

MANHATTAN PROPERTY

PRELIMINARY INVESTIGATION OF  
EXPANDING PRESENT OPERATION

APRIL 8, 1976

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## SUMMARY

A preliminary study has been completed to determine if the Manhattan Property is worthy of expenditures of time and money for a feasibility study.

The numbers presented in this report must not be construed as final operating figures. They are merely guidelines for direction at this stage of our operation.

It appears the remaining gold ore at Manhattan is capable of being treated and gold recovered at a profit. On a total investment of \$1,618,375 a pre-tax profit of \$212,675 could be realized or a return on the investment of 13%. These figures are conservative and the return rate could be as high as 30%. Again, these figures are based on assumed recovery rates and estimated costs and do not include taxes, depreciation or depletion allowance. By engaging in a thorough research and planning effort, enough information could be attained to complete a sound feasibility study by the end of the first half of 1976.

A good feasibility report should reduce the risk for this operation to the same level of any good business venture.

## INTRODUCTION

Summa Corporation's Group 26 property is located in the Manhattan Mining District, approximately fifty miles northeast of Tonopah, Nevada. The property consists of 21 patented claims, 16 unpatented lode claims, and 1 unpatented placer mining claim.

Current operations at Manhattan, which began in October, 1974, consist of 250,000 tons of ore undergoing cyanide leaching and a plant for extracting the gold from the solution and onto activated carbon. The gold-containing carbon is treated at a recovery plant in Tonopah to remove the gold and obtain a saleable product.

Work has been underway to determine the feasibility of mining an additional tonnage of ore from this property. Herein is contained a preliminary study which summarizes the basic ore reserves, mining plan, and economic results. Also, recommendations for further work are made.

GEOLOGY, MINERALOGY AND  
GEOLOGICAL ORE RESERVE

Exploration mapping and sampling began in 1972, to determine if there existed any economic gold mineralization on the property. In 1973, exploration drilling was started to delineate possible ore zones. Three ore zones have been drilled out and are ready to be mined. This report contains a brief summary of the geology and mineralogy of these ore zones.

GEOLOGY

The Manhattan Group 26 property lies in an upthrust window of Cambrian Gold Hill Schist. The Gold Hill Schist consists of a sequence of interbedded metamorphosed sediments. Four distinct rock types are identifiable within the sequence. They are quartz-mica schist, phyllite, quartzite and siliceous limestone.

The major zones of stockwork-type gold mineralization lie in a zone trending  $N 10^{\circ} - 20^{\circ} W$  and have a known length of 1200 feet. The width of mineralization along this trend varies from 50 to 200 feet wide and to depths of over 200 feet. Ore grade mineralization is not continuous along this trend, but is usually controlled by the bedding of extremely



fractured and brittle quartz-mica schist and quartzitic units. The fracturing is believed to be a direct result of local thrusting and folding along the axis of anticlinal structures within the Gold Hill Schist.

Three distinct zones can be delineated along this trend; the Big Four, Big Pine and the Reilley Pit Ore Zones. Lying between these mineralized units are phyllitic units which contain only minor gold mineralization.

#### MINERALOGY

The stockwork-type mineralization at Manhattan occurs along fracture zones as druzy quartz veinlets up to  $\frac{1}{2}$ " thick. Gold, adularia and arsenopyrite occur on the quartz veinlets. Primary gold appears to be related to the quartz and is, in places, locked within the quartz. The arsenopyrite also contains minor amounts of gold. The arsenopyrite represents a later stage of mineralization, as it occurs on the quartz or attached to the free gold.

#### GEOLOGICAL ORE RESERVES

A standard ore classification scale was set up by Michael Brady, 1973 (POTENTIAL ORE BODIES ON SUMMA CORPORATION PROPERTIES IN MANHATTAN MINING DISTRICT) to

separate "known" ore from suspected ore. This ore classification scale is as follows:

Proven Ore: Mineralized rock which has been sampled conclusively by drill holes spaced no further than 30 feet apart. The obtained drill hole assays can be correlated to the known geologic setting so that continuous ore zones are formed.

Probable Ore: Mineralized rock which has been sampled by drill holes spaced approximately 30 feet apart. Only rough correlations of the drill hole assays to the surrounding geologic setting can be made and either more drilling or a better understanding of the geology is required.

Postulated Ore: The category includes explorational targets which are located away from any known ore zone. Ore is postulated on the basis of geochemical data, underground assays, favorable geologic setting, or a few widespread drill holes. Extensive drilling and detailed geologic studies are required to prove or disprove the existence of gold ore.

This same ore classification scale will be used in this report.

