

The Dona Maria Mining and Milling Company

by Frank Hollister Blackmar

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A thesis submitted to the department of
Mining Engineering of the University of Kansas
in partial fulfillment of the requirements
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Situation and Surroundings.

The properties of the Doña Maria Mining and Milling Company are located in the District of San Martin de Loba, Province of Mompos, Department of Bolivar, Colombia, South America.

The nearest town is San Martin de Loba, the boundaries of which are adjacent to the property lines of the company. The town is about one mile from the Magdalena River in a direct line and about six miles southwest of the town of El Banco which is the nearest post office and telegraph station. The distance from El Banco to the sea coast is about 250 miles by the Magdalena River, the only means of transportation in this part of the country. The transportation of freight, passengers and mail between the coast and the interior is effected by two or three river boats each way every week.

Topography.

From a topographical standpoint the country would hardly be suspected of being mineral land. The

country is either flat, in many places swampy, or rolling with a few small hills. Although ten miles to the south the Barbacoa Mountains rise to a height of several thousand feet, the altitude of the property of this company is but one hundred and fifty feet above the sea-level. Everywhere the surface is thickly covered with a luxuriant growth of tropical vegetation. To support this vegetation the ground must necessarily be thickly covered with rich soil. Because of this vein outcrops are scarce and generally found along the water courses.

The country is well supplied with timber for mining purposes, the principal kinds being; cedar, mahogany, roble (oak), caracoli and tolu. This kind of timber is found on and close to the property and can be supplied to the mine easily although owing to the absence of a saw mill all the timbers are hewn out by hand.

The climate is that of all tropical countries of low altitude. The temperature varies from 86 to 92 degrees Fahrenheit the year round. There are two seasons when it rains almost daily; April, May and June and August to November inclusive. During the other months there is no rain at all. Although the region is low and has a tendency to be damp it is comparatively healthy. Cases of malarial fever are not numerous and other diseases are rare.

At all times the atmosphere contains a great deal of moisture so that mold and rust form very rapidly. Particularly this moisture affects assay balances, surveying instruments and all leather articles in a very annoying manner.

Owing to the excessive rain fall the water supply at most times is abundant. The Magdalena River is only a mile distant in a straight line but communication is by a caño or creek which leaves the river about two miles northeast of Loba and flowing by the town and mine enters the river again about a mile northwest of Loba. At the end of the rainy season in December and January the intervening space between the caño and the river is entirely covered by water.

About a mile west of the mill the Regla Creek flows into a large open basin. When the river is high this basin forms a lake. When the river goes down the water flows out of this lake leaving the land dry. For this reason it is necessary to construct a dam to retain the water so that it can be conducted by a canal to the mine.

Geology.

The country rock is all gray granite and as far as has been determined all of the same formation. The ore occurs in well defined fissure veins in this gray granite. The vein filling is white quartz, black quartz and

greenish blue quartz.

Owing to the lack of faults in the formation it is evident that there have been no further disturbances since the formation of the original fissures. In all there are at least fourteen veins which outcrop within the boundaries of the properties. All of these veins with the exception of two bull quartz veins show a gold content of greater or less value.

All of the veins have practically the same strike, north 68 degrees west, and those that have been uncovered show a dip to the south of about 70 degrees with the horizontal.

Several of the veins can be traced for some distance by the outcrops and piles of rock taken out by the Indians from the old workings. The Doña María vein which has been traced the farthest shows up at intervals for a distance of 3300 feet.

The Doña Maria vein is the only one upon which any development work has been done. On this greenish blue quartz vein the ore shows up in frequent small ore chutes. Between these ore chutes so far there has been found ore of low grade but of milling quality. This vein averages about 14 feet in width with the ore occurring in streaks a few inches in width.

History.

The Colombian state records show the mine to be of ancient discovery, that it had been granted by the King of Spain in 1793 to three Spanish gentlemen, and that it had been worked by them and their heirs until the Act of Emancipation in 1845 freed the slaves in Colombia. The owner of the property at this time was Dona Maria Ortiz, who found that the liberated slaves could not be induced to labor in the mines, and as the Spaniards themselves considered mining as fit for slaves only, operations came to a standstill.

No machinery was in use at the time. The ore was mined in a crude way by slaves, placed in cowhide sacks, and carried on their backs for about a mile to an arrastre on the river bank where it was pulverized and washed.

Doña Maria Ortiz had heard of machinery for working mines, so when her slaves were liberated and refused to work, she sailed for Europe to procure machinery, and as she was not heard of again it is believed that she was lost at sea.

The rapid growth of tropical vegetation soon covered up all traces of former operations, and the old shaft and levels were not rediscovered until 1881 when the property was denounced by George W. Cooper.

