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GEOLOGIC REPORT

SELIGMAN IRON PROPERTY

CHINO MINING DISTRICT

YAVAPAI COUNTY, ARIZONA

P.O. Box 1041

MU 4-2287

DORMAN S. O'LEARY

REGISTERED MINING ENGINEER

WICKENBURG, ARIZONA

July 27, 1960

Mr. W. P. Campbell
Lubbock, Texas

Dear Mr. Campbell:

I am presenting a geologic report on the Seligman Iron property, with two maps and two plates of cross-sections, suitable for use as annual assessment work.

Sincerely,

Dorman S O'Leary

Dorman S. O'Leary

Registered Professional Engineer (Mining)
CERTIFICATE EXPIRES
DORMAN SHAW
O'LEARY
DEC. 31, 1960
ARIZONA, U.S.A.

SELIGMAN IRON PROPERTY

Chino Mining District

Yavapai County, Ariz.

D. S. O'Leary
Wickenburg, Arizona
July 26, 1960

This property was examined by the auther, with the assistance of Mr. Elwood Wright, during the period from July 12-July 22, 1960. Drill holes were located with transit and tape or stadia, and geologic reconnaissance was accomplished with transit and stadia or Brunton compass and tape or pacing.

The property consists of 13 patented mining claims, "Federal," "Iron Chanceller", et al., Mineral Survey No. 2282, and 12 unpatented claims, located in Sections 22,23,26, and 27, Township 20 North, Range 6 West, G&SRM, Yavapai County, Arizona, and is about 18 miles south of Seligman, Arizona, on the Seligman-Walnut Creek road, a well maintained gravel road. Seligman is a Santa Fe division point and there is a spur available, but loading facilities are inadequate for anything but very small scale operations.

Elevation of the property is around 5600 feet, the the topography consists of fairly low, flat-topped limestone hills or mesas with steep sides, and gently rounded hills of andesite. Drainage is to the north toward Chino Wash, but there is no permanent surface water. Vegetation consists of juniper and pinion pine, with some cactus. The weather during the period of this examination was hot, and the usual summer thunderstorm season was just startThg.maps and cross-sections which accompany this report show the surface geologic features of main interest, and the size and shape of the ore bodies as determined by the limited amount of drilling which has been done. Data on these drill holes were furnished by Mr. Elwood Wright. The holes labeled M-1, M-2, etc., were drilled with a Mayhew 1000 rotary rig, using tri-cone bits and air scavenging. Drilling in the hard, cherty limestone which sometimes occurs 20 to 50 feet above the ore horizon proved difficult and expensive. Holes labeled 1, 2, 3, etc., were drilled with an Ingersoll-Rand wagon drill and a 600 cfm rotary compressor, a combination which proved fairly cheap and fast, but generally limited in depth to around 80 feet, as the velocity of the annulus air was insufficient to clear the hole of the heavy iron ore cuttings. Fractures in the limestone were occasionally encountered , and a bit and some drill steel were lost in hole No. 30 due to one of these fractures. Samples were taken, in both kinds of drilling, from the cuttings at 5 feet intervals. Grade of the easily recognizable blue black high grade hematite ran a consistent 59% to 63% Fe, and the so-called low grade iron ore consists of stringers of this hematite in red limestone. Holes labeled DD1, DD2, etc., are diamond drill holes drilled by Mather Iron company several years ago. A tabulation of the logs of all these holes will be found in the back of this report, and logs of some of the holes are shown on the detailed map. The cross sections show many of these holes, some of them necessarily projected onto the plane of the section.

The tonnage estimate in this report was based primarily on these drill logs, except for the large ore body on the Iron Chancellor claim, which has not been drilled. Estimates on this latter ore body were based on the assumption that the ore body is semi-circular in shape, and about half as wide as it is long. This is certainly not the real shape of the ore body, but I feel it is a fairly reasonable method of arriving at a tonnage estimate in the absence of information on the real width. Tonnage factor used was a conservative 9 cubic feet per long ton, based on an average 60% Fe content, equivalent to 87% Fe_2O_3, and 13% combined CaO, SiO_2 and Al_2O_3, plus small amounts of other impurities. The U. S. Bureau of Mines reports the phosphorus as less than 0.005%, sulphur as less than 0.02%, and manganese as less than 0.10%. These figures give a mathematical factor of slightly over 8 cu. ft/long ton, so 9 cu. ft/long ton was used.

