline	7.75	6.53	0.48
Moving Screening Plant	12.50	10.53	0.77
Screen Plant Feeder	5.00	4.21	0.31
Trash Screen	3.33	2.80	0.20
Trash Conveyor	2.00	1.68	0.12
Miscellaneous Screen Plant	4.50	3.79	0.28
Plant Feed Pump	13.25	11.16	0.82
Plant Feed Line	32.50	27.37	2.00
Sizer Feed Pump	1.50	1.26	0.09
Sizer Feed Lines	3.50	2.95	0.22
Spiral Feed Pump	0.50	0.42	0.03
Concentrate Pump	3.92	3.30	0.24
Dewatering Classifier	0.75	0.63	0.05
Clear Water Pump	3.00	2.53	0.18
Clear Water Line	6.50	5.47	0.40
Plant Startup	0.50	0.42	0.03
Railroad Cars & Tracks	8.50	7.16	0.52
Electric Power	9.25	7.79	0.57
	118.75	100.00	7.31
Recapitulation			
Crude Ore to Head of Mill	80.83	68.07	4.98
Ore Processing Delays	37.92	31.93	2.33
	118.75	100.00	7.31

e. Complete Concentration Data

Hawkins Wash Plant Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Per Cent Iron Units
Crude to Plant	37,751	100.00	89.37	48.62		24.46	
Screen Plant Rock	4,488		10.63	24.04		60.86	
Pit Crude	42,239		100.00	46.01		28.33	
Total Concentrates Produced & Shipped	19,131	50.68	45.29	56.52	.043	12.05	58.91
Total Unsized Concentrates Produced	19,131	50.68	45.29	56.52	.043	12.05	
Total Fine Tailings (by difference)	18,620	49.32	44.08	40.50		37.21	
Hawkins Retreat Plant Product							
Crude to Plant	1,654,575	100.00	87.63	38.00		40.34	
Pit Rock	24,090		1.28	21.04		65.07	
Screen Plant Rock	209,415		11.09	21.76		64.06	
Pit Crude	1,888,080		100.00	35.98		43.29	
Total Concentrates Produced	610,311	36.89	32.32	56.31	.034	11.68	54.66
Unsized Concentrates Produced	538,957	35.27	28.55	56.29	.034	11.70	
Coarse Concentrates Produced	49,972	3.02	2.65	57.11	.033	10.22	
Fine Concentrates Produced	21,382	1.29	1.13	55.02	.032	14.48	
Total Concentrates Produced & Shipped	610,311	36.89	32.32	56.31	.034	11.68	54.66
Heavy-Media Concentrates	423,211	25.58	22.41	57.36		10.63	
Heavy-Media Rejects	201,472	12.18	10.67	38.92		38.31	
Heavy-Media Feed	624,683	37.75	33.08	50.91		19.56	
-2" Wash Plant Rejects	146	0.01	0.01	24.19		60.03	
Total Fine Tailings (by difference)	842,646	50.92	44.63	24.52		61.59	
Tailings Basin Plant							
Crude to Plant	141,609	100.00		42.29		35.49	100.00
Total Concentrates	43,806	30.93		57.06	.034	13.12	41.74
Total Fine Tailings (by difference)	97,803	69.07		35.68		45.51	

9. MAINTENANCE & REPAIRS

Repairs to pit equipment were carried on throughout the operating season to minimize Winter & Idle repairs. Concentrating plant repairs were completed by January 1, 1958.

10. COST of OPERATIONS

a. Comparative Mining Costs

Product	1957 Estimate	1957 Production	1956 Production
Wash Concentrates	50,000	19,131	2,163
Per Cent Recovery	45.00	45.29	52.18
Retreat Concentrates	550,000	610,311	845,795
Per Cent Recovery	32.00	32.74	32.48
Total Production	600,000	629,442	847,958
Per Cent Recovery	33.00	33.02	32.51
Average Daily Output	4,688	4,996	6,573
Tons Per Man Per Day		35.71	36.33
Days Operated	128	126	129
Costs			
Total Pit Operating	$0.244	$0.274	$0.264
Total Concentrating	0.230	0.206	0.211
Loading Stockpile Ore	0.006	0.014	0.008
Miscellaneous Pit & Beneficiation	0.139	0.110	0.116
Total Pit & Beneficiation	$1.498	$1.521	$1.550
General Mine Expense	0.186	0.213	0.123
Winter & Idle	0.500	0.653	0.395
Cost of Production	$2.184	$2.387	$2.068
Depreciation			
Plant & Equipment		0.267	0.252
Motorized & Other Equipment		0.067	0.032
Movable Equipment		0.013	0.008
Amortization - Stripping			-0.005

Costs	1957 Production	1956 Production
Taxes		
Ad Valorem	$0.346	$0.152
Occupational	0.021	0.171
Royalty	0.184	0.188
Total Depreciation-Amortization-Taxes	$0.898	$0.798
Administrative Expense	0.050	0.050
Miscellaneous Expense & Income	0.020	0.001
Royalty	1.344	1.378
Total Cost on Cars	$4.699	$4.295

b. Detailed Cost Comparison

Pit Costs
$0.010 higher than 1956 and $0.030 over the estimate. Relocating the pit power line and redecking bridge over Highway 169 increased general open pit expenses by $0.015. About half the drilling for the year was done in the pit bottom in wet caving ground. It was impossible to use ammonium nitrate as a blasting agent because of the water problem. This, plus lower drilling penetration rate, increased drilling and blasting charges by $0.007 a ton. During the last month of operations, canning ammonium nitrate with sufficient density to sink in water was used successfully.

Concentrating Costs
$0.024 below the estimate and $0.005 below 1956. Despite higher wages and material costs, concentrating charges were slightly reduced.

Loading Stockpile Ore
$0.008 over the estimate and $0.006 over 1956 because of additional charges in separating coarse-fines in stockpile and additional tonnage loaded out of stockpile.

Miscellaneous Pit & Beneficiation
$0.006 below 1956 and $0.029 below the estimate for reasons mentioned above.

Total Pit & Beneficiation
$0.029 below 1956 and $0.023 over the estimate.

General Mine Expense
$0.027 over the estimate and $0.090 over 1956. These charges have increased $29,000 over the past year and coupled with a lower production rate, the cost per ton increased considerably.

Winter & Idle
$0.153 over the estimate and $0.258 over 1956. All material was ordered and received in 1957 in order to complete repairs by the first of January, 1958. Pit and plant repair crews were increased to rush completion of winter repairs by year's end. Although Winter & Idle charges were increased per ton of concentrating, they will show a definite reduction in 1958.

Cost of Production
$0.203 higher than the estimate and $0.319 higher than 1956 for the reasons stated above.

11. EXPLORATION & FUTURE EXPLORATION — None

12. TAXES

	1957		1956		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$250,047	$109,048.00	$334,996	$110,642.48	-$84,949	-$ 1,594.48
Land,Bldg,Machinery	130,327	55,780.29	130,902	42,516.75	- 575	≠ 13,263.54
IHC Basin Lands,Plant	11,772	3,774.21	11,197	2,871.82	≠ 575	≠ 902.39
Personal Property						
Equipment	119,288	52,022.69	103,012	34,022.80	≠ 16,276	≠ 17,999.89
Stockpile	2,731	1,191.02	422	139.38	≠ 2,309	≠ 1,051.64
	$514,165	$221,816.21	$580,529	$190,193.23	-$66,364	≠31,622.98
Average Mill Rate		431.41		327.62		

Mineral reserve re-estimated by State. Considerable tonnage re-classified from wash ore to retreat at the lower rate per ton. Average mill rate increase of 31.68 per cent increased the over-all taxes.

13. ACCIDENTS & PERSONAL INJURY

Dana Orlovich
On January 10, Dana Orlovich loosened or detached left internal semilur cartilage of left knee while pulling motor in position for overhead crane to hoist. Lost 4 weeks and 1 day. Paid $168.

Carl Forsberg
On September 12, Carl Forsberg dropped 7 feet to the floor off a ladder while installing new shop doors. Suffered chip off posterior tibia and fracture of medial molleolus fragments in good position, right foot. Ankle swelling. Lost 16 weeks. Paid $720.

14. PROPOSED NEW CONSTRUCTION — None

15. EQUIPMENT & PROPOSED NEW EQUIPMENT

a. Equipment Received

1. TD-24 Tractor
1. 2-ton Service Truck
1. Pickup Truck
1. 6x20 Hewitt-Robins Screen

b. Proposed New Equipment

1. Pickup Truck
1. TD-24 Tractor
1. 34-ton Euclid Truck

HILL-TRUMBULL MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

Mine activity at the start of the 1957 season consisted of general winter repairs in the pit, shop, and plant; E&A projects in the plants; and a limited exploration drilling program in the Hill-Walker lease.

The repair and maintenance program covered the following:

> Repairs to pit conveyors, screening plant, and crude ore loading pocket; mine shop repairs covered drills, shovels, locomotives, haulage cars, and miscellaneous equipment; truck shop repairs covered trucks, tractors, and graders; and general repairs covered the washing, retreat, and cyclone plants begun in the fall of 1956.

The following E&A projects were completed prior to the 1957 ore season:

E&A No.	Description	Amount
MC-312	1/4" Coarse-Fines Split Installation.	$45,920
MC-321	Alteration & Installation of Triple Deck Heavy Density Feed Preparation Screen.	13,171
MC-329	Alteration & Installation of Magnetic Separators for Elimination of Process Royalty in Heavy-Media Plant.	23,264

A limited drilling program started during the fall of 1956 was completed in February of 1957. Drilling was done on the north side of the Hill-Walker lease to establish north limits for re-estimating the reserves to set minimums for the next 5-year period starting in 1957.

Nine shifts of stockpile loading were carried on from April 21 to the start of ore season on April 29. The Hill-Walker stockpile was completely depleted.

Rock removal from the Hill rock dump was started on April 15 and continued until April 26 on a single-shift schedule using one shovel and four trucks.

Ore production began on April 29 on a 2-shift, 5-day-week schedule. When the Lake plant production was completed at the Holman mine, a third shift was worked into the schedule, working approximately half of the remaining ore season at the Hill-Trumbull and the other half at the Holman. Two to three shovels in ore serviced by eight to ten trucks produced 2,635,378 tons of crude wash and retreat ore which yielded 659,078 tons of concentrates. Shift production of crude averaged 7551 tons at a recovery of 25.01 per cent, or 3.97 per cent below the 1956 average of 28.98.

51,005 tons of wash ore crude were mined from a thin cretaceous layer on the north side of the Hill-Walker leases and from the south property lines of the Hill and Trumbull leases. Shift production of washed concentrates averaged 3898 tons at a recovery of 59.23 per cent, for a 4.55 per cent recovery above the 1956 average of 54.68.

Tonnages produced and concentrates yielded are shown below:

Property	Tons	Concentrates
Hill-Walker	37,864	23,621
Trumbull	7,429	5,101
Hill	5,712	3,952
	51,005	32,674

2,584,373 tons of retreat crude were mined from the following areas:

a. West, north, east, and a minor amount from the south side of the Hill-Walker.

b. Southeast corner of the Potter.

c. North side of the Hill scram area, and a minor amount from the south property line.

d. North side and center of the Gross-Marble.

e. South central and southeast corner of the Trumbull and a minor amount from the approach leading to the Potter.

Shift production of retreat concentrates averaged 1830 tons at an average recovery from the crude of 23.95 per cent. Tonnages and concentrates produced are as follows:

Property	Material	Tons Produced	Concentrates Yielded
Hill-Walker	Retreat Crude	594,791	139,856
Hill	Retreat & Scram	640,115	156,222
Trumbull	Retreat Crude	569,465	141,099
Potter	Retreat Crude	83,245	12,182
Gross-Marble	Retreat Crude	696,757	177,045
		2,584,373	626,404

122,761 tons of concentrates were stockpiled during the season because of a shortage of railroad cars.

Following the close of mine operations, plant and conveyor systems were cleaned out and crews shifted to stripping and equipment and plant repairs.

20,268 tons of concentrates were loaded from stockpile after mining operations were completed.

Stripping involved removal of surface and transfer of rock from the following areas:

a. East, north, and west sides of the Hill-Walker.

b. Southeast corner of the Potter.

c. Southwest corner of the Trumbull and cleanup of sand silt in the bottom of the pit.

d. Transfer of Hill-Trumbull pit rock dump to rock dump north of pit.