A company was formed, The Bolivar Mining Company, which acquired a title to the property and spent \$60,000 on machinery, buildings and a second hand ten stamp sectionalized mill.

After having taken out about \$20,000 in bullion the work was suspended owing to the lack of funds and the inability to keep the machinery in condition owing to its worn out state.

The affairs of the Bolivar Mining Company passed into the hands of the Doña Maria Mining Company and in 1903 the company was reorganized under the name of the Doña Maria Mining and Milling Company, the present owners.

In 1904 the mill and all the buildings were destroyed by fire and owing to the fact that a revolution broke out soon afterward work was not resumed until 1909 at which time the present mill was started and completed the next year.

The original claim of the company was the "La Cueva de Doña Maria Ortiz", an irregular shaped claim of $231\frac{1}{4}$ acres.

Later there have been added the following claims: Gorman, 12.4 acres; Wilkes and Naideh, 35.5 acres each; Colombia, Carretal, Margarita, Anita and James, 106.7 acres each, making a total of 848 acres.

Underground Development.

A shaft has been sunk on the vein to a depth of 96 feet. At a depth of 60 feet the shaft leaves the vein and passes through heavy ground to a depth of 87 feet where the walls become harder and less timbering is required.

At a depth of 51 feet work was commenced on the No. 1 cross-cut, driven to prove the value and width of the vein. After attaining a length of $12\frac{1}{2}$ feet the vein showed a width of 13 feet. In the course of this drivage the last eighteen inches of the width of the vein showed ore of good grade of a value of \$20 per ton. The remainder of the vein was mineralized with pyrites and sulphides of lead, copper and zinc showing fair values of gold.

No. 1 level was located on the course of the vein close to the west or hanging wall side in order to carry it along on the best of the ore. In the south end the pay streak of \$20 ore continued with slight variations some 15 feet when it decreased in value to \$4 per ton. After a further drivage of a few feet the ore became richer again, assaying \$45 per ton and this lasted for about ^{ten} feet further and then another decrease in value to \$14 per ton occurred. When the level had been driven south 59 feet a fault in the vein was encountered. By running a cross-cut of 19 feet to the east the vein was

picked up again showing a width of the hanging wall side of three to three and one half feet of ore of a good milling grade. Assays of the vein after a few feet of driving being as follows:

Half the face, hanging wall side, of 5 foot level	\$36.93
Remainder of face of level	12.64
Average value of ore	24.78

At this point of intersection of the vein the level was also driven back 25 feet as the ore was of as good milling grade.

The pay streak met in No. 1 cross-cut did not extend into the north level and the ore was unmillable for a distance of 25 feet. Then the level ran through 32 feet of ore of milling grade running \$22 per ton and extending across the entire 5 feet, the width of the level. Certain stringers of this, three or four in number, from a half inch to an inch and a half in width were quite rich running about \$100 a ton, but the remainder of the ore was of lower grade, the whole, however averaging ore that when broken in bulk from stopes will prove of an excellent paying quality. Since passing through the 32 feet of ore mentioned there has been 16 feet of unmillable material, but from surfact indications another ore body within the next 23 or 25 feet of equal if not of

greater length than the last will be encountered.

Sixty-five feet north of the shaft and on a level with the collar, an open cut was commenced on the course of the vein, entering the bluff which abuts at that point. This work was started with two purposes in view; first, to add to the supply of milling ore; and second, to secure definite information as to the position, length and value of the ore bodies north of the shaft, in what is known as Residence Hill. After a distance of 27 feet the work was carried forward as an adit instead of as an open cut and thus continued for a further distance of 15 feet when the top of an old working was encountered. It was partly filled with loose material but evidently pointed downward on the course of the vein. This old working, about 5 feet wide and three feet high, was cleaned out and found to be only 10 feet deep. As good ore showed up at the bottom of the hole, the Gorman Incline was started. This incline with a pitch of 20 degrees from the horizontal, continued a distance of about 36 feet, passing for 21 feet through an ore body which, like that in No. 1 Level, north, had rich streaks in it, showing quite as high as the figures mentioned in referring to No. 1 Level and which was the full width of level, 5 feet. The ore outside of the streaks was

of lower grade, but the average was distinctly good. After this the ore diminished in value. In order to increase the facility of work and decrease the cost of handling the broken material the incline was changed into a horizontal working 7 feet high by 5 feet wide.

This part of the work now measures 31 feet and for the last 5 or 6 feet a stringer of ore 14 inches wide of milling grade has come into the level.

As soon as the level is once more in ore of full width, it is intended to sink to meet the advancing end of No. 1 level, north. A winze to connect the two levels will not be more than 25 feet in depth and will have several advantages. It will ventilate the north workings in and above No. 1 Level and will afford the means of stopping out available ore between the two levels.