GEOLOGY

The Redwall limestone, of Devonian-Mississippian age covers most of the southern and eastern part of the claims, exhibiting shallow dips in several directions. About 1 mile to the south and a few hundred feet higher are some remnants of buff to red sandstone (Supai formation?). Andesite and alluvial material cover the northwest part of the claims, and the deeper valley bottoms, with gentle slopes, are alluvial material. About 10 miles north, on the road to Seligman, is an outcrop of granite, probably Pre-Cambrian. The presence of andesite in the form of sills in limestone is shown in hole No. 25, which had 5' of andesite under 76' of limestone. Directly underneath this andesite sill was 10 feet of high grade iron ore. This andesite, which is generally dark green and fairly fine grained, abutts the ore in the Lone Jack No.2-Iron Horse pit, and the contact with the limestone as shown at the grizzly cut shows a contact brecchia. This andesite also appears, in the form of a sill, or tongue, on the hill northeast of the ore on the Iron Chancellor, about 100 feet in elevation above the andesite in the valley. There is also an outcrop of andesite on a high hill southwest of the claims which could be either a sill or a flow. Since this andesite, which is probably Tertiary in age, is, at least in part, intrusive, there is a good possibility that it furnished the conduits for the introduction of the iron ore bearing solutions, which are generally considered as hydrothermal. With this possible association of andesite and iron ore, it follows that the near vicinity of all outcrops of andesite in the area should be carefully prospected for iron.

Another prospecting guide is the presence of calcite. It was noted that the limestone in immediate contact with the iron ore, contains, along with reddish iron staining, a considerable quantity of crystalline calcite, usually fairly massive.

Mr. Wright had previously noted a quantity of small pebbles of float hematite on the Lone Jack claim, west of the pit and in the near vicinity of holes M-8 and M-9, which logged ore. This float, which is above any known ore horizon, drilled or outcropping, was mapped by Brunton compass and pacing, and was found to have a west to southwesterly trend. One explanation for this float is that is derived from a small near vertical vein or veinlets of ore which may extend up from a continuation of the ore body in the pit, which drilling has shown to have a westerly trend. Similar areas of hematite float, with pebbles up to 1" in diameter, accompanied by calcite crystals in reddish limestone, and yellow-brown, iron stained soil, were noted and mapped on hilltops on Ben Franklin No. 4 and 5 claims, and on the Iron Horse claim, with westerly or southwesterly trends. All of these float areas are at approximately the same elevation, well above the main known ore horizon. A working on the Iron Chanceller followed a 4 foot vertical vein extending up from the main ore body. This vein appeared to be shut off, and no float was found on top of the hill to the east. Another vein, dipping 75° northwest and about 6 feet wide was found on Ben Franklin No. 2 claim, at an elevation at least 15 feet above the highest working on the Iron Chanceller. This vein, exposed in a small cut, may connect with a horizontal ore bodyat lower elevation, not now exposed by erosion.

These main ore bodies, two on the Iron Chanceller, which were probably connected at one time, the connection being destroyed be erosion, and one exposed in the Lone Jack No2-Iron Horse pit, are generally lenticular-tending to thin at the edges-, and contain horses or embayments of limestone. The Lone Jack No. 2 ore body shows a slight easterly dip (see cross-sections), and the outcrop of the Iron Chanceller ore body shows a definite easterly dip, both on top of the ore and in the stratafication of the overlying limestone. In the 40 feet long adit in the small pit on the south end of the Iron Chanceller the ore breaks ratherly sharply downward to the east , limestone coming in at 30 feet, and a winze was sunk at the end of this adit in an attempt to follow the ore. These ore bodies also demonstrate sharply defined thickening in squarish blocks extending up from the horizontal lenses, probably due to vertical fracturing in the replaced limestone. Several examples of this squarish blocking can readily be seen on the Iron Chanceller, and one of them has been classified as a vein. The large block on the north end of the Iron Chanceller ore body is undoubtedly connected with the horizontal body. Although there is a limestone lense outcropping near the bottom of this block, the 51 feet shaft sunk in this block is in solid ore, so the limestone apparently lenses out.

Hole No. 25 penetrated a 10 feet section of high grade iron ore at 95 to 105 feet, or elevations 5509 to 5409, underneath 5 feet of andesite. This hole was barren at the general level of the ore in the immediate area, allowing the deeper penetration. This is the only hole to go this deep in this area, and indicates the possibility of deeper ore bödies. None of this possible ore was considered in the tonnage estimate.

CONCLUSIONS AND RECOMMENDATIONS

Tonnage available on this property, now estimated at over 500,000 long tons can be greatly increased , possibly to 1 million tons, by further drilling or other development of the westward trending ore body on the Lone Jack claim, and the large ore body on the Iron Chanceller claim. Each foot of eastward extension of this latter ore body, taken all together and assuming the length and thickness remain approximately the same, would develop 1600 long tons of ore. Tonnage which could be developed on the smaller ore body on the south end of this claim is much smaller. Choice of development methods seems to rest between wagon drilling with increased compressor capacity, since many of the holes will have to go to 150 feet, and underground methods-drifting and raising in the ore. If a market for the development ore is available, the underground methods would be preferable. Due to the amount of overburden and the resulting high stripping ratio, most of the ore will probably have to be mined by underground methods.