On December 2 work was started on widening and raising of the present dyke and construction of a new clear water basin.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Crude	Line	Wash	Retreat	Total
Hill		5,712	546,275	551,987
Trumbull	7,429		500,585	508,014
Hill-Walker		37,384	501,731	539,115
Gross-Marble			615,967	615,967
Potter			57,415	57,415
	7,429	43,096	2,221,973	2,272,498

Concentrates	Bessemer	Non-Bessemer	Total
Hill Wash	849	3,103	3,952
Hill Retreat	44,194	112,028	156,222
Trumbull Line	482	4,619	5,101
Trumbull Retreat	17,675	123,424	141,099
Hill-Walker Wash		23,621	23,621
Hill-Walker Retreat	19,878	119,978	139,856
Gross-Marble Retreat	29,700	147,345	177,045
Potter Retreat	2,711	9,471	12,182
	115,489	543,589	659,078

b. Shipments

Hill Wash	849	3,103	3,952
Hill Retreat	44,194	108,478	152,672
Trumbull Line	9,507	4,206	13,713
Trumbull Retreat	47,631	124,093	171,724
Hill-Walker Wash	1,963	31,222	33,185
Hill-Walker Retreat	22,998	126,605	149,603
Gross-Marble Retreat	29,700	124,108	153,808
Potter	2,711	9,470	12,181
	159,553	531,285	690,838

c. Stockpile Inventories

Non-Bessemer	Tons
Hill Retreat	3,550
Trumbull Wash	548
Trumbull Retreat	24,190
Gross-Marble Retreat	23,237
	51,525

d. Production by Months

Crude Ore

Month	Hill Wash	Hill Retreat	Trumbull Wash	Trumbull Retreat	Hill-Walker Wash	Hill-Walker Retreat	Gross-Marble Retreat	Potter Retreat	Total
April						20,855			20,855
May					33,014	248,313			281,327
June		162,603			4,370	232,563			399,536
July	5,712	383,672					6,265		395,649
Aug							490,716		490,716
Sept			7,429	109,639			118,986	57,415	293,469
Oct				390,946					390,946
	5,712	546,275	7,429	500,585	37,384	501,731	615,967	57,415	2,272,498

Concentrates

April					1,580	7,708			9,288
May			72		19,097	67,823			86,992
June		47,018	814	5,776	2,628	60,716			116,952
July	3,952	108,180			316	3,609	974		117,031
Aug		1,024					138,543		139,567
Sept			4,215	28,674			37,528	12,156	82,573
Oct				106,649				26	106,675
	3,952	156,222	5,101	141,099	23,621	139,856	177,045	12,182	659,078

3. ANALYSIS

a. Crude Ore

Product	Tons	Iron	Silica
Hill Wash	5,712	48.09	25.66
Hill Retreat	546,275	36.84	43.42
Trumbull Line Wash	7,429	36.50	41.40
Trumbull Retreat	500,585	34.79	45.99
Hill-Walker Wash	37,384	47.66	27.67
Hill-Walker Retreat	501,731	40.81	37.98
Gross-Marble Retreat	615,967	34.62	46.17
Potter Retreat	57,415	34.87	46.85
	2,272,498	36.82	43.31

b. Tonnage & Analysis of Concentrates Produced

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Hill							
Bessemer Wash	849	61.53	.037	8.02	.14	.52	5.80
Non-Bessemer Wash	3,103	60.29	.043	8.89	.13	.66	6.58
Bessemer Retreat	44,194	57.57	.038	11.90	.17	.59	6.80
Non-Bessemer Retreat	112,028	57.97	.043	10.95	.17	.62	7.01
Trumbull							
Bessemer Line	482	56.84	.041	11.89	.13	.42	7.35
Non-Bessemer Line	4,619	56.13	.043	12.57	.13	.42	8.19
Bessemer Retreat	17,675	56.08	.042	13.20	.16	.58	6.18
Non-Bessemer Retreat	123,424	56.97	.047	11.73	.16	.61	7.23
Hill-Walker							
Non-Bessemer Wash	23,621	57.07	.046	13.60	.16	1.02	11.12
Bessemer Retreat	19,878	59.82	.054	9.97	.16	1.01	8.59
Non-Bessemer Retreat	119,978	59.24	.053	10.44	.16	.91	8.53
Gross-Marble							
Bessemer Retreat	29,700	57.64	.041	10.67	.17	.48	6.26
Non-Bessemer Retreat	147,345	57.45	.045	10.76	.15	.47	6.12

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Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Potter							
Bessemer Retreat	2,711	57.22	.037	13.15	.14	.73	8.19
Non-Bessemer	9,471	56.74	.037	13.38	.15	.67	7.58
	659,078	57.79	.046	11.20	.16	.65	7.27

c. Tonnage & Complete Analysis of Concentrates Shipped

Product	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist.
Hill											
Bessemer Wash	849	61.53	.037	8.02	.14	.52	.10	.25	.010	2.84	5.80
Non-Bessemer Wash	3,103	60.29	.043	8.89	.13	.66	.10	.25	.010	3.60	6.58
Bessemer Retreat	44,194	57.57	.038	11.90	.17	.59	.10	.25	.010	4.51	6.80
Non-Bessemer Retreat	108,478	57.98	.043	10.92	.17	.62	.10	.25	.010	4.86	6.98
Trumbull											
Bessemer Line	9,507	56.20	.042	12.26	.13	.48	.10	.15	.007	6.37	5.30
Non-Bessemer Line	4,206	56.02	.043	12.85	.13	.41	.10	.15	.007	6.10	7.43
Bessemer Retreat	47,631	56.34	.043	12.26	.16	.50	.10	.15	.007	6.10	5.67
Non-Bessemer Retreat	124,093	56.88	.047	11.69	.16	.56	.10	.15	.007	5.83	6.81
Hill-Walker											
Bessemer Wash	1,963	58.93	.051	11.01	.22	.84	.06	.25	.010	3.14	8.24
Non-Bessemer Wash	31,222	57.31	.048	13.17	.16	.98	.06	.25	.010	3.25	10.36
Bessemer Retreat	22,998	59.73	.053	10.04	.16	1.00	.06	.25	.010	2.87	8.68
Non-Bessemer Retreat	126,605	59.25	.053	10.43	.16	.91	.06	.25	.010	3.27	8.56
Gross-Marble											
Bessemer Retreat	29,700	57.64	.041	10.67	.17	.48	.20	.15	.007	5.74	6.26
Non-Bessemer Retreat	124,108	57.45	.045	10.77	.15	.47	.20	.15	.007	5.94	6.21
Potter											
Bessemer Retreat	2,711	57.22	.037	13.15	.14	.73	.12	.15	.007	3.74	8.19
Non-Bessemer Retreat	9,470	56.74	.037	13.38	.15	.67	.12	.15	.007	4.25	7.58
	690,838	57.76	.046	11.22	.16	.65	.11	.19	.008	4.90	7.18

d. Mine Analysis of Ore in Stockpile

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Hill Retreat	3,550	57.57	.042	11.73	.17	.58	7.82
Trumbull Wash	548	56.50	.045	11.60	.13	.42	8.45
Trumbull Retreat	24,190	56.91	.048	11.79	.16	.63	6.85
Gross-Marble Retreat	23,237	57.47	.043	10.70	.14	.47	6.61
	51,525	57.21	.045	11.29	.15	.55	6.83

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Material	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Hill-Trumbull & Hill-Walker			
Merch	14	0	100
Wash	14	0	54
Retreat	14	0	30
Gross-Marble & Potter			
Wash	14	0	54
Retreat	14	0	25

b. Ore Reserves Estimated as of December 31, 1957

Lease	Reserve 12-31-56	Mined 1957	Balance after Mining	Changed by re-estimate	Reserve 12-31-57
Trumbull	1,415,385	146,199	1,269,186		1,269,186
Hill	962,548	160,175	802,373		802,373
Hill-Walker	480,521	163,478	317,043	∕284,214	601,257
Potter	73,954	12,181	61,773	∕ 12,327	74,100
Gross-Marble	1,355,899	177,045	1,178,854	-534,583	644,271
	4,288,307	659,078	3,629,229	-238,042	3,391,187

c. Estimated Analyses of Ore Reserves

Material	Tons	Iron	Phos	Silica	Mang	Alum
Trumbull Concentrates						
Bessemer Wash	17,093	57.61	.037	9.63	.10	.39
Non-Bessemer Wash	139,207	58.23	.053	9.70	.11	.54
Bessemer Retreat	170,495	57.69	.037	10.75		
Non-Bessemer Retreat	942,391	57.66	.056	10.72		
	1,269,186	57.72	.053	10.58	.11	.53
Hill						
Non-Bessemer Direct	63,317	60.05	.063	8.82		
Bessemer Wash Concts	264,011	62.38	.028	9.24	.11	.48
Non-Bessemer Wash Concts	75,258	60.12	.053	10.76	.12	.36
Bessemer Retreat Concts	321,858	60.42	.033	10.54		
Non-Bessemer Retreat Concts	77,929	60.01	.049	10.37		
	802,373	60.97	.038	9.98	.11	.45
Hill-Walker Concts						
Non-Bessemer Retreat	601,257	60.36	.050	8.75		
Potter Concts						
Non-Bessemer Retreat	74,100	58.00	.045	11.50		
Gross-Marble Concts						
Non-Bessemer Wash	160,915	58.25	.054	9.35		
Bessemer Retreat	93,985	57.67	.035	10.52		
Non-Bessemer Retreat	389,371	58.16	.049	9.62		
	644,271	58.08	.049	9.66		
Total Direct	63,317	60.05	.063	8.82		
Total Wash Concts						
Bessemer	281,104	62.09	.036	9.26	.10	.40
Non-Bessemer	375,380	58.62	.053	9.76	.11	.45
	656,484	60.10	.046	9.55	.11	.43

Material	Tons	Iron	Phos	Silica	Mang	Alum
Total Retreat Concts						
Bessemer Retreat	586,338	59.19	.034	10.60		
Non-Bessemer Retreat	2,085,048	58.63	.052	9.96		
	2,671,386	58.75	.049	10.10		
Total Concentrates						
Bessemer	867,442	60.13	.035	10.17	.10	.40
Non-Bessemer	2,523,745	58.63	.052	9.93	.11	.45
	3,391,187	59.01	.048	9.99	.11	.44

5. LABOR & WAGES

a. Comments

An ample labor supply prevailed in 1957. A few men not returning to work and retirements were replaced from the Hawkins mine layoff list.

The following rate increases were granted to the hourly group in 1957:

1. Effective January 1, 1957: $0.03 per hour cost-of-living.
2. Effective July 1, 1957: $0.04 per hour cost-of-living.
3. Effective July 1, 1957: $0.07 per job class general increase plus $0.002 per job increment raise.
4. Effective July 1, 1957: Double time and one-tenth (2.1) for holidays worked.
5. Effective July 1, 1957: Time and one-fifth (1.2) premium pay for Sundays worked.

All rate increases were negotiated in the August 6, 1956 agreement. Company-Union relations continued on a satisfactory basis.

b. Comparative Statement of Production & Wages

Product	659,078
Average Number of 8-hour Shifts	2 & 3
Average Number of Men Working	198
Average Wages Per Day	22.56
Product Per Man Per Day	24.85
Labor Cost Per Ton	$0.924
Total Number of Days Worked	131
Amount Paid for Labor	$608,692.36

6. GENERAL SURFACE

a. Building & Repairs

Resheeting of the washing plant started by Western Knapp Engineering Company in the fall of 1956 was completed prior to the 1957 ore season.

Houses and other buildings were repaired and painted as required.

b. Roads, Transmission Lines, Tracks & Construction

No major road changes were made during the year.

The Oliver Iron Mining Division constructed a road through the Hill and Trumbull leases which was used to haul Delaware #1 ore from the mine to the screening plant serving the Oliver plant and located on the Gross-Marble lease. The Oliver will make minor changes to the road as mining progresses in the Hill and Trumbull leases.

Power lines to the screening plant over the Delaware #1 were removed and a power line installed from the Trumbull lease to the screening plant.

A normal track repair program was carried on throughout the ore season.

7. OPEN PIT

a. Stripping

No stripping was in progress at the start of the 1957 season. A small amount of sand cleanup and rock was removed prior to the start of the ore season. 5744 cubic yards of rock were removed from the Hill rock dump during the week of April 15. In addition, a small amount of surface (702 cubic yards) was cleaned up along the Hill-Walker approach road. All stripping operations were carried out on a single-shift schedule using one shovel and four trucks.

Following the close of mining operations on October 25, one shovel was moved into the Hill-Walker lease and one into the Potter for stripping. A third shovel remained in the Trumbull lease to clean up silt from the bottom of the pit. Upon completion of cleanup, the shovel was moved into the Hill-Walker lease. Three crews worked a 40-hour, 15-shifts-per-week schedule throughout the stripping program using two shovels and nine to ten trucks per shift. The Hill-Walker program consisted of stripping the east, north, and west sides. The Potter program consisted of stripping the west and north sides of the existing area. In addition to the silt cleanup in the bottom of the Trumbull pit, a small yardage of stripping was removed in the southwest corner in the approach leading to the Potter. A small amount of rock was transferred from the Hill-Trumbull rock dump located in the Hill pit to the rock dump north of the pit. Stripping and rock removal was completed on November 30 with a total of 375,831 cubic yards of material moved.

Shift production during the fall program averaged 5148 cubic yards at an average cost of $0.237 per yard, $0.002 below the budget.