The Big Four Ore Zone is the northernmost of the three ore zones. It has a proven tonnage of 250,000 tons of .075 ounce/ton.

The Big Pine Ore Zone lies approximately 400 feet south of Big Four Ore Zone and has a proven tonnage of 106,000 tons at .070 ounce/ton.

The Reilley Pit Ore Zone lies approximately 400 feet south of Big Pine Ore Zone and has a probable tonnage of 25,000 tons of .080 ounce/ton. This zone is considered probable ore because drilling, although at close spacing, has not conclusively been correlated to known geological setting.



## MINING

### MINING PLAN

A pit has been designed to extract a majority of the ore from the Big Four and Big Pine mineral zones. For the 1976 year, we plan to limit our ore excavation to about 200,000 tons. The basic strategy is to reduce expenditures by setting the treatment rate at 1,000 GPM through the present extraction plant.

The 1976 Mining Plan calls for the excavation of 578,000 tons of material with a 1.89:1 stripping ratio. This material would be mined from the 7170 through 7070 benches of the pit.

The benches would be mined in order, setting a bench height at 20 feet. The pit slopes are designed at a 63° angle with safety benches, as necessary, allowing conformity to safe working standards.

The ore would be transported about one-half mile. The waste disposal area is still under study, but will be established to minimize haul distances.

The 200,000 tons of ore in the plan is all proven. Any possible or unknown ore encountered in the excavation

will tend to reduce the total amount of material mined in order to reach the required ore tonnage.

The ore in this Plan contains 13,400 ounces of gold.  
The ore cut-off is + 0.02 ounce/ton contained.

1976 MINING PLAN (BIG FOUR - BIG PINE AREA)

BENCH	TOTAL TONS (x 1000)	TONS WASTE (x 1000)	TONS ORE (x 1000)	ORE GRADE (oz./ton)	OUNCES Au (Contained)
7170	10.3	6.3	4.0	.033	132
7150	80.1	58.4	21.7	.041	890
7130	124.5	83.7	40.8	.098	3,998
7110	153.4	103.5	49.9	.060	2,994
7090	133.7	77.7	56.0	.056	3,136
7070	<u>76.0</u>	<u>48.4</u>	<u>27.6</u>	<u>.082</u>	<u>2,263</u>
TOTAL	578.0	378.0	200.0	.067	13,413

The mining plan for the remaining 181,000 tons of ore has not been completed at this time; however, the mining costs are assumed to be the same throughout the entire operation.

Ore at 0.02 ounce/ton cut-off

Ore is proven only

Probable and possible not considered

## MINING COSTS

The moving of material at Manhattan has been figured on a minimum of 5 months. The equipment list is as follows:

### ADDITIONAL EQUIPMENT WITH RENT-PURCHASE AGREEMENT

- 4 35-ton End Dump Trucks
- 1 6-Yard Loader
- 1 Water Truck
- 1 Service Truck (Fuel and Grease)

### COMPANY EQUIPMENT

- 1 D8 Dozer
- 1 14 Blade
- 1 980 5-Yard Loader
- 1 DM-3 Drillmaster

With the rental equipment and company equipment, we can blast, mine and haul to the pads or waste dumps 123,200 tons of material per month at a cost of \$1.00 per ton.

To mine 381,000 tons of ore, it will be necessary to remove an additional 556,500 tons of waste. The total mining cost at \$1.00 per ton would be \$937,500.

## METALLURGY

From all geological data thus far reviewed, it appears the remaining Manhattan gold ore is of relatively low grade. This limits the type of extraction processes to four possible operations. They are as follows:

- I. Heap Leaching - Carbon Adsorption - Electrowinning
- II. Vat Leaching - Carbon Adsorption - Electrowinning
- III. Agitation Leaching - Carbon-in-Pulp - Electrowinning
- IV. Agitation Leaching - Counter Current Decantation -  
Zinc Precipitation

In our case, items III and IV would be adapted to utilize existing carbon-electrowinning facilities.

Fitting the right extraction process to our specific needs is merely an economic determination. The highest return on our investment and the best cash flow will dictate which process is to be used. Several factors influence the economics i.e., size and grade of ore deposit, mine life, anticipated metal recoveries, metal market price, capital requirements and operating costs.