With the object in view of increasing the milling ore and of supplying some of a higher grade than the last part of the old dumps furnished, what is called the Office Hill Open Cut was opened. It is situated on the same vein as that opened up by the shaft and the Gorman Incline, but about 370 feet south of them. The cutting is in the side of Office Hill, a little south of the main bulk of the old dumps. The opening is at present about 35 feet in length by 9 feet in width and

from 6 feet to 20 feet in depth as the cut advances.

The ore encountered has varied from \$2 to \$15 per ton, averaging \$5 or \$6.

In order to further increase the ore capacity and also to explore the hill, a tunnel was started 200 feet east of the shaft and driven into the hill 230 feet where the main vein was encountered showing a width of 12 feet, seven feet of which averaged \$30 per ton. The vein has been followed at this place both north and south with the same results as in the other workings, that is; richer ore chutes between the leaner material. The tunnel at present has not been driven any farther than this vein but the intention is to run it through the hill, a distance of about fifty feet in order to cut a white quartz vein which parallels the vein now exposed.

So far all the workings have been dry and no trouble with water has been experienced. It is probable that with a depth of 100 feet more in the shaft considerable water will be encountered as that depth will take the shaft below the level of the river.

In this climate rock disintegration is very rapid and consequently the amount of disintegrated material on the surface is so great that all the workings have been in heavy ground and have required considerable timbering.

Concentration.

The hoisting from the shaft is accomplished by means of a 20 H. P. Vulcan geared hoist and buckets with a capacity of 1400 pounds. The ore is shoveled into the buckets, trammed to the shaft, hoisted, dumped into cars and trammed to the mill.

The ore from the open cuts and the tunnel is loaded directly into cars of about 1600 pounds capacity and trammed to the mill. At the present time no ore is being taken from the Gorman Incline.

The ore that is hauled from the shaft, tunnel and open cuts is dumped into an ore bin at the mill having a capacity of 75 tons. From this bin the ore is fed to a grizzly with one inch spaces between the bars. The over-size is fed to an Allis Chalmers Blake Crusher, size 10 by 7 inches, set to a three-fourths inch opening. The under-size goes directly to the mill ore bin. From here the ore is fed by a Challenge feeder to a 5 foot Allis Chalmers Huntington Mill discharged through 30 mesh slot screens.

Mercury is fed into the mill along with the ore. The pulp that is discharged from the mill is passed over a silver coated copper plate 4x12 feet in two sections. From the amalgam plate the pulp is fed to one No. 3 Overstrom table which gives two products, concentrates and

tailings. The tailings are discharged into the lake at the foot of the hill while the concentrates are stored for future treatment. These concentrates which consist mainly of iron pyrites and some galena and chalcopryrite assay from \$100 to \$130 in gold and about \$25 in silver per ton.

The ore which is a greenish blue quartz, fairly hard and much honey-combed, carries about 2% pyrites. Owing to the small amount of concentrates and the inadequate shipping facilities the pyrites is stored in a wooden tank for future treatment by regrinding and cyaniding when the out-put is sufficient for the installation of a plant.

At present time to ship the concentrates to the United States for treatment, they must be double sacked and loaded into dug-out canoes and hauled to the river three miles distant. Here they are loaded on a river boat and taken to Barranquilla, 250 miles down the river, transferred to the railroad and taken to Puerto Colombia where they are loaded on ocean boats.

To bring machinery and supplies to the mine the process may be changed somewhat. The machinery is loaded on a tow launch at Barranquilla and may be towed up to the mine when there is sufficient water in the caño.

Production.

The Blake crusher has a capacity of about $5\frac{1}{2}$ tons per hour or 55 tons for a ten hour shift. As the Huntington Mill can handle only about 11 tons in the twelve hour run the crusher is run but one shift a week. Owing to the small ore supply the mill can not be run more than 12 hours a day. As there is no work done Sundays the weekly capacity is between 55 and 60 tons.

Labor.

In this district the natives are a mixture of Indian Negro and Spanish Jew. As most of the population are descendants of the slaves that the early owners brought here to work the mine, the negro blood predominates. As workmen the men are lazy and unreliable. The numerous feast days of the country provide reasons for not working two-thirds of the time. Fishing and the desultory farming that they practice nets them such ample returns in food that there is no inducement to work so they are independent. The women make large quantities of pottery the sale of which furnishes them with all the money necessary for clothes and what little else they require.