Stripping carried on in 1957 under the two E&A's is shown as follows:

E&A No. MC-314
507,235 cubic yards were stripped under this E&A in 1956 at a cost of $0.221 per yard. In 1957, stripping was resumed in April. 6446 cubic yards were moved at a cost of $0.722 per yard, giving a grand total of 513,771 cubic yards moved at a cost of $0.228 for this E&A.

E&A No. MC-343
approved May 14, 1957, called for the removal of 570,000 cubic yards of surface from the Trumbull and Hill-Walker leases, and 30,000 cubic yards of rock from the Hill-Trumbull rock dump, or a total of 600,000 cubic yards at an estimated cost of $0.313.

Stripping was started in October, 1957, and continued through November. 375,831 cubic yards were stripped at a cost of $0.287 per yard, leaving a balance of 224,169 cubic yards in this E&A and an unexpended balance of $78,804.69.

b. Open Pit Mining

The 1957 ore season started on April 28 on a 2-shift, 5-days-per-week schedule. A third shift was made up from the Holman Lake plant crew and worked alternately between the Holman and the Hill mines. Approximately half of the ore season was worked on a 3-shift, 5-days-per-week schedule. Two to three shovels and eight to ten trucks were used per shift under normal operating conditions.

2,635,378 tons of crude ore were produced in 131 days at an average rate of 7595 tons per shift. From this crude ore, 362,880 tons of -1/4 inch waste rock were screened out in the pit and the balance of 2,272,498 tons sent to the plants at an average rate of 6549 tons per shift.

Screen rock made up 13.77 per cent of the total crude, 0.94 per cent of the wash crude, and 14.02 per cent of the retreat. Rock percentage in wash ore decreased 4.35 per cent below the previous year; increased 2.24 per cent in retreat ore; giving a combined increase of 2.59 per cent over the 1956 season. This increase resulted from the decreased percentage of wash ore mined and the increased amount of rocky material handled over the previous year.

As in the past several years, retreat crude ore made up the major portion of pit production, totalling 2,584,373 tons as compared with 51,005 tons of wash crude ore.

Following is the retreat tonnage produced from the various leases:

Lease	Retreat Ore	Area Mined
Hill-Walker	594,791	By enlarging pit on all sides.
Hill	640,115	North side, scram area, and south property line.
Trumbull	569,465	South central, southeast corner, and southwest corner.
Potter	83,245	Southeast corner.
Gross-Marble	696,757	Center and north side.

Wash ore was produced from a thin cretaceous layer on the north side of the Hill-Walker lease and from the south property lines of the Hill and Trumbull leases.

During mining operations, rock too large to pass through the screening plant was sorted and loaded out at the shovel. This pit rock amounted to 114,210 tons which, combined with 14,931 tons of sand and waste cleanup, gave a total of 129,141 tons of waste material moved from the mine during the operating season.

Mining conditions during the 1957 operating season were generally satisfactory and normal, with only a few heavy rains and average equipment breakdown.

c. Pumping & Drainage

The main pit pumping remained the same as it has for the past several seasons. The Hill-Trumbull pumped the major portion of the water from the Trumbull pit bottom, with the Oliver doing some pumping to dewater road areas. The Oliver continued pumping the Gross-Marble throughout the entire season. Intermittent pumping was done from the lower ditch to the upper ditch in the Hill-Walker pit area. Pumping and drainage cost was $0.002 per ton of crude ore.

d. General Pit Activity

Pit activity during the past year consisted of surface stripping, transfer of rock dump, mining, and some scramming. Except for pit rock and sand cleanup, there was no movement of waste or lean ore.

8. BENEFICIATION

a. Washing Plant

The washing plant was started on April 29 on a 2-shift, 5-day schedule. Later, a third shift was added to produce tonnage requirements. 649,203 tons of concentrates were produced when the season ended on October 26.

Operating 347 shifts, the washing plant treated 50,525 tons of wash crude and 2,221,973 tons of retreat crude, for a total tonnage of 2,272,498 tons. The plant produced 30,208 tons of washed concentrates at an average plant recovery of 59.79 per cent and 1,076,437 tons of Heavy-Media feed at an average recovery of 48.45 per cent.

The -2" scalped material was 12.15 per cent of the total retreat crude. This was higher than last year and can be attributed to the low grade material handled which was not suitable to crush for Heavy-Media feed.

Net crude to the washing plant averaged 852.30 tons per hour, down slightly from the previous season due to slower handling of the increased amount of rocky material.

Delay time for out-of-ore was slightly higher in 1957, but delay time of the plant itself was down from the past season. Following is a brief summary of delay time to the washing plant:

Source of Delay	Hours	Per Cent	Per Cent of 2776.0 Working Hours
Out of Ore	71.66	65.33	2.58
8' Pan Conveyor	3.83	3.49	0.14
Crude Conveyor	6.50	5.92	0.23
Primary Screens	1.62	1.48	0.06
Secondary Screens	1.50	1.37	0.05
Waiting for Rock Truck	1.50	1.37	0.05
Surge Pile Feed Belt	9.25	8.43	0.33
Concentrate Stacker	1.00	0.91	0.04
Dewatering Screen Cyclone Plant	1.00	0.91	0.04
Miscellaneous Chutes & Launders	0.25	0.23	0.01
Tailings Line	2.08	1.90	0.07
Plant Tieup	1.25	1.14	0.05
Electric Power	8.25	7.52	0.30
	109.69	100.00	3.95

Recapitulation

Ore to Head of Mill	81.99	74.75	2.95
Ore Processing Delays	27.70	25.25	1.00
	109.69	100.00	3.95

b. Heavy-Media Plant

The Heavy-Media plant began operations on April 29 on the same schedule as the washing plant, operating on feed from the surge pile during periods when the washing plant was down for repairs or when processing wash ore.

From 1,076,437 tons of feed, 478,795 tons of Heavy-Media concentrates were produced at an average weight recovery of 44.48 per cent. From 2,221,973 tons of retreat crude delivered to the washing plant, 619,095 tons of retreat concentrates were produced at an average weight recovery of 27.86 per cent.

During the past operating season a considerable tonnage of ore was shipped on a split basis. Provision was made during the winter of 1956-1957 to combine the -1/4+1/8" fraction of the Heavy-Media concentrate with the cyclone concentrates to form the "fines" concentrate. Of the total split retreat concentrate shipped, 63 per cent was made up of this -1/4+1/8" fraction from the Heavy-Media plant.

Actual and estimated concentrate grade was very close, with both the iron and silica being slightly above the pre-season estimate.

Changes in the ferrosilicon cleaning circuit during the previous repair season reduced ferrosilicon losses from 1.491 pounds per ton of feed in 1956 to 1.345 pounds per ton of feed in 1957.

There were no major mechanical delays in the Heavy-Media plant during the season. Following is a brief summary of delay time:

Source of Delay	Hours	Per Cent	Per Cent of 2719.0 Working Hours
Out of Ore	38.59	67.75	1.42
Heavy Density Feed Conveyor	0.50	0.88	0.02
Circulating Media Pump	0.62	1.09	0.02
Coarse Reject Screen	0.50	0.88	0.02
Reject Belt	2.00	3.51	0.07
Plant Tieup	8.00	14.04	0.29
Electric Power	6.75	11.85	0.25
	56.96	100.00	2.09
Recapitulation			
Ore to Head of Mill	39.09	68.63	1.43
Ore Processing Delays	17.87	31.37	0.66
	56.96	100.00	2.09

Concentrating data for the washing and Heavy-Media plants is shown as follows:

Wash Plant Product	Tons	% Weight Plant	% Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Iron Units
Crude to Plant	50,525	100.00	99.06	46.07		29.46	
Screen Plant Rock	480		.94	24.40		60.10	
Pit Crude	51,005		100.00	45.87		29.75	
Total Concts Produced	30,208	59.79	59.23	57.38	.044	12.91	74.47
Unsized Concentrates	30,208	59.79	59.23	57.38	.044	12.91	
Stockpile Overrun-1956	2,466	4.88	4.83				
Total Concts Produced & Shipped	32,674	64.67	64.06	57.38	.044	12.91	80.55
⁄2" Wash Plant Rejects	2,867	5.67	5.67	30.51		53.08	
Total Fine Tailing (by difference)	17,450	34.54	34.21	29.04		54.23	
Retreat Plant Product							
Crude to Plant	2,221,973	100.00	82.34	36.61		43.62	
Pit Rock	114,210		4.23	22.62		63.02	
Screen Plant Rock	362,400		13.43	23.42		62.02	
Pit Crude	2,698,583		100.00	34.25		46.91	
Total Concts Produced	619,095	27.86	22.94	57.84	.046	11.09	44.00
Unsized Concts Produced	366,270	16.48	13.57	58.00	.047	10.97	
Coarse Concentrates Produced	159,489	7.18	5.91	57.59	.046	11.00	
Fine Concentrates Produced	93,336	4.20	3.46	57.67	.047	11.63	
Stockpile Overrun-1956	7,309	.33	.27				
Total Concts Produced & Shipped	626,404	28.19	23.21	57.84	.046	11.09	44.55
Heavy-Media Concentrates	478,795	21.55	17.74	57.61		11.12	
Heavy-Media Rejects	597,642	26.90	22.15	23.38		63.17	
Heavy-Media Feed	1,076,437	48.45	39.89	38.61		40.02	
⁄2" Wash Plant Rejects	269,936	12.15	10.00	22.96		63.94	
Total Fine Tailing (by difference)	735,300	33.09	27.25	34.49		47.66	

c. Cyclone Plant

The cyclone plant operated on the same schedule as the other two plants. Smooth operation of the cyclone plant reduced media loss to 5.93 pounds per ton of cyclone feed as compared to 8.53 pounds for the previous season.

On a calculated basis, 271,044 tons of cyclone feed sent to the plant produced 152,423 tons of concentrates at an average weight recovery of 56 per cent.

Plant delays are summarized below:

Source of Delay	Hours	Per Cent	Per Cent of 2719.75 Working Hours
Out of Ore	51.25	47.60	1.88
Dewatering Screens	1.00	.93	0.04
Circulating Media Pump	4.00	3.72	0.15
Media Return Pump	1.00	.93	0.04
Cyclones	1.50	1.39	0.05
Concentrate Wash Screens	7.50	6.96	0.27
Reject Wash Screens	16.25	15.09	0.60
Tramp Screen Feed Pump	2.42	2.25	0.09
Tramp Screens	7.50	6.97	0.28
Diaphram Pump	1.00	.93	0.04
Reject Conveyor	1.00	.93	0.04
Electric Power	8.25	7.66	0.30
Plant Tieup	5.00	4.64	0.18
	107.67	100.00	3.96
Recapitulation			
Ore to Head of Mill	52.25	48.53	1.92
Ore Processing Delays	55.42	51.47	2.04
	107.67	100.00	3.96

9. MAINTENANCE & REPAIRS

The winter repair program in progress at the start of the year was continued until ore season. After ore season, 74 new pan sections were installed in the 8-foot pan feeder located at the pit screen plant. Minor repairs were made to dump cars and rotary drill. Following completion of stripping, four 34-ton trucks were sent to the Canisteo. Necessary truck repairs will be made during the last half of March and during April.

Following the close of the 1957 ore season, all plants were cleaned out and repairs were carried on until the end of the year. The plant repair program was accelerated to accomplish all necessary repairs before shutdown on January 1, 1958.

10. COST of OPERATIONS

a. Comparative Mining Costs

Product	1957 Budget	1957 Year	1956 Year
Wash Plant Concentrates	30,000	30,208	114,332
Retreat Plant Concentrates	620,000	619,069	523,877
Overrun		9,801	
	650,000	659,078	638,209
Per Cent Recovery	24.89	23.84	27.75
Average Daily Output		5,031	4,526
Tons Per Man Per Day		24.85	27.02
Days Operated		135	141
Costs			
Pit Operating	$0.231	$0.235	$0.249
Concentrating	0.289	0.256	0.282
Loading Stockpile Ore	0.017	0.014	0.007
General Mine Expense	0.198	0.220	0.183
Winter & Idle	0.500	0.628	0.547
Cost of Production	$2.783	$2.886	$2.617
Depreciation			
Plant & Equipment		0.098	0.069
Motorized Equipment		0.140	0.071
Movable Equipment		0.006	0.006
Amortization			
Defense Facilities		0.099	0.165
Taxes			
Ad Valorem		0.195	0.090
Occupational		0.281	0.211
Royalty		0.223	0.235

Costs	1957 Budget	1957 Year	1956 Year
Total Depreciation, Amortization, Taxes		1.042	0.847
Administrative Expense		0.100	0.100
Miscellaneous Expense & Income		0.006	0.014
Royalty		1.645	1.610
Total Cost at Mine		$5.679	$5.189

Note: 1957 cost figures do not include revisions by the Cleveland office.

b. Detailed Cost Comparison

Pit Operating: Cost was $0.004 above the budget and $0.014 below 1956 costs. Cost of trucks operating increased $0.006 over the estimate due to the increased amount of rock and the longer haul than was anticipated. Considering the wage increases during the year, pit costs compare favorably with the budget estimate and with 1956 costs.