The ore in the stockpile and in the pit faces has a large amount of fines, an objectionable feature for steel manufacture. Whether the amount of fines will decrease in freshly broken ore is a matter of conjecture, but in any case some screening will probably be required at the mine.

The ore is high grade and of unusual purity, and the outlook for the property is quite favorable.

Dorman S. O'Leary

ORE RESERVE TABULATION

In Long Tons, using a factor of 9 cubic feet per long ton

Lone Jack, Lone Jack No. 2 and Iron Horse claims

	Assured	Possible
Open Pit ore	108,000 L. T.	10,000 L. T.
Underground ore	46,700 L. T.	50,000 L. T.

Iron Chanceller claim

	Assured	Possible
Open Pit ore		
Small pit on S. end	30,000 L. T.	
Underground Ore "		10,000 L. T.
Large, squarish ore body on N. end. 51' shaft in ore.	25,000 L. T.	25,000 L. T.
Lenticular ore body	200,000 L. T.-probable ore	

Totals --	Assured	Probable	Possible
Open Pit	138,000		10,000
Underground	71,700	200,000	85,000
	209,700	200,000	95,000
			504,700 L. T.

Mined ore in stockpile

Plus 4" lump ore	525 L. T.	
Minus 4" ore	1370 L. T.	
		1895 L. T.

HOLE LOG TABULATION

Hole No.	Elevation of Collar	Depth Log	Formation	Elevation of Formation	Thickness of ore
M-1	5586	0-10	Limestone	5586-5576	
		10-20	H. G. Ore	5576-5566	10
		20-30	Limestone	5566-5556	
M-2	5620	0-10	Alluvium	5620-5610	
		10-40	Andesite	5610-5580	
		40-85	Limestone	5580-5535	
M-3	5633	0-5	Alluvium	5633-5628	
		5-15	Andesite	5628-5618	
		15-20	L.G. Ore-20%	5618-5613	
		20-40	H.G. Ore	5613-5593	20
		40-50	L. G. Ore	5593-5583	
		50-55	Limestone	5583-5578	
M-4	5627	0-5	Limestone	5627-5622	
		5-30	H. G. Ore	5622-5597	25
		30-40	L. G. Ore-20%	5597-5587	
		40-50	Limestone	5587-5577	
M-5	5610	0-20	H. G. Ore	5610-5590	20
		20-30	L. G. Ore-40%	5590-5580	
		30-40	Limestone	5580-5570	
M-6	5616	0-5	Alluvium	5616-5611	
		5-10	Limestone	5611-5606	
		10-35	H. G. Ore	5606-5581	25
		35-50	L. G. Ore-40%	5581-5566	
		50-60	Limestone	5566-5556	
M-7	5692	0-50	Limestone (cherty, hard)	5692-5642	
M-8	5689	0-60	Limestone	5689-5629	
		60-80	H. G. Ore	5629-5609	20
		80-85	Limestone	5609-5604	
M-9	5688	0-25	Limestone	5688-5663	
		25-30	L. G. Ore	5663-5658	
		30-35	H. G. Ore	5658-5653	5
		35-95	Limestone	5653-5593	
M-10	5617	0-5	Alluvium	5617-5612	
		5-10	Limestone	5612-5607	
		10-12	H. G. Ore	5607-5605	2
		12-40	Limestone	5605-5577	
M-11	5609	0-15	Alluvium	5609-5594	
		15-50	Limestone	5594-5559	
M-12	5607	0-15	Alluvium	5607-5592	
		15-20	Limestone	5592-5587	
		20-26	H. G. Stringers	5587-5581	
		26-40	Limestone	5581-5567	

Hole No.	Elevation of Collar	Depth Log	Formation	Elevation of Formation	Thickness of Ore
M-13	-lost hole-				
M-14	5581	0-15	Alluvium	5581-5566	
		15-100	Limestone	5566-5481	
Wagon Drill Holes					
1	5601	0-15	Alluvium	5601-5586	
		15-40	Limestone	5586-5561	
		40-60 plus (stopped in ore)	H. G. Ore	5561-5541	20 plus
2	5601	0-16	Alluvium	5601-5585	
		16-21	H. G. Ore	5585-5580	5
		21-36	L. G. Ore-40%	5580-5565	
		36-80	Limestone	5565-5521	
3	5600	0-14	Alluvium	5600-5586	
		14-30	H. G. Ore	5586-5570	16
		30-80	Limestone	5570-5520	
4	5599	0-13	Alluvium	5599-5586	
		13-38	H. G. Ore	5586-5561	25
		38-50	L. G. Ore-40%	5561-5549	
		50-80	Limestone	5549-5519	
5	5600	0-14	Alluvium	5600-5586	
		14-40	H. G. Ore	5586-5560	26
		40-50	L. G. Ore-40%	5560-5550	
		50-80	Limestone	5580-5520	
6	5598	0-14	Alluvium	5598-5584	
		14-34	H. G. Ore	5584-5564	20
		34-80	Limestone	5564-5518	
7	5599	0-14	Alluvium	5599-5585	
		14-54	Andesite	5585-5545	
		54-55	Limestone	5545-5544	
8	5598	0-14	Alluvium	5598-5584	
		14-54	Andesite ~~Limestone~~	5584-5544	
		54-64	H. G. Ore	5544-5534	10
9 thru 13	5600-5607	0-14	Alluvium	-5585	
		14-59	Andesite	5585-5540	
14, 15, 16	5600-5603	0-14	Alluvium	5585-5585	
		14-30 plus	Andesite		
17	5598	0-9	Alluvium	5598-5589	
		9-24	H. G. Ore	5589-5574	15