Experienced miners are scarce, four being the largest number that has ever worked at one time on the

property. Later when the development work warrants, it will be necessary to import miners from the Department of Antioquia. The scale of wages for a ten hour shift is:

2 miners	100 pesos or	\$1.00
4 muckers and trammers	50 pesos or	.50
2-6 unskilled laborers	30 " "	.30
1 engineer and blacksmith	200 pesos or	2.00
1 millman	200 " "	2.00
1 nightwatchman	50 " "	.50
1 carpenter and helper	200 " "	2.00

Prices.

Timber - Good mining timber is plentiful and can be delivered at the mine for from \$14 to \$16 a thousand, on contract depending upon the kind of wood and the size of the timbers required.

Fuel - Wood is used entirely for fuel as it is impossible to secure coal at any price. Wood costs 80 cents a cubic meter and is of an inferior quality. As it requires about twelve cubic meters per day the fuel bill is quite an item. Plans are under way for substituting crude oil engines or burners which can be operated at one-fourth the present cost of power.

Supplies-- All tools, powder and other supplies are extremely expensive, drill steel costing 30 cents a pound and 40% dynamite \$32 per case of 100 pounds in Barranquilla where all supplies are secured. Acetylene lamps are used entirely for lighting in the mill, houses and under-ground. This form of lighting is cheaper than either candles or petroleum, besides giving more light and keeping the ore free from grease that would hinder amalgamation. Calcium carbide costs \$5.50 a hundred pounds laid down at the mine. Baldwin No. 8 lamps are used.

The food supply for natives is abundant and cheap as they require quantity instead of quality and variety. Foreigners, however, demand something more which must be supplied from imported goods which are necessarily high.

Surface Plant.

The power plant consists of one 25 H. P. Chandler & Taylor slide valve engine and one 30 H. P. boiler.

The water for the boiler and the mill is supplied from a 42000 gallon wooden tank on the hill. It is pumped into this tank from a sump at the foot of the hill by a

Cameron pump. This sump is connected with the caño or creek which flows through the town by a canal. During the dry season January to April, 1911 the caño went dry owing to the low stage of the river and the mill was without water for five months. To prevent a repetition of this occurrence a dam is under construction along the south line of the Wilkes claim to impound the water from the Regla Creek.

This dam is to be constructed by filling in the low places for a distance of about 600 feet with rock and covering with clay to a height of eight feet. Along the line of the dam are three hillocks from which rock and clay are being taken to fill in the low places between. This will form a lake which will have an outlet only by a canal that passes near the mill. The capacity of this lake will be about 200,000,000 gallons of water which will be an ample supply for the dry season, allowing for the excessive evaporation.

The Mill House, 64 feet in length by 56 feet in width, is centrally located being in a position to be readily supplied from all working points. It affords a cover not only for the mill, engine, boiler and table, but also for some 150 cubic meters of wood close to the boiler, besides the clean up and tool rooms. The building consists of a

skeleton frame and has a roof of corrugated iron. The assay and general offices are housed in two buildings of native construction, that is, mud sides and palm roofs.

Production.

The following are the details of bullion bars produced by the mill from the time that operations commenced up to July 1, 1911.

<u>Bar No.</u>	<u>Weight Oz.</u>	<u>Value</u>
1	15.00	\$ 190.34
2	10.50	106.97
3	82.47	975.62
4	102.75	1381.45
5	110.45	1562.49
6	75.75	1080.24
7	41.50	595.68
8	80.50	1072.57
9	82.00)	
10	45.50)	1797.38
11	43.75	586.43
12	54.75	752.20
13	93.00	1300.50
14	67.40	955.95

<u>Bar No.</u>	<u>Weight Oz.</u>	<u>Value</u>
15	96.80	\$1364.12
16	61.25	860.88
17	71.55	955.32
18	44.12	614.49
19	67.48	950.43
20	53.62	739.27
21	57.44	776.67
22	61.06	827.69
23	43.40	583.30
	<u>1462.04</u>	<u>\$20,029.99</u>
Total		

The above results were obtained from the following ores:

From the		
Office Hill Old Dump		2444 tons
Shaft and Levels		387 "
Office Hill Open Cut		295 "
Residence Hill Old Dumps		377 "
Gorman Incline		132 "
Other sources		50 "
Total		<u>3685 Tons</u>

It is seen that at present this mine is only in the first stages of development. The underground development work is not extensive enough to give a large ore supply or indicate what the future of the mine will be.

The mill is not large enough to give any great capacity but serves merely as an experimental plant to test the ore. The development work is being pushed rapidly and a large mill will be installed as soon as the ore supply warrants it.

There are no other mines in active operation in the district although there have been denounced in all about thirty claims. Ten miles south of the mill the Agamientorico Mining Company is driving a tunnel into the side of the Barbacoa Mountains in order to cut the vein. There is a mill outfit similar to the above one on the property ready to be set up.