Beneficiation: Efficient operation of the plant resulted in a definite saving in concentrating-operating and media. Costs were $0.033 below the budget and $0.026 below 1956 costs. A saving of $0.008 was effected by the elimination of the process royalty cost after July 1.

Loading Stockpile: Cost was $0.003 lower than the budget but $0.007 higher than 1956 costs because of the increased amount of material stockpiled. However, this cost remained below the increase anticipated.

General Mine Expense: SUB of $0.015 not carried in the estimated budget raised general mine expense $0.022 above the budget and $0.037 over 1956 costs.

Winter & Idle: These costs remained below the estimated budget until December when an accelerated repair program increased costs $0.128 over the budget and $0.081 over 1956 costs.

Cost of Production: The increased Winter & Idle program in 1957 raised the cost of production $0.103 over the budget. This cost was $0.269 over the 1956 cost due to a decrease in recovery of 4.69 per cent. The combined pit and beneficiation cost for 1957 was $0.040 below 1956 costs.

11. EXPLORATION & FUTURE EXPLORATION

Hill-Walker
A limited drilling program in the Hill-Walker lease started in 1956 was completed in January, 1957. This program established mining limits for re-estimating reserves to set minimums in 1957.

Gross-Marble
This lease will require more drilling in the bottom and on the south side.

Trumbull
A few more holes are needed along the north bank of the Trumbull to determine actual mining limits.

Hill
Some additional holes will be needed to further prove or disprove ore beneath the present bottom in the Hill pit. Further exploration is required on the north bank of the Hill lease between the Hill pit and the Barbara. Most of this area has been drilled on 300-foot centers and does indicate some ore.

Potter
With only the eastern half of the Potter forty drilled to any extent, this lease will require more exploration.

12. TAXES

	1957		1956		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Real Estate						
Mineral	$222,224	$ 49,867.06	$244,574	$ 46,796.79	-$22,350	+$ 3,070.27
Land,Bldg,Machinery	146,079	40,295.15	144,723	35,020.89	+ 1,356	+ 5,274.26
Accounts Receivable	27,734	6,223.51	27,866	5,331.88	- 132	+ 891.63

	1957		1956		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Personal Property						
Equipment	$171,586	$ 38,539.09	$136,125	$ 26,046.16	+$35,461	+$12,492.93
Stockpile	3,188	715.39	428	81.89	+ 2,760	+ 633.50
	$570,811	$135,640.20	$553,716	$113,277.61	+$17,095	+$22,362.59
Average Mill Rate		237.63		204.58		

Note: Decrease in mineral value was offset by 17.28 per cent mill rate increase in Village of Marble. Lands, building, machinery increased in value from additional lands leased from Oliver Iron Mining Division for water clarification basin and average mill rate increase of 16.16 per cent. Personal property equipment valuation increased by County Assessor; stockpile by larger tonnage.

13. ACCIDENTS & PERSONAL INJURY

Name	Injury Date	Injury Nature	Cause	Time Lost Days	Time Lost Weeks	Compensation Paid
Robert E. Nelson	1-4-57	Fractured large toe and 2 adjoining toes of right foot; large toe and adjoining toe left foot.	When lifting a 230# angle iron to be cut for truck box repairs, iron caught on ties under truck box. Jolt knocked iron from hands of crew, striking Nelson.		7	$840
Mearl Ballard	1-30-57	Fractured 4 ribs.	Moving scaffolding; Slipped 6' into 78" classifier.	2	7	$296
Oscar Haapoja	6-27-57	Fracture, cut right hand.	When cleaning bend pulley at #3 station with steel bar, caught hand between belt and pulley.	2	9	$--- Complete settlement not made.

Everett Danielson	9-4-57	Right inquinal hernia	While helping on tailings pump, he was pulling on wrench & slipped. Felt pain right side.	4	5	$261
Dywane Hausman	11-12-57	Fractured right foot and bruised hip.	Stepped on tail gate when getting on truck. Bottom end of gate came loose from truck box. Hausman fell between gate and truck box.		8	$350

14. PROPOSED NEW CONSTRUCTION

Extend rock reject belt at the mill.
Construct conveyor system to new rock reject area at the mill.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. New Equipment Received

1 6x20 Allis-Chalmers Low Head Screen
1 5x14 Triple Deck Allis-Chalmers Screen
1 3x7 Derrick Screen
1 40 hp Allis-Chalmers Motor
1 20 hp Allis-Chalmers Motor
1 Hazelton 6" Pump
1 2-ton International Dump Truck
1 3/4-ton International Pickup
1 1/2-ton Ford Pickup
1 Dings Crockett Magnetic Separator
1 Thor Rotary Air Grinder
2 Falk Reducers Type J14
1 1000 KVA Transformer
1 set of 22" Track Group

3023' 30" Conveyor Belting
279' 24" Conveyor Belting
200' 24" Conveyor Belting (Used)

1505'	#2 5000-volt Power Cable
1720'	#2/0 Power Cable
200'	30" Culvert
1400'	8' Hardwood Ties
18	24" Pan Sections
37,400#	Rail

b. Proposed New Equipment

1	Plant Service Truck
1	Rock Reject Stacker
4	Demagnetizing Coils
2	10" Cleanup Cyclones
	Cyclone Plant Screens
1	166 KVA Transformer
1	249 KVA Transformer
1	10 KVA Transformer
2	Circuit Breakers Type F-122
1	Operating Toggle for Circuit Breaker
1	Undervoltage Device

HOLMAN-CLIFFS MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

This property operated throughout the year in the usual seasonal cycle. Winter & Idle repairs to pit and plant equipment were conducted from January 1 until April 29. In addition, changes were made in the plant flowscheme. Pit operations were underway from April 29 to October 26 and Lake concentrator operations from April 29 to May 28, at which time all ore tributary to this plant was exhausted.

The winter stripping program started on October 28 and continued until the end of the year.

Concentrates were loaded from stockpile intermittently from April 10 to November 6.

Operating conditions throughout the year were normal and no serious delays were encountered.

2. PRODUCTION-INVENTORIES-SHIPMENTS

a. Production by Grades

Crude	Wash	Retreat	Total
Holman		69,899	69,899
Brown		805,330	805,330
Bingham		245,979	245,979
North Star	106,980	568,508	675,488
Holman Lake		11,288	11,288
Brown Lake		24,535	24,535
North Star Lake		7,441	7,441
	106,980	1,732,980	1,839,960

Concentrates	Bessemer Wash	Bessemer Retreat	Non-Bessemer Wash	Non-Bessemer Retreat	Total
Holman		816		28,523	29,339
Brown		83,517		220,590	304,107
Bingham		17,541		82,230	99,771
North Star	60,094	147,673	17,962	180,489	406,218
Holman Lake		333		4,072	4,405
Brown Lake		4,690		7,208	11,898
North Star Lake				3,466	3,466
	60,094	254,570	17,962	526,578	859,204

b. Shipments

Holman		1,669		28,523	30,192
Brown		165,615		211,025	376,640
Bingham		20,870		114,253	135,123
North Star	60,094	150,966	17,962	121,497	350,519
Holman Lake		333		4,072	4,405
Brown Lake		4,690		7,208	11,898
North Star Lake				3,466	3,466
	60,094	344,143	17,962	490,044	912,243

c. Inventories

Retreat	Tons
Brown	23,154
Bingham	786
North Star	58,992
	82,932

d. Production by Months

Crude Ore

Month	Retreat Holman	Brown	Bingham	No. Star	Lake Retreat Holman	Brown	No. Star	Wash No. Star	Total
April				10,832		2,906		10,513	35,539
May			42,601	156,669	11,288	21,629	7,441	53,345	281,685
June			166,198	62,009				1,160	229,367
July		139,808	37,180	98,679					275,667
Aug		237,216		51,845					289,061
Sept	52,842	246,408		55,652				16,936	371,838
Oct	17,057	181,898		132,822				25,026	356,803
	69,899	805,330	245,979	568,508	11,288	24,535	7,441	106,980	1,839,960

Concentrates

April				6,447		1,260		8,075	15,782
May	816		18,992	96,576	4,405	10,638	3,466	37,748	172,641
June			64,437	36,630				962	102,029
July		55,014	16,342	60,270					131,626
Aug		93,776		24,798					118,574
Sept	21,942	88,440		31,521				12,555	154,458
Oct	6,581	66,877		71,920				18,716	164,094
	29,339	304,107	99,771	328,162	4,405	11,898	3,466	78,056	859,204

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore Produced

Crude Ore	Tons	Iron	Silica
Holman			
Retreat	69,889	35.12	43.32
Lake Retreat	11,288	42.30	33.02

Crude Ore	Tons	Iron	Silica
Brown			
Retreat	805,330	38.39	40.44
Brown Lake	24,535	46.36	27.19
Bingham Retreat	245,979	36.18	43.48
North Star			
Wash	106,980	50.65	22.24
Retreat	568,508	47.10	27.64
North Star Lake	7,441	47.21	22.79
	1,839,960	41.54	35.65

b. Tonnage & Analysis of Concentrates Produced

Product	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Holman							
Bessemer Retreat	816	57.65	.026	13.48	.14	.32	5.89
Non-Bessemer Retreat	28,523	56.69	.085	10.22	.23	.72	6.41
Lake Bessemer	333	55.90	.039	12.40	.35	.44	6.50
Lake Non-Bessemer	4,072	53.63	.046	16.31	.28	.61	6.70
Brown							
Bessemer Retreat	83,517	57.28	.034	12.97	.17	.50	6.19
Non-Bessemer Retreat	220,590	56.91	.032	12.40	.18	.55	6.34
Lake Bessemer	4,690	56.60	.043	12.35	.18	.54	6.89
Lake Non-Bessemer	7,208	55.68	.046	13.47	.22	.66	7.37
Bingham							
Bessemer Retreat	17,541	57.74	.039	11.77	.24	.65	7.04
Non-Bessemer Retreat	82,230	57.13	.048	11.72	.23	.63	6.96
North Star							
Bessemer Wash	60,094	57.76	.034	11.71	.26	.52	7.10
Non-Bessemer Wash	17,962	57.50	.043	11.81	.24	.45	6.98
Bessemer Retreat	147,673	58.57	.033	10.77	.26	.52	6.67
Non-Bessemer Retreat	180,489	58.36	.041	10.65	.28	.49	6.69
Lake Non-Bessemer	3,466	56.30	.055	10.57	.31	.66	7.72
	859,204	57.60	.043	11.57	.23	.55	6.72

c. Tonnage & Complete Analysis of Concentrates Produced & Shipped

Product	Tons	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist
Holman											
Bessemer Retreat	1,669	57.69	.027	13.62	.14	.32	.12	.22	.027	2.95	6.00
Non-Bessemer Retreat	28,523	56.69	.085	10.22	.23	.72	.12	.22	.027	7.11	6.41
Lake Bessemer Retreat	333	55.90	.039	12.40	.35	.44	.10	.20	.007	6.34	6.50
Lake Non-Bessemer Retreat	4,072	53.63	.046	16.31	.28	.61	.10	.20	.007	5.59	6.70
Brown											
Bessemer Retreat	165,615	57.06	.038	13.05	.17	.48	.20	.24	.027	4.09	5.95
Non-Bessemer Retreat	211,025	56.91	.052	12.40	.18	.55	.20	.24	.027	4.84	6.34
Lake Bessemer	4,690	56.60	.043	12.35	.18	.54	.10	.20	.007	5.52	6.89
Lake Non-Bessemer	7,208	55.68	.046	13.47	.22	.66	.10	.20	.007	5.53	7.37
Bingham											
Bessemer Retreat	20,870	57.70	.039	11.91	.23	.62	.10	.15	.007	4.29	6.91
Non-Bessemer Retreat	114,253	57.14	.048	11.77	.23	.67	.10	.15	.007	5.16	6.88
North Star											
Bessemer Wash	60,094	57.76	.034	11.71	.26	.52	.24	.20	.014	4.28	7.10
Non-Bessemer Wash	17,962	57.50	.043	11.81	.24	.45	.24	.20	.014	4.63	6.98
Bessemer Retreat	150,966	58.53	.033	10.82	.26	.52	.24	.20	.014	4.07	6.66
Non-Bessemer Retreat	121,497	58.36	.041	10.65	.28	.49	.24	.20	.014	4.47	6.69
Lake Non-Bessemer	3,466	56.34	.054	10.53	.31	.66	.10	.20	.007	7.38	7.72
	912,243	57.48	.044	11.83	.22	.54	.20	.21	.019	4.43	6.53

d. Mine Analysis of Ore in Stockpile

Retreat Concentrates	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Brown	23,154	57.20	.055	12.26	.18	.58	6.79
Bingham	786	56.82	.049	11.67	.24	.54	7.35
North Star	58,992	58.73	.033	10.57	.26	.48	6.89
	82,932	58.28	.039	11.05	.24	.51	6.87