Hole No.	Elevation of Collar	Depth Log	Formation	Elevation of Formation	Thickness of Ore
18	5598	0-11	Alluvium	5598-5587	
		11-39	H. G. Ore	5587-5559	28
		39-50	Limestone	5559-5548	
19	5600	0-14	Alluvium	5600-5586	
		14-35	H. G. Ore	5586-5565	21
		35-50	L. G. Ore-40%	5565-5550	
		50-80	Limestone	5550-5520	
20	5600	0-14	Alluvium	5600-5586	
		14-50	Limestone	5586-5550	
21	5602	0-13	Alluvium	5602-5589	
		13-43	H. G. Ore	5589-5559	30
		43-80	Limestone	5559-5522	
22	5602	0-11	Alluvium	5602-5591	
		11-60	Limestone	5591-5542	
23	5611	0-5	Alluvium	5611-5606	
		5-60	Limestone	5606-5551	
24	5611	0-5	Alluvium	5611-5606	
		5-60	Limestone	5606-5551	
25	5604	0-14	Alluvium	5604-5590	
		14-90	Limestone	5590-5514	
		90-95	Andesite	5514-5509	
		95-105	H. G. Ore	5509-5499	10
		105-106	Limestone	5499-5498	
26	5628	0-15	Limestone	5628-5613	
		15-35	H. G. Ore	5613-5593	20
		35-37	Limestone	5593-5591	
27	5628	0-10	Limestone	5628-5618	
		10-50	H. G. Ore	5618-5578	40
		50-60	L. G. Ore-40%	5578-5568	
		60-80	Limestone	5568-5548	
28	5628	0-5	L. G. Ore-40%	5628-5623	
		5-80	Limestone	5623-5548	
29	5621	0-11	Alluvium	5621-5610	
		11-51	H. G. Fe Ore	5610-5570	40
		51-60	L. G. Ore	5570-5561	
		60-80	Limestone	5561-5541	
30	5585	0-20	Alluvium	5585-5565	
		20-40	Fractured Limestone	5565-5545	
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Hole No.	Elevation of Collar	Depth Log	Formation	Elevation of Formation	Thickness of Ore
31	5585	0-25	Alluvium	5585-5560	
		25-40	Andesite	5560-5545	
		40-100	Limestone	5545-5485	
32	5585	0-25	Alluvium	5585-5560	
		25-40	Andesite	5560-5545	
		40-100	Limestone	5545-5485	
33	5590	0-12	Alluvium	5590-5578	
		12-50	Limestone	5578-5540	
34	5593	0-26	H. G. Ore	5593-5567	26 (originally 41')
	(from bottom of pit)	26-35	Limestone	5567-5558	
35	5598	0-31	H. G. Ore	5598-5567	31 (" ")
	(from pit bottom)				
36	5611	0-5	Limestone	5611-5606	
		5-20	H. G. Ore	5606-5591	15
		20-40	Limestone	5591-5571	
37	5614	0-5	Limestone	5614-5609	
		5-10	H. G. Ore	5609-5304	5
		10-50	Limestone	5604-5654	
38	5616	0-60	Limestone	5616-5556	
39	5614	0-60	Limestone	5614-5554	
40	5609	0-60	Limestone	5609-5549	
41	5580	0-80	Limestone	5580-5500	

Diamond Drill Holes --drilled by Mather Iron in 1953

Hole No.	Elevation of Collar	Depth Log	Formation	Elevation of Formation	Thickness of Ore
DD1	5604	0-13	Alluvium	5604-5591	
		13-37	H. G. Ore	5591-5567	24
		37-45	L. G. Ore-40%	5567-5559	
		45-80	Limestone	5559-5524	
DD2	5600	0-14	Alluvium	5600-5586	
		14-40	H. G. Ore	5586-5560	26
		40-80	Limestone	5560-5520	
DD4	5632	0-20	Limestone	5632-5612	
		20-22	H. G. Ore	5612-5610	2