The proven ore reserves, at this time, are as follows:



<u>ORE ZONE</u>	<u>TONS</u>	<u>GRADE</u>	<u>TOTAL OUNCES GOLD</u>
Big Four	250,000	.075	18,750
Big Pine	106,000	.07	7,420
Reilley	<u>25,000</u>	<u>.08</u>	<u>2,000</u>
TOTAL	381,000	.0739	28,170

If we set the price of gold at \$130/ounce, the total value of the 28,170 ounces of gold in the ground is \$3,662,100. All of the capital and operating costs to remove the waste, mine the gold-bearing ore, treat the gold-bearing ore, recover the gold, and sell the finished product must all be deducted from the in-place value. Also, any general and administrative or overhead costs must be considered.

The net figure at this point would be the profit generated for this particular operation, if 100% of the gold available could be recovered and turned into a saleable product. However, recovery of the gold through the several processes creates losses which can amount to as much as 55% of the gross value. Or, in this instance, the dollar value base could change from \$3,662,100 to \$1,647,945.

The fixed mining cost of \$937,500 is the same for all four treatment processes. The recoveries, capital, and operating expenses will be relative and the most economic process will be used.



ECONOMIC COMPARISONS OF EXTRACTION PROCESSES

	I HEAP	II VAT	III C-I-P	IV CCD
MINING	\$ 937,500	\$ 937,500	\$ 937,500	\$ 937,500
CRUSHING		300,000	300,000	300,000
GRINDING			300,000	300,000
LEACHING & RECOVERY	300,000	359,000	428,000	455,000
CAPITAL	<u>100,000</u>	<u>700,000</u>	<u>1,000,000</u>	<u>1,333,000</u>
Subtotal	1,337,500	2,296,500	2,965,500	3,325,500
15% CONTINGENCY	<u>133,750</u>	<u>344,475</u>	<u>444,825</u>	<u>498,825</u>
TOTAL	\$1,471,250	\$2,640,975	\$3,410,325	\$3,824,325

	I 50%	II 70%	III 90%	IV 90%
RECOVERY				
GROSS	\$1,831,050	\$2,563,470	\$3,295,890	\$3,295,890
EXPENSE	(1,471,250)	(2,640,975)	(3,410,325)	(3,824,325)
10% G & A	<u>(147,125)</u>	<u>(264,098)</u>	<u>(341,033)</u>	<u>(382,433)</u>
	\$ 212,675	\$ (341,603)	\$ (455,468)	\$ (910,868)

This exercise clearly points out the direction for investigation. The small deposit of remaining ore at Manhattan is too low grade for any major capital expenditures. We must focus our attention on case I, which is Heap Leaching-Carbon Adsorption-Electrowinning.

The figures presented are based on assumed recovery rates and estimated costs and are somewhat conservative. More extensive research is necessary to generate a dependable feasibility study. This could be a viable operation yielding 13% - 30% return on investment.

## CONCLUSIONS AND RECOMMENDATIONS

To reduce the risk of this venture requires more investigation. The three major areas of study are Geology, Mining, and Metallurgy.

GEOLOGY: The figures presented in this report are proven geological facts; however, with less than a month's work, more information could be obtained. The new data could possibly reduce the overall costs of the project.

The area between Reilley and Big Pine needs more drilling. A 5000-ton ore zone was mined out of this area in 1973 and mining assay results correlated extremely well to drilling assays.

Presently, we have two more possible ore bodies and two more postulated ore zones which need extensive drilling and more geological evaluation, in order to prove or disprove their existence.

MINING: Mining equipment requirements and costs are based on verbal quotes from suppliers. The mining costs are generated from past experience and industry

comparisons. The figures are firm but become less accurate with expiration of time. Figures should be updated every 30 days.

The mining plan needs another month of detailed work before it is completed.

METALLURGY: In order to determine the ultimate recovery rate of the gold from the material to be mined in 1976 and 1977, a series of samples have been taken from the Big Pine Area for use in metallurgical tests. The distribution of gold in the sized fractions of these samples shows little upgrading effect.

Since the profitability of the operation is dependent on recovery, a determination of the effects of rock size on recovery should be made. A suggested procedure is building a series of columns of ore and leaching with a solution of the same makeup as used in our current operation. Each column would be built using a particular size fraction of ore. The leaching rate and recovery could then be determined for each fraction.

A series of tests of this type could be used to determine the financial benefits, if any, of crushing, hard blasting, or screening.

Further, the effects of heap height on the recovery of gold could be defined. By changing the column height/column diameter ratio, it will be possible to estimate the detriment, if any, of building our present heaps to a greater height.

There is little historical data useable to predict the operation of our heaps. It is, therefore, felt that the metallurgical data for this and other properties be developed in our own lab, using outside organizations only for verification of results.

This work can be performed by Summa personnel with little or no expenditure for equipment, since the basic testing hardware is either now available or easily fabricated. A minimum of forty-five days is required to obtain any metallurgical data.