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Concentrates	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Wash	14	0	52
Retreat	14	0	40

Lease	Reserve 12-31-56	Mined 1957	Balance After Mining	Reserve 12-31-57
North Star N½-NE 21-56-24	538,734	406,217	132,517	132,517
Bingham NW-SE 21-56-24	1,496,091	99,772	1,396,319	1,396,319
Holman SE-NE 21-56-24	1,167,559	29,339	1,738,220	1,138,220
Brown No. 1 SW-NE 21-56-24	592,403	64,897	527,506	527,506
Brown No. 2 SW-NW 22-56-24	1,844,942	239,210	1,605,732	1,605,732
	5,639,729	839,435	4,800,294	4,800,294

b. Estimated Analysis of Ore Reserves

Concentrates	Tons	Iron	Phos	Silica
North Star				
Non-Bessemer Wash	25,330	59.20	.042	10.66
Bessemer Retreat	53,943	55.15	.026	10.70
Non-Bessemer Retreat	53,244	55.15	.051	10.70
	132,517	55.92	.039	10.69

Concentrates	Tons	Iron	Phos	Silica
Bingham				
Bessemer Wash	329,717	60.14	.033	9.27
Non-Bessemer Wash	190,282	60.36	.053	8.53
Bessemer Retreat	370,606	58.00	.032	11.43
Non-Bessemer Retreat	505,714	58.00	.051	11.43
	1,396,319	58.83	.042	10.52
Holman				
Bessemer Wash	205,078	59.61	.031	9.29
Non-Bessemer Wash	105,726	59.35	.054	8.93
Bessemer Retreat	566,995	57.24	.030	10.64
Non-Bessemer Retreat	260,421	57.24	.057	10.64
	1,138,220	57.86	.039	10.24
Brown No. 1				
Bessemer Wash	61,333	60.51	.035	9.14
Non-Bessemer Wash	42,611	60.29	.039	9.50
Bessemer Retreat	377,578	56.93	.029	12.32
Non-Bessemer Retreat	45,984	56.93	.046	12.32
	527,506	57.62	.032	11.72
Brown No. 2				
Bessemer Wash	303,577	59.36	.028	9.31
Non-Bessemer Wash	68,345	58.34	.059	9.04
Bessemer Retreat	828,226	57.21	.027	10.76
Non-Bessemer Retreat	405,584	57.21	.066	10.76
	1,605,732	57.66	.038	10.41
North Star & Bingham				
Bessemer Wash	329,717	60.14	.033	9.27
Non-Bessemer Wash	215,612	60.22	.052	8.78
Bessemer Retreat	424,549	57.64	.031	11.33
Non-Bessemer Retreat	558,958	57.72	.051	11.36
	1,528,836	58.57	.042	10.54
Holman & Brown				
Bessemer Wash	569,988	59.57	.030	9.28
Non-Bessemer Wash	216,682	59.22	.053	9.08
Bessemer Retreat	1,722,799	57.16	.029	11.05
Non-Bessemer Retreat	711,989	57.20	.061	10.82
	3,271,458	57.73	.038	10.56

Concentrates	Tons	Iron	Phos	Silica
Total Wash				
Bessemer	899,705	59.78	.031	9.28
Non-Bessemer	432,294	59.72	.053	8.93
	1,331,999	59.76	.038	9.16
Total Retreat				
Bessemer	2,197,348	57.26	.029	11.10
Non-Bessemer	1,270,947	57.43	.057	11.06
	3,468,295	57.31	.036	11.09
Total Holman-Cliffs				
Bessemer	3,097,053	57.99	.029	10.57
Non-Bessemer	1,703,241	58.01	.056	10.53
	4,800,294	58.00	.040	10.56

5. LABOR & WAGES

a. Comments

There was practically no labor turnover during the year, and labor relations were satisfactory. Wage and fringe benefits increased at various times throughout the year as follows:

1. Effective January 1, 1957: $0.03 per hour cost-of-living.
2. Effective July 1, 1957: $0.04 per hour cost-of-living.
3. Effective July 1, 1957: $0.07 per job class general increase plus $0.002 per job increment raise.
4. Effective July 1, 1957: Double time and one-tenth (2.1) for holidays worked. Time and one-fifth (1.2) premium pay for Sundays worked.
5. Effective 1957: Seventh paid holiday (Good Friday)

b. Comparative Statement of Production & Wages

	1957	1956
Wash & Retreat Concentrates	859,204	993,012
Number of Days Operated	134	142
Average Number of Men Working	152	169
Average Wages Per Day	$23.51	$22.32
Production Per Man Per Day	42.28	41.27
Labor Cost Per Ton	$0.556	$0.541
Total Number of Man Days	20,330	24,062
Amount Paid for Labor	$478,008.79	$537,076.39

Note: Above comparative statement covers pit and lake concentrator.

6. GENERAL SURFACE

a. Buildings & Repairs

Normal maintenance work was carried on throughout the year on mine buildings and company-owned houses. $3021 was expended on rental units.

b. Roads, Transmission Lines, Etc.

Only minor changes were made.

c. Miscellaneous General Construction

The tailings discharge line in the tailings basin was moved to a new location and raised 15 feet.

The following concentrating plant projects were completed in 1957:

E&A No.	Amount	Description
MC-313	$36,000	1/4" Coarse-Fines Split Facilities.
MC-333	45,000	Media Reclamation Circuit Revision.
MC-334	72,500	Clear Water Reclamation from Tailings Basin.
MC-335	10,000	Alterations to Tailings Pump Drives.

7. OPEN PIT

a. Stripping

The following table shows material moved from the various leases and the actual and estimated costs during 1957:

Lease	E&A No.	Cubic Yards Surface	Cost Estimated	Cost Actual
North Star	MC-315	46,500	$0.409	$0.259
North Star	MC-340	410,057	0.450	0.318
Bingham	MC-340	184,591	0.450	0.318
Brown No. 1	MC-340	43,002	0.450	0.318
		684,150		

Surface stripping under E&A No. MC-315, continued from 1956 during April and May cleaning up top of ore in the North Star lease, was completed on May 17.

Upon completion of the ore season, surface stripping under E&A No. MC-340 on a 3-shift, 5-day schedule was started on October 28 with two shovels loading and serviced by eight to nine trucks. Surface was removed from the east side of the Bingham and Brown No. 1 leases and from the northwest corner of the North Star lease. For this program to date, an average of 4868 cubic yards per shift was maintained.

b. Open Pit Mining

The following table shows material mined from the various leases:

Lease	Gross Crude	Screen Rock	Net Crude	Pit Rock, Lean, Waste	Total
Holman*	80,729	10,830	69,899	1,925	82,654
Brown No. 1*	199,319	27,460	171,859	29,260	228,579
Brown No. 2*	734,711	101,240	633,471	1,225	735,936
North Star	818,363	142,875	675,488	17,670	836,033
Bingham	272,199	26,220	245,979	1,530	273,729
	2,105,321	308,625	1,796,696	51,610	2,156,931

*Includes 145,377 tons mined from Lean Ore Dump No. 6

Mining of crude ore from the pit started at 7 a.m. on April 29 on a 2-shift, 5-day schedule with two shovels loading and from five to six trucks hauling ore. One truck was required for disposal of screen rock and one to two trucks for the heavy density reject haul. A basic 2-shift, 5-day schedule was maintained until September 3 when the crew from the Hill-Trumbull was transferred to this property and a 3-shift, 5-day schedule was worked for the balance of the season which was completed at 3 p.m. on October 26.

2,105,321 tons of gross crude were mined on 308 shifts at an average rate of 6835 tons per shift. 308,625 tons of screen rock were removed, leaving a total net crude of 1,796,696 tons for a shift average of 5833 tons.

The following leases and areas were mined:

Holman Lease: All crude mined was retreat from the west end of the forty adjacent to the screening plant. 25,846 tons were mined from Lean Ore Dump No. 6 and absorbed in pit production.

Brown No. 1 Lease: Mining was from the central bottom to the north end of the lease and was all retreat ore. Included was remnant of an old retreat stockpile which, due to cyclone plant treatment, made an acceptable grade silicawise.

Brown No. 2 Lease: Retreat ore was mined from upper benches along the east and north side of this forty. In addition, some 119,531 tons of crude from Lean Ore Dump No. 6 were absorbed in the pit production.

North Star Lease: All crude mined was from the north side of the NW-NE and was approximately 84 per cent retreat and 16 per cent wash ore.

Bingham Lease: All mining produced low recovery retreat crude from an area above the paint rock layer in the southeast corner of the property.

Operating conditions were normal throughout the season and no serious delays were experienced. Cost of producing crude ore in 1957 was $0.224 a ton as compared to $0.226 in 1956.

51,610 tons of pit rock, lean, and waste material were moved and placed on respective dumps at a ratio of .06 tons of waste per ton of concentrates and at a cost of $0.016 a ton of shipping ore.

c. Pumping & Drainage

There were no changes in pumping facilities and the flow of water remained constant. Pumping cost per ton of concentrates was $0.037 as compared to $0.027 in 1956.

d. General Pit Activities

Only minor road and transmission line changes were necessary during the year. Cost was $0.014 per ton of concentrates as compared to $0.017 in 1956.

8. BENEFICIATION

a. Pit Plant

The pit plant operated on the same schedule as the pit, treating wash and retreat ores as required. When on a 2-shift schedule, repairs were made on the third shift; and when on a 3-shift schedule, repairs were made on weekends.

1,796,696 tons of crude ore treated produced 839,435 tons of concentrates at an average rate of 2725 tons a shift and a net weight recovery of 46.72 per cent.

Of the wash portion of the feed, 106,980 tons produced 78,056 tons of concentrates for a weight recovery of 72.96 per cent; the crude retreat feed of 1,689,716 tons produced 761,379 tons for a weight recovery of 45.06 per cent.

Total net weight recovery was 46.72 per cent as compared to 45.7 per cent in 1956. Average crude feed was 5833 tons per shift as compared to 5805 tons in 1956. Concentrates were produced at the rate of 2725 tons a shift as compared to 2654 tons in 1956.

Facilities for separation of 1/4" coarse-fines were in use intermittently throughout the season, producing 32 per cent coarse and 12 per cent fines.

Operations were normal throughout the season and there were no serious delays. The 839,435 tons of concentrates averaged 53.79 natural iron and 10.78 natural silica as compared to an estimate of 825,000 tons at 53.66 iron natural and 11.04 silica natural.

During the season it was necessary to stockpile 150,838 tons of concentrates which, added to a balance of 135,971 tons carried over from 1956, made a total of 286,809 tons in stock; 203,877 tons were loaded and shipped intermittently from April 10 to November 6, leaving a balance of 82,932 tons in stock as of December 31, 1957.

Following is a tabulation of lost time:

Washing Plant

Source of Delay	Hours	Per Cent	Per Cent of Total Working Hours
Out of Ore	3.00	5.32	0.12
Crude Ore Pocket	2.17	3.85	0.09
Pit Screening Plant	8.00	14.19	0.33
8' Pan Conveyor	1.42	2.52	0.06
Crude Ore Conveyor	1.41	2.50	0.06
Storage Bin Feeder	2.00	3.55	0.08
Primary Screens	0.42	0.74	0.02
Crushers	2.71	4.81	0.11
Secondary Screens	0.33	0.59	0.01
Fine Concentrate Belt	1.59	2.82	0.06
Chutes & Launders	3.25	5.76	0.13
Railroad Cars & Tracks	1.16	2.06	0.05
Tailings Pumps	1.75	3.10	0.07
Tailings Line	7.76	13.76	0.32
Electric Power	11.08	19.65	0.44
Heavy-Media Plant	8.33	14.78	0.34
	56.38	100.00	2.29

Recapitulation

Crude Ore to Head of Mill	18.00	31.93	0.73
Ore Processing Delays	38.38	68.07	1.56
	56.38	100.00	2.29

Heavy-Media Plant

Washing Plant Delays	41.55	71.69	1.78
Circulating Media Pumps	0.25	0.43	0.01
Coarse Concentrate Wash Screen	0.67	1.16	0.03
Fine Concentrate Wash Screen	0.83	1.43	0.04
Heavy-Media Reject Conveyor	3.75	6.47	0.16
Reject Truck	1.25	2.16	0.05
Chutes & Launders	1.58	2.72	0.07
Electric Power	8.08	13.94	0.35
	57.96	100.00	2.49

Recapitulation

Crude Ore to Head of Mill	41.55	71.69	1.79
Ore Processing Delays	16.41	28.31	0.70
	57.96	100.00	2.49

Cyclone Plant

Circulating Media Pump	2.00	14.29	0.13
Float Wash Screen	3.00	21.43	0.19
Tramp Screens	0.50	3.57	0.03
Chutes & Launders	1.50	10.71	0.10
Clear Water Piping	1.50	10.71	0.10
Electric Power	5.50	39.29	0.34
	14.00	100.00	0.89

Recapitulation

Ore Processing Delays	14.00	100.00	0.89

b. Lake Concentrator

Operations at this plant were started at 7 a.m. on April 29, and operating on a 2-shift, 5-day schedule, were completed at 11 p.m. on May 28. All ore tributary to this plant has been exhausted, and the plant is being gradually dismantled.

Material treated in 1957 is as follows:

Stockpile	Gross Crude	Screen Rock	Net Crude	Pit Rock
Holman	20,033	8,745	11,288	4,518
Brown	33,085	8,550	24,535	72
North Star	9,181	1,740	7,441	126
	62,299	19,035	43,264	4,716

43,264 tons of net crude treated produced 19,769 tons of concentrates at a net weight recovery of 45.69 per cent and an average production rate of 471 tons of concentrates per shift. This compares with a net weight recovery of 35.7 per cent and producrate of 501 tons in 1956.

The following table shows lost time:

Source of Delay	Hours	Per Cent	Per Cent of Total Working Hours
Out of Ore	9.50	24.62	02.76
Circulating Media Pump	11.83	30.66	03.44
Primary Spiral Feed Pump	2.25	5.83	00.65
Chutes & Launders	2.00	5.18	00.58
Railroad Cars & Tracks	11.50	29.82	03.34
Charging Plant	1.00	2.59	00.29
Clear Water Pump	0.50	1.30	00.16
	38.58	100.00	11.22

Recapitulation

Crude Ore to Head of Mill	9.50	24.62	02.76
Ore Processing Delays	29.08	75.38	08.46
	38.58	100.00	11.22

Concentrating data for the wash, retreat, and Lake Concentrator products is shown as follows:

Wash Product	Tons	Per Cent Weight Plant	Per Cent Weight Pit	Per Cent Iron	Per Cent Phos	Per Cent Silica	Per Cent Iron Units
Crude to Plant	106,980	100.00	84.52	50.65		22.24	
Pit Rock	3,270		2.58	29.56		52.69	
Screen Plant Rock	16,320		12.90	29.64		53.00	
Pit Crude	126,570		100.00	47.40		26.99	
Total Concentrates	78,056	72.96	61.67	57.61	.036	11.82	82.98
Unsized Concentrates	43,537	40.69	34.40	57.77	.039	11.67	
Coarse Concentrates	26,719	24.98	21.11	56.48	.034	12.95	
Fine Concentrates	7,800	7.29	6.16	60.71	.026	8.82	
Total Concts Produced and Shipped	78,056	73.15	61.83	57.61	.036	11.82	82.98
Total Fine Tailings (by difference)	28,924	27.04	22.85	31.87		50.35	
Retreat Product							
Crude to Plant	1,689,716	100.00	84.53	40.86		36.70	
Pit Rock	16,875		0.84	26.05		57.50	
Screen Plant Rock	292,305		14.63	24.73		59.70	
Pit Crude	1,998,896		100.00	38.38		40.23	
Total Concts Produced	760,563	45.01	38.05	57.66	.047	11.53	63.51
Unsized Concentrates Produced	437,732	25.91	21.90	57.70	.046	11.58	
Coarse Concentrates Produced	226,285	13.39	11.32	57.30	.049	11.59	
Fine Concentrates Produced	96,546	5.71	4.83	58.40	.042	11.12	
Stockpile Overrun 1956	816	0.05	0.04				
Total Concts Produced and Shipped	761,379	45.06	38.09	57.66	.047	11.53	63.58
Heavy-Media Concentrates	467,559	27.67	23.39	57.38		11.80	
Heavy-Media Rejects	360,645	21.34	18.04	35.47		44.23	
Heavy-Media Feed	828,204	49.01	41.43	47.84		25.92	
Total Fine Tailings (by difference)	568,509	33.65	28.44	21.81		65.58	
Lake Concentrator Retreat Product							
Crude to Plant	43,264	100.00	64.56	45.45		27.95	
Pit Rock	4,716		7.04	38.27		40.57	
Screen Plant Rock	19,035		28.40	41.88		33.40	
Pit Crude	67,015		100.00	43.93		30.39	
Total Concentrates Produced	19,769	45.69	29.50	55.57	.044	13.28	55.86
Heavy-Media Feed	20,932	48.38	31.23	51.07		19.71	
Heavy-Media Concentrates	12,892	29.80	19.24	56.02		12.39	
Heavy-Media Rejects	8,040	18.58	12.00	41.01		33.63	
Total Fine Tailings (by difference)	15,455	35.73	23.06	34.81		43.76	

9. MAINTENANCE & REPAIRS

The usual maintenance of mine and plant equipment was carried on throughout the operating season. In the shops, a small crew made necessary repairs to shovels, trucks, tractors, and drills from January 1 to the start of the ore season. Stripping equipment maintenance only was carried on during the fall months.

Winter & Idle repairs at the plant were under way in January and February. Crews were engaged in E&A work in March and April. Good progress was made on necessary plant repairs carried on from the end of ore season until December 27.

10. COST of OPERATIONS

a. Comparative Cost

Pit Product	1956 Actual Cost	1957 Budget	1957 Actual Cost
Crude Ore Net Tonnage	1,869,300	1,833,333	1,796,696
Concentrate Tonnage	854,685	825,000	839,435
Per Cent Recovery	45.7	45.0	46.7
Average Shift Output	2,654	2,750	2,725
Tons Per Man Per Day	44.52		42.28
Shifts Operated	322	300	308
Costs			
Pit Operating	$0.226	$0.217	$0.224
Beneficiating	0.225	0.227	0.260
Loading Stockpile	0.006	0.005	0.010
Sampling & Analyzing	0.029	0.029	0.032
Safety & First Aid	0.001	0.001	0.002
Employees Vacation	0.046	0.049	0.054
Personal Injury	0.005	0.004	0.015
Social Security	0.024	0.031	0.022
Total Pit & Beneficiating	$1.230	$1.230	$1.266
General Mine Expense	0.128	0.130	0.170
Winter & Idle	0.384	0.400	0.523
Cost of Production	$1.742	$1.760	$1.959

Pit Product	1956 Actual Cost	1957 Budget	1957 Actual Cost
Depreciation			
Plant & Equipment	$0.296		$0.269
Motorized Equipment	0.059		0.073
Movable Equipment	0.003		0.002
Amortization			
Deferred Facilities	0.032		
Stripping	0.019		
Taxes			
Ad Valorem	0.133		0.201
Occupational	0.516		0.435
Royalty	0.207		0.223
Total Depreciation, Amortization, Taxes	$1.265		$1.203
Miscellaneous Expense & Income	0.007		0.010
Administrative Expense	0.100		0.100
Royalty	1.451		1.633
Total Cost on Cars	$4.565		$4.905
Lake Product			
Crude Ore Net Tonnage	534,560	138,889	67,015
Concentrate Tonnage	138,327	25,000	19,769
Per Cent Recovery	25.88	18.0	29.5
Average Shift Output	501	500	471
Tons Per Man Per Day	28.43		
Number of Shifts Operated	276	50	42
Costs			
Feeding	$0.684	$0.962	$0.660
Concentrating	0.696	0.948	0.879
Sampling & Analyzing	0.029	0.029	0.023
Safety & First Aid	0.002	0.001	0.001
Employee Vacations	0.046	0.049	0.043
Personal Injury	0.004	0.004	0.055
Social Security	0.028	0.031	0.018
Total Operating & Beneficiating	$1.489	$2.024	$1.679

Lake Product	1956 Actual Cost	1957 Budget	1957 Actual Cost
General Mine Expense	$0.127	$0.129	$0.127
Winter & Idle	0.163	0.400	0.087
Cost of Production	$1.779	$2.553	$1.893
Depreciation			
Plant & Equipment	1.084		1.371
Motorized Equipment	0.206		0.058
Taxes			
Ad Valorem	0.109		0.348
Royalty	0.193		0.212
Total Depreciation, Taxes	$1.592		$1.989
Miscellaneous Expense & Income	0.007		-0.037
Administrative Expense	0.100		0.100
Royalty	1.409		1.504
Total Cost on Cars	$4.887		$5.449
Combined Pit & Lake			
Crude Ore Net Tonnage	2,256,638	1,972,222	1,839,960
Concentrate Tonnage	993,012	850,000	859,204
Per Cent Recovery	44.00	43.10	46.70
Average Shift Output	3084	2833	2790
Tons Per Man Per Day	41.27		42.26
Shifts Operated	322	300	308
Costs			
Pit Operating	$0.226	$0.217	$0.224
Beneficiating	0.225	0.227	0.260
Lake Concentrator	1.380	1.910	1.539
Loading Stockpile	0.006	0.005	0.010
Sampling & Analyzing	0.029	0.029	0.032
Safety & First Aid	0.001	0.001	0.002
Employee Vacations	0.046	0.049	0.054
Personal Injury	0.005	0.004	0.016
Social Security	0.025	0.031	0.022
Total Pit & Beneficiating	$1.263	$1.250	$1.276

Pit & Lake Combined	1956 Actual Cost	1957 Budget	1957 Actual Cost
General Mine	$0.131	$0.130	$0.168
Winter & Idle	0.353	0.400	0.513
Cost of Production	$1.747	$1.780	$1.957
Depreciation			
Plant & Equipment	0.406		0.294
Motorized Equipment	0.080		0.073
Movable Equipment	0.003		0.002
Amortization			
Deferred Facilities	0.028		
Stripping	0.016		
Taxes			
Ad Valorem	0.130		0.205
Occupational	0.444		0.425
Royalty	0.205		0.222
Total Depreciation, Amortization, Taxes	$1.312		$1.221
Miscellaneous Expense & Income	0.007		0.009
Administrative Expense	0.100		0.100
Royalty	1.445		1.630
Total Cost on Cars	$4.611		$4.917

b. Cost Comments

Pit: Cost of production in 1957 was $0.199 higher than the budget and $0.217 higher than 1956 costs. The largest part of this increase was in Winter & Idle where 1957 costs were $0.123 higher than the budget and $0.139 higher than 1956 costs.

In 1956, crews worked on cyclone plant construction rather than concentrating on repairs with the result that a heavy repair program was necessary in 1957. This, coupled with increased labor and supply costs, contributed to the higher cost of production in 1957. Plant, pit screening, and conveying maintenance was a major factor in raising costs. In January and February, considerably more work than anticipated was done on the fine ore circuit. During November and December, repair work and supply purchases were rushed in order to absorb as much of this cost in 1957 as possible.

The 1957 General Mine Expense item was $0.040 higher than the budget and $0.042 higher than 1956 costs due to increased labor and supply costs and the additional SUB item.

Cost of beneficiation was $0.033 higher than the budget and $0.035 higher than 1956 costs due mainly to considerable experimental work done on DSM screens throughout the season.

Pit operating was $0.007 higher than the budget and $0.002 lower than 1956 costs. There was no charge for rental trucks in 1957.

Lake Concentrator: Cost of production in 1957 was $0.660 lower than the budget and $0.114 higher than 1956 costs. A comparison would be meaningless since only 42 shifts operated in 1957 as compared to 276 in 1956. The budget figure for 1957 was not properly established because of the difficulty of determining the nature and amount of ore remaining to exhaust the lean ore piles in this area.

11. EXPLORATION & FUTURE EXPLORATION

There was no exploration drilling at this property during the year. A small amount of bank sampling for current information was done early in the season. It will be necessary in 1958 to do some exploratory drilling in the southeast corner of the Bingham lease to outline the ore below the paint rock layer. This will be done when the upper ore has been removed. In addition, several holes will be required along the east bank of the Bingham and Brown No. 1 leases to definitely outline the ore in this area for future stripping.

12. TAXES

Real Estate	1957 Assessed Value	1957 Taxes	1956 Assessed Value	1956 Taxes	Increase-Decrease Assessed Value	Increase-Decrease Taxes
Mineral	$596,461	$120,372.67	$668,892	$119,270.13	-$ 72,431	+$ 1,102.54
Lands,Bldgs,Machinery	154,437	38,514.14	154,997	27,954.18	- 560	+ 10,559.96
Personal Property						
Equipment	83,033	17,582.68	83,763	15,034.61	- 730	+ 2,548.07
Stockpile Conct.	7,138	1,508.83	1,748	311.68	+ 5,390	+ 1,197.15
Lake Conct Stockpile only	5,148	1,106.67	49,997	9,502.18	- 44,849	- 8,395.51
	$846,217	$179,084.99	$959,397	$172,072.78	-$113,180	+$ 7,012.21
Average Mill Rate		210.27		179.36		

Note: Mill rate increase of 17.23% offset mineral valuations decreased by mining. Lake concentrator stockpiles were all processed in 1957 and will be off tax rolls in 1958.

13. ACCIDENTS & PERSONAL INJURY

Harry Mattson, Electrician-Starter, age 42, sustained hernia left side on August 30 while using pike pole to set power pole. 3-weeks lost time. Compensation Paid: $135

14. NEW CONSTRUCTION

a. Completed in 1957

1. Revision of media reclamation circuit.
2. Clear water reclamation from tailings pond.
3. New tailings pumps drives.
4. 1/4" Coarse-fines split facilities.

b. To Be Completed in 1958

1. Increase capacity of reject conveyor.
2. Facilities for separate stocking of coarse-fines.

3. Installation of DSM screens in cyclone plant.
4. Construction of dykes and ditch for tailings basin.
5. Purchase and install new 30" pit conveyor belt.

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Received in 1957

1. 25-ton Bay City Truck Crane.
2. One Set Crawler Pads for Marion Shovel.
3. Replacement Doors for Truck Shop.
4. Purchased 7 Rental Euclid Trucks.

b. Proposed Equipment for 1958

1. 2 only 1/2-ton Pickups.

SALLY MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

Stripping at the Sally mine, underway on January 1, was completed on February 26. The ore haul to the Canisteo was started on February 11 and completed March 14. 744,860 tons of crude ore, including 19,110 tons of direct ore, were stockpiled in the Canisteo pit. During this period, both operations were conducted on a 20-shift-per-week schedule.

On December 2, stripping operations were resumed at the Sally mine on a 5-day, 3-shift schedule and continued into 1958. 1,174,817 cubic yards of surface overburden were stripped in 1957.

During the operating season, 631,934 tons of ore, including 33,889 tons of screen rock, were mined from the Sally crude ore stockpile, leaving 93,816 tons of crude in stockpile at the end of the 1957 season.

The Canisteo plant received 598,045 tons of crude ore which produced 311,651 tons of Sally concentrates. In addition, 22,950 tons of Sally fine ore concentrates were produced from classifier overflows at the Canisteo fine ore plant.

19,110 tons of direct ore were shipped out prior to May 1, 1957.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Crude Ore

Wash	17,532
Retreat	580,513
	598,045

	Concentrates		
Sally	Bessemer	Non-Bessemer	Total
Wash	5,366	3,496	8,862
Retreat	67,856	257,883	325,739
Direct		19,110	19,110
	73,222	280,489	353,711

b. Shipments

Wash	5,366	3,496	8,862
Retreat	53,922	138,818	192,740
Overflow	7,060	15,890	22,950
Direct		19,110	19,110
Retreat Stockpile-1957	6,874	53,424	60,298
	73,222	230,738	303,960

c. Inventories

Sally Retreat	49,751

d. Production by Months

	Crude		
Month	Wash	Retreat	Total
April		9,383	9,383
May		109,055	109,055
June		153,911	153,911
July		160,593	160,593
Aug	3,550	59,280	62,830
Sept	13,982	88,291	102,273
	17,532	580,513	598,045

Concentrates & Direct

Month	Overflow	Wash	Retreat	Direct	Total
April	400		4,745	19,110	24,255
May	4,257		49,869		54,126
June	5,637		77,512		83,149
July	5,786		92,350		98,136
Aug	2,662	1,979	31,445		36,086
Sept	4,208	6,883	46,868		57,959
	22,950	8,862	302,789	19,110	353,711

3. ANALYSIS

a. Crude Ore

Sally	Tons	Iron	Silica
Wash	17,532	49.60	22.08
Retreat	580,513	46.20	26.93
	598,045	46.30	26.79

b. Tonnage & Analysis of Concentrates Produced

Sally	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Bessemer Wash	5,366	55.63	.037	13.29	.35	.55	6.28
Non-Bessemer Wash	3,497	54.62	.060	13.84	.48	.50	6.78
Bessemer Retreat	67,856	57.66	.040	11.43	.39	.58	6.41
Non-Bessemer Retreat	257,882	56.94	.061	11.42	.48	.61	6.85
Non-Bessemer Direct	19,110	54.60	.121	11.76	.36	3.00	12.39
	353,711	56.91	.048	11.49	.46	.73	7.06

c. Tonnages & Analyses of Concentrates Shipped

Sally	Tons	Iron	Phos	Sil.	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist
Bessemer Wash	5,366	55.63	.037	13.29	.35	.55	.34	.18	.007	5.51	6.28
Non-Bessemer Wash	3,496	54.62	.060	13.84	.48	.50	.34	.18	.007	6.21	6.78
Bessemer Retreat	53,923	57.61	.039	11.29	.40	.58	.34	.18	.007	4.57	6.16
Non-Bessemer Retreat	138,817	56.59	.066	11.51	.52	.63	.34	.18	.007	5.52	6.77
Bessemer Overflow	7,060	57.20	.036	12.92	.36	.60	.34	.18	.007	3.57	7.03
Non-Bessemer Overflow	15,890	57.42	.043	12.41	.36	.54	.34	.18	.007	3.81	6.99
Non- Bessemer direct	19,110	54.60	.121	11.76	.36	3.00	.34	.18	.007	5.85	12.39
Bess Retreat Stockpile-1957	6,874	58.48	.045	11.01	.29	.62	.12	.20	.014	3.90	7.73
Non-Bess Retreat S.P. 1957	53,424	57.61	.055	10.85	.42	.60	.12	.20	.014	5.12	6.89
	303,960	56.89	.059	11.50	.45	.75	.30	.18	.008	5.14	7.07

d. Mine Analysis of Ore in Stockpile

Tons	Iron	Phos	Silica	Mang	Alum	Moisture
49,751	57.02	.057	11.44	.50	.61	6.99

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
Merch	14	0	100
Wash	14	0	57
Lean Wash	14	0	46
Low Grade Wash	14	0	58
Lean Low Grade Wash	14	0	51
Retreat	14	0	40

b. Ore Reserves as of December 31, 1957

Lease	Reserve 12-31-56	Mined 1957	Balance After Mining	Changed by Re-estimate	Reserve 12-31-57
Bovey #1 NW-SW 21, 56-24	1,751,579	353,711	1,397,868		1,397,868

c. Estimated Analysis of Ore Reserves

Concentrates	Tons	Iron	Phos	Silica
Bessemer Merch	88,457	64.01	.020	5.50
Non-Bessemer Merch	44,547	62.12	.078	5.59
Bessemer Wash	743,003	60.92	.026	7.85
Non-Bessemer Wash	431,052	58.89	.067	8.65
Bessemer Retreat	90,809	58.33	.031	11.73
	1,397,868	60.39	.041	8.07
Merch				
Bessemer	88,457	64.01	.020	5.50
Non-Bessemer	44,547	62.12	.078	5.59
	133,004	63.38	.039	5.53
Wash Concentrates				
Bessemer	743,003	60.92	.026	7.85
Non-Bessemer	431,052	58.89	.067	8.65
	1,174,055	60.17	.041	8.15
Retreat Concentrates				
Bessemer	90,809	58.33	.031	11.73
Total Sally				
Bessemer	906,379	61.05	.026	7.91
Non-Bessemer	491,489	59.18	.068	8.38
	1,397,868	60.39	.041	8.07

5. LABOR & WAGES

a. Comments

Labor relations during the year were satisfactory.

b. Comparative Statement of Production & Wages

Production-Tons	353,711
Number of Days Operated	76
Number of Shifts Operated	98
Average Product Per Shift	3351
Average Number of Men Employed	142
Product Per Man Per Day	57.47
Average Wages Paid Per Day	$21.87
Total Amount Paid for Labor	$168,230.13
Labor Cost Per Ton	$0.476

6. SURFACE

a. Buildings & Repairs

Construction of a combination pit office and service garage with auxiliary facilities, authorized under E&A No. CC-854, was started in November, 1956, by the Mipac Builders of Duluth, Minnesota, and completed January 31, 1957, at a cost of $36,366.57.

b. Roads, Transmission Lines, Etc. None

c. Miscellaneous General Construction None

7. OPEN PIT

a. Stripping

Surface stripping authorized under E&A No. CC-851 in the fall of 1956 was completed February 26. Operations were conducted on a 20-shift schedule using 2 shovels and 12 to 14 trucks. 1,159,895 cubic yards of surface were removed at a cost of $0.053 per cubic yard for a total expenditure of $408,923.

Surface stripping was resumed on December 2 on a 3-shift, 5-day schedule using 2 shovels and 12 trucks. E&A No. CC-933 was authorized for the removal of 550,000 cubic yards at an estimated

cost of $0.380 per yard. 396,094 cubic yards were removed in December at an average rate of 6713 cubic yards per shift and a cost of $0.287 per cubic yard. An unexpended $101,764 remained in this E&A on December 31, 1957, and the stripping program was continued into 1958.

1,174,817 cubic yards of surface overburden were removed in 1957 at an average rate of 5703 cubic yards per shift.

b. Open Pit Mining

Hauling of ore to the Canisteo was started on February 11 on a 20-shift schedule using 2 shovels and 14 trucks. 744,860 tons of crude--which included 19,110 tons of direct ore--were stockpiled in the Canisteo pit. The ore haul was completed March 14. Ore was mined on the south and east sides of the Sally forty. With the exception of some painty material in the upper portion of the ore body, most of the ore mined was high grade.

Ore operations were started at the Canisteo on a 2-shift, 5-day schedule on April 29 and remained in effect until shutdown of operations on September 27.

The pit operated 93 shifts on Sally crude ore producing 631,934 tons (including 33,889 tons of screen rock) at an average rate of 7900 tons per shift.

c. Pumping & Drainage

No pit pumping was necessary. Surface drainage was directed into the natural flowage to the west.

8. BENEFICIATION

The concentrating plant--operating the same schedule as the pit--received 598,045 tons of crude and produced 311,651 tons of concentrates, of which 8862 tons were wash and 302,789 tons retreat concentrates. Concentrates were produced at an average rate of 3351 tons per shift and a weight recovery of 52.11 per cent of plant crude and 49.32 per cent of pit crude.

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The Heavy-Media plant received 180,722 tons of feed and produced 110,258 tons of concentrates at a weight recovery of 61 per cent. Coarse tailings from the Heavy-Media plant amounted to 70,464 tons.

The fine ore plant produced a total of 22,950 tons of concentrates from Sally classifier overflows at a rate of 247 tons per shift.

Since Sally and Bovey crude ores at the Canisteo were mined simultaneously, concentrate tonnage and weight recovery were estimated from test data and previous experience on Bovey ore at the Canisteo.

Concentration data for the year is as follows:

		Per Cent Weight		Per Cent			
Wash Product	Tons	Plant	Pit	Iron	Phos	Silica	Iron Units
Crude to Plant	17,532	100.00	94.23	46.26		26.90	
Screen Plant Rock	1,074		5.77	26.50		58.55	
Pit Crude	18,606		100.00	45.12		28.73	
Total Concentrates Produced	8,862	50.55	47.63	55.65	.046	13.52	
Total Concts Produced & Shipped	8,862	50.55	47.63	55.65	.046	13.52	
Total Fine Tailings (by difference)	8,670	49.45	46.60	36.66		40.58	
Retreat Product							
Crude to Plant	580,513	100.00	94.65	46.26		26.90	
Screen Plant Rock	32,815		5.35	26.50		58.55	
Pit Crude	613,328		100.00	45.20		28.59	
Total Concentrates Produced	302,789	52.16	49.36	57.10	.056	11.42	
Total Concts Produced & Shipped	302,789	52.16	49.36	57.10	.056	11.42	64.38
Heavy-Media Concentrates	110,258	18.99	17.98	57.25		10.67	
Heavy-Media Rejects	70,464	12.14	11.49	42.55		30.83	
Heavy-Media Feed	180,722	31.13	29.47	53.03		16.30	
Total Fine Tailings (by difference)	207,260	35.70	33.79				
Fine Ore Plant							
Crude to Plant	275,105	100.00		28.13		55.07	
Total Concts Produced & Shipped	22,950	8.34		57.35	.041	12.57	
Total Fine Tailings (by difference)	252,155	91.66					

It was necessary to stockpile 110,049 tons of concentrates during the operating season. Of this amount, 60,298 tons were shipped from stockpile, leaving a balance in stock of 49,751 tons on January 1, 1958.

Following is a brief classification of delay time at the washing and Heavy-Media plants:

Washing Plant	Hours	% Total Hours Worked
Screening Plant Machines	4.75	0.64
Plant Pocket & Rock Chute	5.50	0.74
Electric Power	4.00	0.54
Pumps & Pipelines	2.25	0.30
Washing Plant Machines	11.25	1.51
Conveyors	2.50	0.34
Concentrate Stacker	2.25	0.30
	32.50	4.37
Retreat Plant		
Conveyors	1.50	0.21
Electric Power	1.50	0.21
Heavy-Media Plant Machines	7.25	1.00
Concentrate Chute	1.00	0.14
Out of Feed	1.00	0.13
	12.25	1.69

9. MAINTENANCE & REPAIRS

Plant equipment repair continued from January 1 until the start of ore season on April 29 and was resumed at the end of the ore season. Truck and shovel repair was conducted prior to the start of the ore season. All repair work was suspended on December 27.

10. COST of PRODUCTION

a. Comparative Mining Costs

Product	1957-Budget	1957 Actual
Wash Concentrates		8,862
Retreat Concentrates	275,000	302,789
Fine Ore Concentrates	20,000	22,950
Direct Ore		19,110
	295,000	353,711
Per Cent Gross Crude Recovery		49.32
Average Product Per Shift		3,351
Tons Per Man Per Day		57.47
Days Operated		76
Costs		
Pit Operating	$0.414	$0.373
Beneficiation	0.170	0.149
Fine Ore Concentrating	0.893	0.807
Loading Stockpile Ore	0.009	0.005
Sampling & Analysis	0.025	0.028
Safety & First Aid Supplies	0.001	0.003
Employees' Vacation Pay	0.052	0.049
Personal Injury Expense	0.002	0.001
Social Security Taxes	0.022	0.036
Total Pit & Beneficiation	$1.464	$1.117
General Mine Expense	0.122	0.134
Winter & Idle	0.347	0.156
Cost of Production	$1.933	$1.407
Depreciation		
Plant & Equipment		0.264
Motorized Equipment		0.017
Taxes		
Ad Valorem		0.210
Occupational		0.664
Royalty		0.016
Deferred Mining Cost		0.018

Total Costs	1957 Actual
Depreciation-Taxes	$1.189
Royalty	0.300
Total Cost at Mine	$2.896

b. Detailed Cost Comparison

Overall Mining Costs: $0.526 under the budget. There were no operations in 1956 for a cost comparison. An increase in recovery over the budget estimate and a variation in the method of allocating Sally-Canisteo costs contributed to decreased costs.

Pit Operating: (including cost of hauling Sally ore to the Canisteo) $0.041 under the budget due to allocation method noted above.

Beneficiation: $0.021 under the budget due mainly to late delivery of the scrubber. The budget estimate was set up on assumption that scrubber would be in operation the entire season.

Fine Ore Concentrating: $0.086 below budget due to increase in recovery over that estimated and improved operating conditions with less downtime.

General Mine Expense: $0.012 over budget due to SUB which was not included in budget.

Winter & Idle: $0.191 under budget due to allocation method.

11. EXPLORATION & FUTURE EXPLORATION

No exploratory drilling was done at the Sally in 1957. Additional drilling will be required to determine extent of mineable ore, particularly in the northwest portion of the forty. A minimum requirement of 2000 feet of future exploratory drilling has been estimated.

	1957		1956		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Real Estate						
Mineral	$278,403	$56,741.32	$242,704	$41,946.53	⁄$35,699	⁄$14,794.79
Land,Bldg,Machinery	933	195.68	666	122.18	267	73.50
	$279,336	$56,937.00	$243,370	$42,068.71	⁄35,966	⁄$14,868.29
Average Mill Rate		203.83		172.86		

Note: Mill rate increase average of 17.92% plus reclassification of 339,424 tons from undeveloped to developed increased mineral value and tax. Additional forty for dump lands purchased from Oliver Iron Mining Division increased land value. $17,344.19 for portion of personal property, beneficiating plant, etc., charged to Sally assessed against Canisteo.

Tax Commission Reserve
as of May 1, 1957

1957	1,727,324
1956	1,751,579

Note: 24,255 tons produced 1957 prior to May 1, 1957.

13. ACCIDENTS & PERSONAL INJURY

Lawrence Gagner: On February 27, incurred sore and swollen leg from knee to upper part of thigh when large chunk of ore fell off shovel bucket striking him in thigh of left leg. Lost 3 Weeks,4 Days.
Paid: $152

Don Korte: On March 13 developed sore back while working on truck tire prying rim loose from tire. Bar slipped injuring his back. Lost 1 Day. Paid: $128

14. PROPOSED NEW CONSTRUCTION — None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT — None

SARGENT OPEN PIT MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

During January, February, and March a crew of five hourly and three salaried employees repaired the shovel, trucks, tractors, and grader on a 1-shift, 5-day-per-week schedule. In February, electric motors from the shovel, screen, and wash plants were taken out for cleanup and repair, and in March repairs were started at the washing plant. On April 22, the 3-1/4 yard Bucyrus Erie shovel was moved into the pit for cleanup and stripping on the north side of the south channel in the upper benches. Heavy rains slowed cleanup work, with soft spots developing in the roads and dump. The tailings discharge pipeline was extended along the west side of the pond and stripping material was used to raise the east side dyke.

The Pacific Isle Mining Company was given permission to use Sargent roads to make the St. Paul plant accessible for crude ore from its Mississippi #1 property located north of the Sargent.

Pillars of ore encountered in stripping were screened and stockpiled. On May 13, the concentrating plant was put on a 1-shift, 5-day-per-week schedule and then increased to a 2-shift schedule on May 27. Five trucks and one shovel were used in stripping and six trucks on ore.

Operations were affected by heavy rainfall during the latter part of June and by delays in Great Northern railroad service. The derail on the load track at the wash plant was moved down to provide for storage of six more loads.

Stripping operations and cleanup in the old caves where ore pillars were found were conducted intermittently with ore operations. The uncertainty of obtaining ore for the plant necessitated overtime in the pit to keep the plant going. At times the plant was down to one shift or down entirely for a short time. Heavy rains in July also contributed to lowered production, resulting in shutdown of pit and plant. In July, it was not necessary to purchase water from Pacific Isle as we obtained it from our pump in the swamp and from Pacific Isle's forced pumping for its own pit drainage.

In August, pit and plant were in full production, the shovel having been moved to the pit bottom of the south channel to recover ore in anticipation of possible cancellation of the lease.

A clause in the Sargent lease requires that the lease be not cancelled if held on January 1, 1958, until all ore is exhausted or the lease term expires in 1968. Also, that minimum annual shipments after January 1, 1958, be established as one-tenth of the remaining reserve. Six-months' notice of cancellation is required, which was reduced to four months by agreement with the lessors. Because of these conditions, future operation of the Sargent lease was carefully considered. Remaining ore reserves--estimated jointly by Cliffs and Meriden to total 1,394,000 tons--were either low natural direct or low recovery, high cost concentrates occurring in the north ore body under a heavy rock capping.

After much study, it was finally decided to cancel the lease effective December 31, 1957. International Harvester concurred in this decision, and the Sargent Land Company was so notified on December 13, 1957.

Ore mining continued in the pit bottom and all ore not requiring a great deal of old cave removal was cleaned up. The shovel was moved out of the pit on September 20 and a small stockpile was cleaned up back of the shop, screened, and sent to the washing plant. Washing plant operations were discontinued on September 27 after cleaning up all available crude ore in the stockpile. Transfer of equipment and men to the Hawkins mine and dismantling of washing and screening plants were completed on November 27. The office building, pit shop, and old underground shop, engine house, and boiler house will be sold and moved, and material remaining will be sold for scrap.

An estimated 15,450 tons of trespass ore were stocked in the Bray pit by M. A. Hanna Company, of which 11,460 tons came from along the Mesabi Chief line and 3,990 tons from the Mississippi #3 line. This stockpiled ore will be concentrated in 1958 in the Mesabi Chief plant. Hanna has agreed to take the concentrates, repaying Cliffs for the royalty when final crude weight is determined. 3,962 cubic yards of paint rock from the Mississippi #3 were stocked on the east end of the Sargent #3 taconite dump.

The M. A. Hanna Company satisfied an earlier 10,600 ton Bray merch ore trespass by crossing the Sargent line on October 24 and 25, 1957, and mining and processing an equivalent tonnage of Sargent ore.

2507 tons of old Gordon lease trespass by the Sargent was reduced by an estimated 403 tons in early November when M. A. Hanna Company made a trespass cut in direct ore.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production by Grades

Sargent	Tons
Crude	93,608
Concts	76,629

b. Shipments (Same as production)

c. Inventories None

d. Production by Months

Month	Crude	Concentrates
May	8,809	7,747
June	20,834	15,500
July	18,349	14,037
August	28,920	24,127
September	16,699	13,592
Adjust Wt.	-3	
October		1,626
	93,608	76,629

3. ANALYSIS

a. Tonnage & Analysis of Crude Ore

Tons	Iron	Silica
93,608	51.32	20.73

b. Tonnage & Complete Analysis Produced & Shipped

Sargent Concts.	Iron	Phos	Silica	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moist
76,629	56.40	.058	13.09	.50	1.36	.10	.30	.007	3.64	10.70

4. ESTIMATE of ORE RESERVES

a.

Product	Cubic Feet Per Ton	Rock Reduction	Per Cent Recovery
Merch Ore	14	0	100
Wash Concts	14	0	60

b. Ore Reserves as of December 31, 1957

Sargent Mine Open Pit	Reserve 12-31-56	Mined 1957	Changed by Re-estimate	Reserve 12-31-57
NE-SE 23, 57-22				
Merch	43,000			43,000
Wash Concentrates	57,000			57,000
	100,000			100,000
SW-SE 23, 57-22				
Merch	10,000		-10,000	
Wash Concentrates	65,000	76,629	∠11,629	
	75,000	76,629	∠ 1,629	
SE-SE 23, 57-22				
Merch	2,000			2,000
Wash Concentrates	23,000			23,000
	25,000			25,000
NW-NE-26, 57-22				
Wash Concentrates	6,912			6,912
Total Sargent Open Pit				
Merch	55,000		-10,000	45,000
Wash Concentrates	151,912	76,629	∠11,629	86,912
	206,912	76,629	∠ 1,629	131,912*

*In addition to this amount, there are 15,450 tons of Sargent crude ore stocked in the Bray pit by the M. A. Hanna Company. This ore is to be treated during the 1958 season. 2104 tons of concentrates from this stockpile are to be credited to the Gordon mine.

c. Estimated Analysis of Reserves

Open Pit	Tons							Iron
NE-SE 23, 57-22	Non-Bess	Iron	Phos	Silica	Mang	Alum	Moist	Natural
Merch	43,000	54.34	.057	12.78	1.22	2.09	14.00	46.73
Wash Concts	57,000	56.96	.082	6.83	.81	1.46	12.00	50.12
	100,000	55.83	.071	9.39	.99	1.73	12.87	48.64
SE-SE 23,57-22								
Merch	2,000	54.34	.057	12.78	1.22	2.09	14.00	46.73
Wash Concts	23,000	55.84	.057	13.21	.69	1.26	11.54	49.40
	25,000	55.72	.057	13.18	.73	1.32	11.74	49.18
NW-NE 26, 57-22								
Wash Concts	6,912	55.84	.057	13.21	.69	1.26	11.54	49.40
Total Sargent								
Merch	45,000	54.34	.057	12.78	1.22	2.09	14.00	46.73
Wash Concts	86,912	56.57	.074	9.03	.77	1.39	11.84	49.87
	131,912	55.81	.068	10.31	.92	1.63	12.58	48.79

5. LABOR & WAGES

a. Comments

Labor supply was ample and labor relations good. Under the terms of the labor contract, a $0.03 cost-of-living increase was granted on January 1, 1957; a $0.04 cost-of-living increase on July 1, 1957; and a $0.07 general wage increase on July 1, 1957.

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4. ESTIMATE of ORE RESERVES

Item d. Prospective Reserves

Tonnages jointly estimated by Meriden Iron Company and The Cleveland-Cliffs Iron Company as of January 1, 1958:

Material	Gross Crude	Tons Concentrates	Iron	Phos	Silica
Merch	251,208	226,086	55.92	.090	10.36
Wash	670,534	310,104	57.38	.065	10.09
Retreat	2,587,068	857,910	56.92	.035	11.45
	3,508,810	1,394,100			

Factors

Material	Tons Per Cubic Yard	Per Cent Rock Deduction	Per Cent Recovery
Merch	14	10	100
Wash	14	11	52
Retreat	14	15	39

Material	Stripping Cubic Yards
Surface	1,618,805
Taconite	1,316,342
Lean Ore	1,299,868
Paint Rock	460,688
	4,695,703

b. Comparative Statement of Wages & Product

Tons	76,629
Number of Days Operated	83
Number of Shifts Operated	83
Average Daily Product	923
Average Product Per Shift	923
Average Production Per Man Per Day	38.4
Average Wages Per Hour - Ore Season	$2.935
Amount Paid for Labor	$62,226.63
Labor Cost Per Ton	$0.812

6. GENERAL SURFACE

a. Building & Repair — None

b. Roads, Transmission Lines, Etc.

No roads or power lines were built in 1957. Pacific Isle Mining Company was granted permission to use roads from the Sargent northwest corner past the pit shop to the old underground road for transportation by truck of crude ore from the Mississippi #1 mine to the St. Paul mine concentrator.

c. Miscellaneous General Construction — None

7. OPEN PIT

a. Stripping

Under E&A No. CC-850, cleanup work was started in April in the approach road, and stripping continued on the south channel on the north and east sides on an intermittent basis with ore operations. Some of this cleanup was charged to operating. All of the work was on a 1-shift, 5-day-per-week schedule using the Bucyrus Erie 3-1/4 yard shovel loading five trucks. Rain hampered operations a great deal.

A summary of stripping follows: