224 New Custom house
Denver 2, Colorado

July 14, 1955

Memorandum

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Report of Examination, DMEA Docket 3607 (Manganese), Manganese Corporation of Arizona, Socorro County, New Mexico

Enclosed are the original and three copies of the report pertaining to the above application.

We recommend the proposed 2-stage churn drilling program at an estimated total cost of $53,150.00 as outlined in the report.

Seven copies of Figure 1 and Figure 2 are attached for possible use in the contract.

DMEA Field Team, Region III

W. M. Traver

W. M. Traver

E. N. Harshman

E. N. Harshman

Enclosures

HMC:sr

cc Docket
Harshman
King
Storms
Faick
Chron

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Defense Minerals Exploration Administration
Denver Federal Center
Denver, Colorado

DMEA
Date Rec'd.
JUN 21 1955
BUREAU OF MINES
Denver, Colorado

June 20, 1955

Memorandum

To: Field Team, Region III

From: E. N. Harshman

Subject: DMEA Docket 3607 (Manganese), Manganese Corporation of America, Socorro County, New Mexico

Enclosed are the original and eight copies of a geologic report by Leonid Bryner, U. S. Geological Survey, covering his examination of the subject property.

Although exploration appears to be warranted, the exploration program recommended in the engineering report is considerably different from that recommended in the geologic report. This appears to be an oversight rather than a difference of opinion for no mention of disagreement is noted in either covering letter.

I suggest that the examining team be requested to reconcile, if possible, the differences in the two reports.

E. N. Harshman

E. N. Harshman
Member, Field Team

Enclosures (9)

DMEA
Date Rec'd.
JUL 8 1955

DMEA
Date Rec'd.
JUN 15 1955

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

THE BUREAU OF MINES
Denver, Colorado

BUREAU OF MINES
Denver, Colorado

Summary Reports of Examination and Review of Examination Reports to Merrill 5-17-55

SOUTHWEST EXPERIMENT STATION
Box 4097
UNIVERSITY STATION

TUCSON, ARIZONA

TRANSMITTED
JUL 13 1955

June 13, 1955

Memorandum

To : W. M. Traver, Executive Officer, DMEA Field Team, Region III.

From : Superintendent, Southwest Experiment Station

Subject : Field Examination Report, DMEA-3607, Manganese Corporation of Arizona, Socorro County, N. Mex.

Enclosed are original and 8 copies of the section on Summary, Conclusions, and Recommendations, by T. M. Romslo of the Bureau of Mines and Leonid Bryner of the Geological Survey, and the section on Engineering by Romslo.

The examiners recommend churn drilling on the Red Hill Extension deposit, but recommend denial of Government exploration assistance for the Big Basin and West Niggerhead properties. Drilling on the Red Hill Extension would be in two stages for a total cost of $53,150.00. I concur with their recommendation.

Brochure is enclosed.

Walter R. Storms

Walter R. Storms

CC W.M. Traver (8)
J.N. Faick
DMEA-3607
DF

WRStorms/jlb

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION OF FIELD TEAM
REGION XII

DMEA-2627, Manganese Corporation of Arizona

Red Hill Extension, Big Basin and Mary Bluegrass

Manganese Claims, Roosevelt County, New Mexico

T.M. Rennie, Mining Engineer
U. S. Bureau of Mines

Leonid Bryner, Geologist
U. S. Geological Survey

June 1955

TRANSMITTED
JUL 13 1955

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By T. M. Romalo[1] and Leonid Bryner[2]

Examiners for the Defense Minerals Exploration Administration investigated the Red Hill Extension, Big Basin, and West Niggerhead properties in Socorro County, N. Mex. in connection with an application by the Manganese Corporation of Arizona for Governmental assistance to explore the claims under the Defense Production Act of 1950, as amended. The application, docketed as DMEA-[illegible]7, requested assistance on a proposed churn-drilling program that would cost an estimated total of $86,790.00. During the investigations, the program was revised to a 2-stage churn-drilling project that envolved the drilling of an estimated total of 6,900 feet in about 56 holes on the Red Hill Extension property. The estimated total cost of the project is $53,150.00, of which $19,275.00 and $33,875.00, respectively, are for Stages 1 and 2.

The first mining activity on the properties probably was during World War I when a small amount of exploratory work was done at Big Basin and Red Hill Extension, and about 100 tons of sorted ore was produced from the latter. In 1943, the National Zinc Corp. acquired the Red Hill and Niggerhead claims, and located the Red Hill Extension claims. The properties were explored and a 300-ton wet concentrator was constructed. Mining of ore from the Red Hill and Red Hill Extension by open pit, and milling of the ore started in December 1944. Production ceased before 1948, probably before fulfillment of a contract to deliver 5,000 tons of concentrates to the Metals Reserve Company. The properties then were idle to 1954 when the Manganese Corporation of Arizona

1/ Mining Engineer, Bureau of Mines

2/ Geologist, Geological Survey

replaced the old mill with a 500-ton heavy-media concentrator. From September 1954 to March 19, 1955, the corporation had mined about 60,000 tons of ore and milled about 50,000 tons of sorted ore. Production for the period was about 6,200 tons of 38 to 40 percent manganese concentrates. Of the 60,000 tons of mined ore, 45,000 tons came from the Red Hill deposit, 14,000 tons was produced from the Red Hill Extension, and the remaining 1,000 tons was mined at the Niggerhead deposit. On March 19, 1955, the 500-ton mill was shut down and milling was started in a new 3,000-ton heavy-media and tabling plant.

The ore occurs as incrustations of psilomelane in fractures or cavities in a rhyolite host rock. At the Red Hill Extension the ore is mainly in three parallel zones in a belt of manganiferous rock about 1,100 feet wide. The ore zones are 100 to 200 feet wide and up to 70 feet thick. Manganese mineralization is present between the three zones, but is of a considerably lower grade. In cross section, the manganiferous belt is bow-shaped so the central ore zone is about 80 feet below the surface, while at the two edges of the belt the other two zones reach the surface. Total reserves of all classes at the Red Hill Extension are estimated at one million long tons of 5 percent manganese.

The Big Basin and West Niggerhead deposits are similar geologically to the Red Hill Extension. However, the Big Basin is considerably lower in grade, and the West Niggerhead appears to offer possibilities of only low grade and a comparatively small tonnage. Therefore, exploration is recommended only at the Red Hill Extension, where as much as half a million long tons might

be discovered by the proposed drilling program.

The Red Hill Extension is the sole property of the three investigated where conditions are favorable for the finding of significant reserves of manganese ore. There, the grade of ore could be similar to that of the nearby Red Hill deposit of the applicant's present operation. The operation is sustained by the Government's price for manganese. Continuation of the operation under this price will shortly be dependent on ore from the deposit of the proposed exploration program.

The proposed exploratory project is confined to churn drilling, a feasible and relatively low-cost method. Satisfactory supervision of the project can be expected.

Approval is recommended for the proposed 2-stage program that can be completed in 8 months at an estimated total cost of $53,150.00, of which stages 1 and 2 have been allocated $19,275.00 and $33,875.00, respectively.

DMEA-3607, MANGANESE CORPORATION OF ARIZONA, RED HILL EXTENSION, MID BASIN AND WEST NIGGERHEAD MANGANESE CLAIMS, SOCORRO COUNTY, N. MEX

Engineering Report

By: T.M. Romalo

Mining Engineer

U. S. Bureau of Mines

June 1955

DMEA-3607, MANGANESE CORPORATION OF ARIZONA, RED HILL EXTENSION, BIG BASIN AND WEST NIGGERHEAD MANGANESE CLAIMS, SOCORRO COUNTY, N. MEX.

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ILLUSTRATIONS

Fig. — Following Page

1. Location and claim map. — 2
2. Geologic and exploratory map.—(in Geological Report)

INTRODUCTION

The Manganese Corporation of Arizona made application to the Defense Minerals Exploration Administration for Governmental aid on a proposed exploration project at each of 3 properties in Socorro County, N. Mex. The proposed work consisted of a small bulldozing operation and the churn drilling and sampling of 10,400 feet in 52 holes at an estimated total cost of $86,790.00. It was designed to indicate sufficient reserves of manganese ore for a 3,000-ton a day concentrator that recently replaced a 500-ton plant. The application was docketed as DMEA-3687, reviewed by the Operating Committee, and sent to the Field Team of Region III for a field investigation of the properties.

The field investigations were carried out from March 29 to 31, 1953, by Leonid Bryner, Geologist, U. S. Geological Survey and the writer. Investigations were largely confined to the corporation's concentration plants and the three areas of proposed explorations, the Red Hill Extension, the Big Basin groups of claims, and the West Niggerhead claim. Victor J. Morgan, President of the corporation, accompanied the examining team during an investigation of the West Niggerhead claim, and during a brief visit to the Red Hill Extension claims after the team had examined these claims. Certain data, vital to this and the Geological Report, were not obtained from the applicant until May 12.

LOCATION AND ACCESSIBILITY

The Red Hill Extension and Big Basin groups of claims are about 8 air-miles southwest of the town of Socorro and are respectively situated in secs. 17 and 20, and 17 and 18 of T. 4 S., R. 1 W., Socorro County, N. Mex. (figure 1). They are accessible from Socorro by following U.S. Highway 85 south for 6.5 miles, thence 2.4 miles west on a graded dirt road to the applicant's new concentrating plant. Proceed on the dirt road 0.5 miles to the company office at the old concentrator, thence 1.3 miles to the active "State Lease" open pit. The area of present and proposed churn drilling on the Red Hill Extension claims is about 0.5 air-mile west of the open pit and is accessible from the pit via 1.2 miles of graded road.

The Big Basin group of claims, about 0.5 air-mile northwest of the Red Hill Extension claims, may be reached by traveling about 2 miles northwesterly on a graded road from the company office.

The West Niggerhead claim, about 8 air-miles northwest of the company's office, is situated in sec. 32, T. 3 S., R. 2 W., Socorro County. It may be reached from the office by traveling 5.0 miles northwesterly on a graded road to U.S. Highway 60. Proceed west on the highway for about 2.0 miles to a westerly-trending graded access road that follows a prominent dry wash, Six Mile Canyon. It is about 3.5 miles from the highway to an adit on the West Niggerhead claim that has its portal on the north face of the canyon. The last mile of road is in the bed of the canyon and is in extremely poor condition.

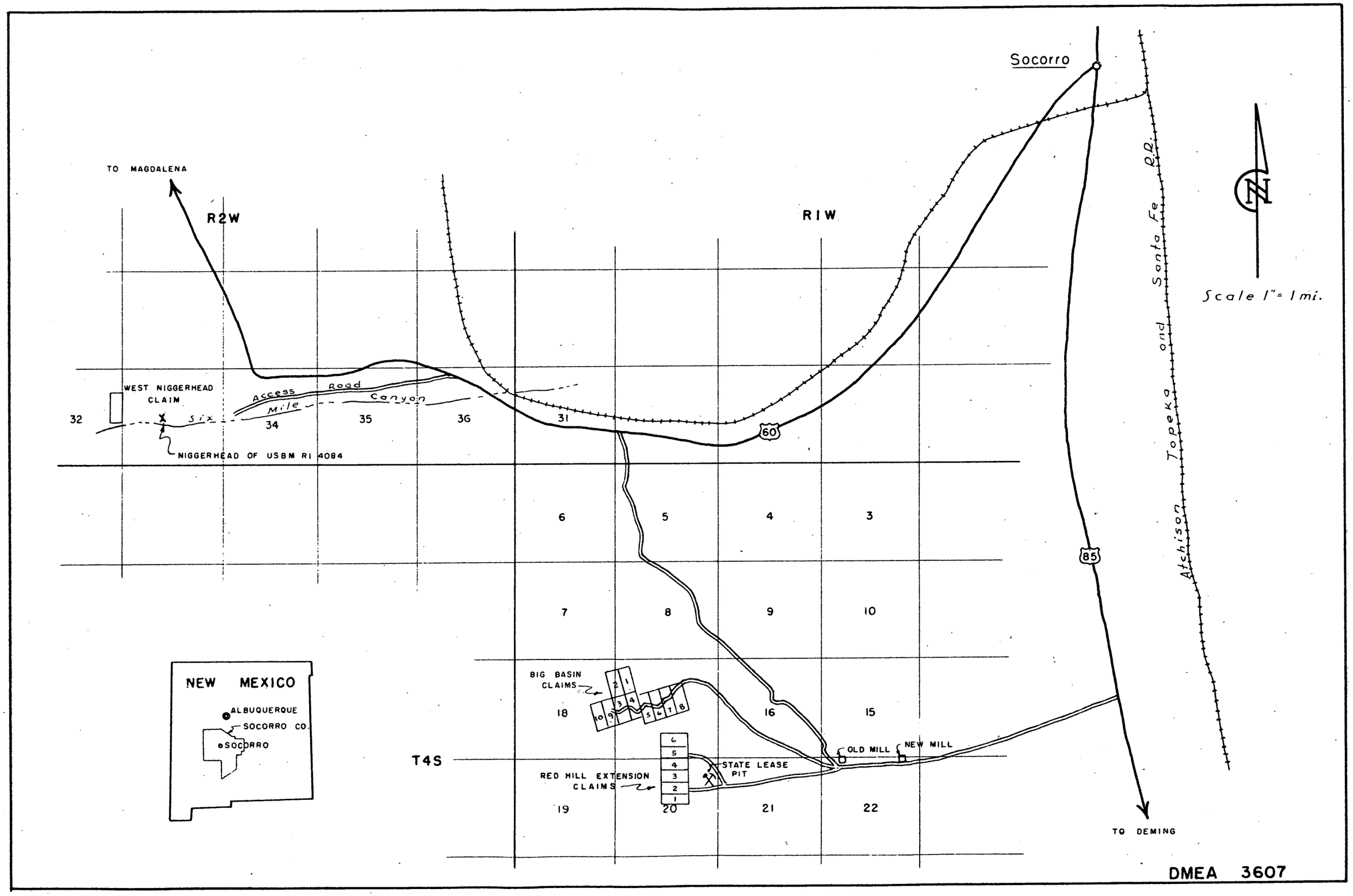

FIGURE-1- LOCATION AND CLAIM MAP - MANGANESE CORP OF ARIZONA
SOCORRO COUNTY, NEW MEXICO
MAY - 1955

The nearest railroad shipping point to the applicant's concentrator is at the village of San Antonio, about 11 miles south of Socorro via U.S. Highway 84. Deming, the site of one of the Government manganese ore purchasing depots, is 150 miles south of Socorro via U.S. Highway 85 and state highway 26.

PHYSICAL FEATURES AND CLIMATE

The Red Hill Extension and Big Basin properties are situated in the west-central portion of the northerly trending Chupadera Mountain range at average altitudes of about 5,300 and 5,800 feet, respectively. Their areas are moderately rugged. Maximum relief on each property is in the order of 300 feet. The properties are on either side of Misra Tank Canyon that drains easterly to the Rio Grande Valley.

The West Niggerhead claim, at an average altitude of 6,000 feet, is in an area of rolling hills and gravel filled arroyos. Drainage of the immediate area is easterly to the Rio Grande Valley, principally via Six Canyon.

Vegetation comprises a sparse growth of forage grasses, the usual variety of desert plants, and a few scattered junipers and pinon pines.

Annual precipitation of about 10 inches occurs principally as heavy summer showers and light snowfalls. Summers are mild and winters are not sufficiently severe to impede surface operations.

HISTORY AND PRODUCTION

Probably the first production of manganese ores from the district comprising the properties under consideration was during World War I. During this period a total of about 100 tons of sorted

ore of 35 percent grade was shipped mainly from a shaft on the Van Pelt claims, now a portion of the Red Hill Extension group. From then to April 1944, when the claims in the Red Hill area were examined by the United States Geological Survey,[1] numerous trenches, pits, and open cuts had been completed on the Red Hill Group of claims, but little or no production had resulted. Probably during this same period, the Big Basin group was explored by several small workings. Field evidence indicates these workings yielded little or no manganese ore.

In 1943, the National Zinc Corp., later reorganized as the United Mining and Milling Corp., obtained the Red Hill and Biggerhead claims under a lease agreement and located the Red Hill Extension group of claims. The history of the corporation's activities through 1944 has been extracted from a Bureau memorandum report of January 3, 1945 by W.R. Stone, formerly Superintendent, Southwest Experiment Station, Region III. After spending some $35,000 in exploring the various deposits of the above claims, a 300-ton wet concentrator was constructed about 1 mile east of the Red Hill and mining and milling of the Red Hill ore was initiated. An adequate water supply was developed by a 520-foot well after about $40,000 was spent on well drilling and equipment. Ore zones were drilled with wagon drills and blasted ore was hauled to the mill in 5-ton trucks. Plans called for increasing mine production to 600 tons of 10.0 percent ore daily and treating 500 tons of 14.0 percent

[1] Wheeler, Thomas K., Junior Geologist, Memorandum Report on Four Manganese Claim Groups, Navajo Reservation, New Mexico.

ore after sorting out about 300 tons of waste at the mill. The operations, started early in December 1944, had not reached capacity at the end of the month and tonnage and grade records were insufficient to justify any prediction. Several cars of 44 percent concentrate were made. Records showed the mine could produce ore of the expected grade, and that the mill on occasion could make concentrate to meet specifications. Mill heads on good days ran [illegible] percent and on those days the concentrate dropped below 44 percent. The corporation had a contract with the Metals Reserve Company for 3,000 tons delivered to railroad cars at $1.00 per unit for 48 percent ore with a 44 percent minimum grade, and a limit of 25 percent of fines through a 20-mesh screen. A deduction of $0.01 per unit was made for material under 48 percent and a sintering charge of $3.00 a ton was deducted from payments. In April 1945, when the property was again visited by Swaine, the plant was closed. Production probably was less than the contracted 3,000 tons.

As far as known, operations of the Red Hill ("State Lease" Pit) and Red Hill Extension ("BPG" Pit) were not resumed until September 1954 when the applicant began milling ore from these deposits. To March 15, 1955, about 80,000 tons of ore had been mined and milled for a production of approximately 6,200 tons of concentrates averaging 38 percent manganese. A brief description of operations is given in this report under Present Status.

EXTENT AND OWNERSHIP OF PROPERTIES

The Red Hill Extension property comprises a group of 8 unpatented lode mining claims, Red Hill Extension Nos. 3, 4, 5, 6, 8 and 10. This property and the Big Basin group of 10 unpatented claims, specifically the Big Basin Nos. 1 to 10, are held by the applicant under a lease and option agreement with the Reserve Corp., (Figure 1). Data submitted with the application indicates that the Reserve Corp. holds the properties under a lease and option agreement with the Reconstruction Finance Corporation.

Terms of the agreement between the applicant and Reserve Corp. call for an advance payment of $5,000.00. This is to be deducted from royalties of 15 percent of gross receipts from production of every kind that may be produced from the properties. Such royalties are to be paid until $75,000.00 has been received by the Reserve Corp., and shall continue until the option to purchase is exercised. The purchase price of $215,000 is to be paid off by an initial payment of $100,000.00 and monthly payments thereafter of $4,000.00. One third of $75,000.00 of initial royalty payment is to be applied as a credit against the purchase price.

The applicant, the Manganese Corporation of Arizona, lists the following officers:

Victor J. Morgan, president, Reserve, N. Mex.
E. V. Mendenhall, vice president, Reserve, N. Mex.
Beatrice B. Morgan, secretary-treasurer,
[illegible] V. Indian School Rd.,
Phoenix, Ariz.

The West Niggerhead claim is held by the applicant under a sub-lease agreement with Dallas B. Gorsuch who is lessee of the

claim under Permit N-5319, issued by the Office of the Commissioner of Public Lands of the State of New Mexico.

During the field investigations, Mr. Morgan reported that the corporation had acquired the Riggerhead deposit that was explored by the U.S. Bureau of Mines and the National Zinc Corp. during 1943. The Bureau findings are reported in R.I. 4094. Plans for exploitation of the deposit by the National Zinc Corp. were abandoned, probably in 1947. Since then, activity at the deposit has been confined to announcement work that consisted mainly of starting an open cut at the portal of the adit driven by the Bureau. The applicant has recently made metallurgical tests on the open cut broken ore that presently blocks entry to the underground workings.

DESCRIPTION OF THE DEPOSITS

Red Hill Extension

The principal zone of manganese mineralization of the Red Hill Extension claims occurs at the head of a draw that drains northerly from an easterly trending ridge to Misra Tank Canyon (figure 2). It has been worked by several large open-cuts within an area about 1,000 feet wide in an east-west direction and a maximum of 800 feet in a north-south direction. The maximum thickness of significant mineralization as revealed by mining and churn drilling is about 100 feet. Portions of the mined zone contain little or no ore minerals.

The rocks of the area are predominantly reddish rhyolite. That strike N. 15° to 20° W. and generally dip almost vertically. Fracturing of the rhyolite is rather intense in the mineralized

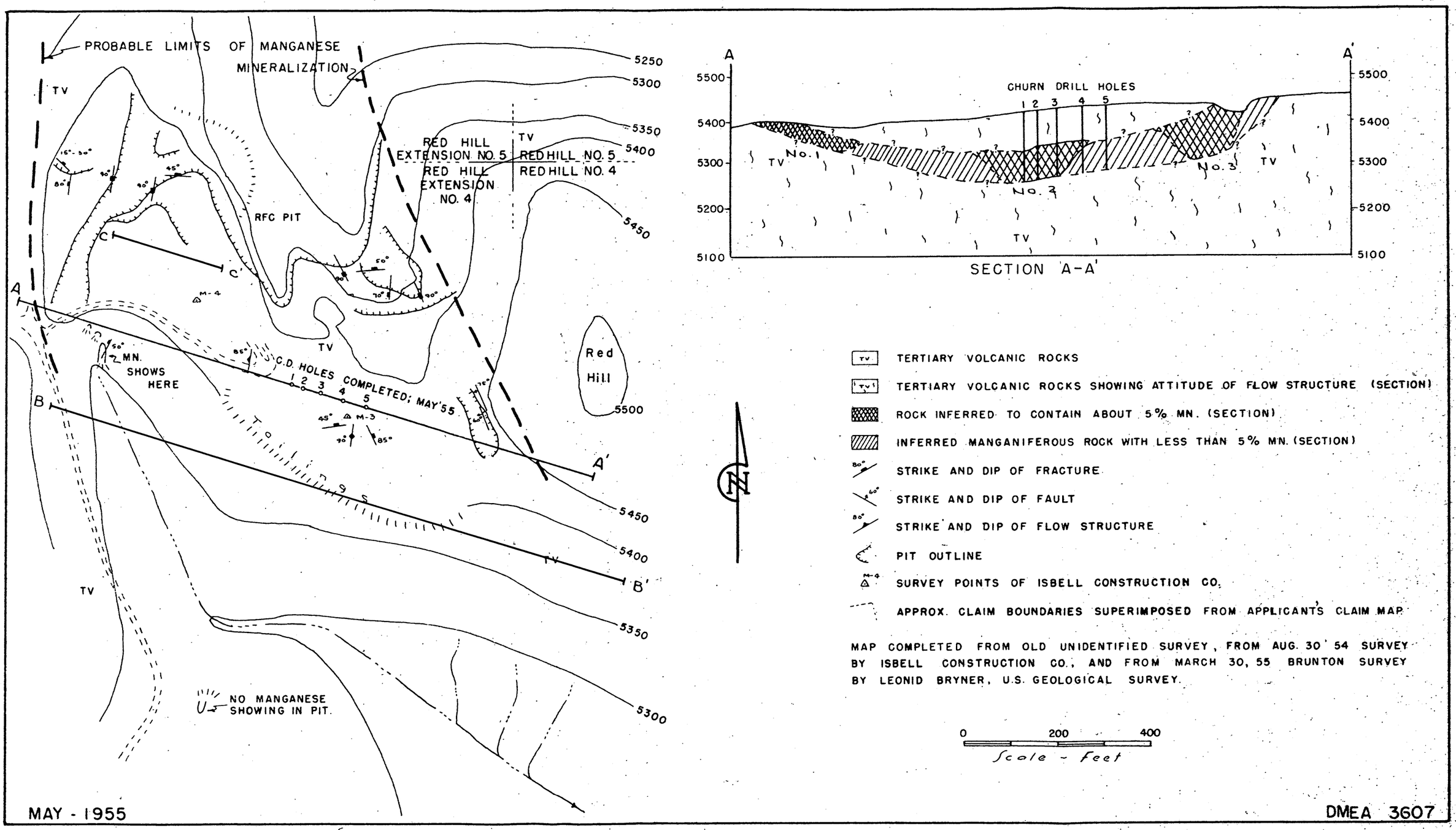

FIGURE - 2 - GEOLOGIC AND EXPLORATION MAP, RED HILL EXTENSION MANGANESE ZONE
MANGANESE CORP. OF ARIZONA, SOCORRO COUNTY, NEW MEXICO

zones. The most persistent zones of faulting and brecciation strike N. 15° E. to N. 30° W., and dip vertically to about 80° West.

The ore minerals, principally psilomelane with minor amounts of pyrolusite and wad, occur as fillings of fractures and cavities of rhyolitic rocks. Calcite, that generally occurs as incrustations on psilomelane, is the principal gangue mineral.

Big Basin

The area of proposed exploration of the Big Basin claims is approximately 300 feet by 300 feet in extent. Here, a few discontinuous fractures that carry manganese oxides have been explored by 4 or 5 small open cuts having a maximum depth of about 25 feet.

West Niggerhead

The West Niggerhead deposit is similar to the main Niggerhead deposit which has been described by U.S. Bureau of Mines R.I. 4084. It crops out on the north wall of a canyon that drains to the east and has been explored by an adit and 2 trenches. The adit, driven from about 25 feet above the canyon floor, is 100 feet long and trends about N. 40° W. The 2 trenches have been excavated at rightangles to the adit for distances of 200 and 120 feet. The longer trench is on the adit level a few feet south of the portal. The other is about 80 feet to the north of the portal and approximately 30 feet vertically above the adit level.

The host rock is rhyolite porphyry that strikes about N.25°W. and dips approximately N. 30° E. The principal fractures strike

N. 30° W. and dip N. 70° W. There are subsidary fractures, but little or no brecciation.

Manganese occurs as psilomelane as fracture fillings up to 1 inch thick . Some of the psilomelane contains much iron oxide. According to Mr. Morgan, his corporation were-milled several hundred tons of similar appearing ore from the nearby Higgerhead deposit. He said the test resulted in the recovery of about 40 percent of the manganese in a high-iron concentrate.

ORE RESERVES

The indicated and inferred ore reserves of the Red Hill Extension deposit have been estimated at 1,000,000 to 1,500,000 tons containing about 5 percent manganese.

At the Big Basin Group and the West Higgerhead deposits the potential reserves are not significant.

PRESENT STATUS

Exploration

At present, exploratory work by the applicant is confined to churn drilling on the Red Hill Expansion property. Five holes have been drilled (figure 2).

Mining

The Isbell Construction Co., Reno, Nev., has a contract with the applicant for the mining of all ore and waste, delivery of ore to the company's nearby primary crusher, and delivery of crushed ore to the applicant's mill. Ore from the primary crusher passes over a picking belt where the applicant maintains a sorting

crew. Sorting out waste, estimated at 20 percent of run-of-mine ore, has been in practice since January 1955.

To March 19, 1955, the company had mined about 60,000 tons of ore and approximately 60,000 tons of waste. Of the 60,000 tons of ore, approximately 45,000 tons was from the presently operating State Lease Pit. The other idle pits, (the RFC and Niggerhead, respectively) yielded about 14,000 tons and 1,000 tons of ore.

According to Richard "Dick" Strand, superintendent for Isbell Construction Co., the current operations account for possible 95 percent of all ore removed from the State Lease pit. The present average dimensions of the pit are 450 feet by 80 feet by 40 feet deep. A probable 200-foot extension in the length has been indicated by an open cut recently started to the north of the pit.

Drilling for blast holes is done with wagon drills. Blasted ore from benches is loaded by Diesel-electric shovels and hauled to a primary crusher or to stockpiles by dump trucks. The height of mining benches is held to about 15 feet as the drilling of much deeper blast holes in the highly fractured ore zones is uneconomic. These holes are drilled for sampling, then used as blast-holes. Casing is required, but it cannot be recovered from holes much deeper than 15 feet. Ore is mined selectively, large boulders of waste are cast aside for loading into trucks at irregular intervals, and horses of waste are mined as encountered. There is no overburden. Waste, removed in the above mentioned manner, and ore occur in about equal amounts.

A total of 50 to 55 men are employed. Two shifts are worked daily for 7 days a week.

Contract prices, started at $2.00 per ton for ore and waste, have been lowered as production has increased. At present, contract prices are $0.80 per ton for ore and waste, and $0.35 per ton for primary crushing and haulage to the mill. All weights at both mine and mill are in long tons.

A list of equipment employed, with uses, follows:

<u>Shovels</u>

1 - 80D Northwest 2½ yd.

1 - 25D " 3/4 yd.

1 - 25D " Crane Boom (Secondary breaking and repair work)

<u>Trucks</u>

4 - "FD" Euclids - 15-ton Rear Dump)
2 - BD Euclids - 10-ton " ") Pits.
3 - F-8 Ford Dump (6 to 7 long ton))

7 - Rental Dump Trucks (Hauling from Crusher to Mill)

1 - F-1 Ford Pick-up (Supt)

1 - 1-ton Chev Pick-up (Foreman)

1 - 2-ton Chev Flatrack (Shop)

1 - 2-ton Chev Service Truck

2 - 4x4 Chev. Trucks (1-water truck - 1 powder truck)

<u>"Cats"</u>

1 - D-7 Cat w/dozer (Road work and pit clean-up)

1 - D-8 Cat w/"FP" Carryall, or "U" Dozer (same use as above)

1 - 112 Motor Patrol (Road work)

1 - Scoopmobile (small loading jobs)

Drilling

1 - 600 Cu. Ft. Ingersoll-Rand Gyro-flow Compressor -truck mounted

1 - 600 Cu. Ft. Joy compressor

1 - Gardner Denver 3½" wagon drill - tractor	Blast hole drilling
3 - Cleveland - D-14 - wagon drills	
2 - 29T - Bucyrus-Erie Churn Drill	

Crusher

1 - Model 173 Pioneer Primary Crushing Unit with 30x42-in. jaws.

Milling

Ore crushed to minus 5-inch at the primary crusher is delivered to an ore bin at the secondary crushing plant. Secondary crushing to a mill feed (minus half inch) is accomplished by an Austin-Western portable unit, comprising a jaw crusher, rolls, and delivery belt. The unit, powered by a Diesel-electric generator, has a rated capacity of 200 tons per hour. Crushed ore is delivered to a stockpile. A feeder, installed in a tunnel beneath the stockpile, delivers the ore to a belt conveyor that discharges into either of two 6-foot by 16-foot double-deck vibrating wet screens at the head of a No. 3M HMS Mobil Mill, designed by the Western Machinery Co., San Francisco, Calif. Minus 10-mesh material from the screen by-passes the heavy media plant to 36-inch spiral classifiers flows to a distributor that is in closed circuit with 8 Wilfley table.

The plus 10 mesh is treated by 2 identical units, each having a rated capacity of 50 tons per hour. It flows to 10-foot cone low-gravity separators that deliver float and sink products to 4-foot by 16-foot drain and wash screens. Float from the screen goes to waste. The sink product then is treated in 10-foot cone high-gravity separators. Both products from the high-gravity separators are washed and screened to deliver sink material as a finished concentrate and middlings that presently go to a stock pile for possible future treatment. Media from diverters at the screens is returned to the circuit either directly or after treatment by densifiers and magnetic separators. The media consists of ferro-silicon and magnetite.

Water for milling is pumped from a 520-foot well that is located about 600 feet east of the new mill. A second well is presently being drilled from a site within 60 feet of the mill.

Power for milling is by electricity furnished by the Socorro Co-op, Inc., Socorro, N. Mex. A Diesel-electric generator powers the well pump.

Concentrates are hauled to Deming by 5 Diamond-T trucks attached to Clements trailers of 20-ton capacity. This haulage equipment is of 1954 and 1955 manufacture. Other major equipment consists of the complete idle 500-ton gravity-table mill, a Model D4 Caterpillar dozer, a 5-ton Ford dump truck, 2 Dumpster trucks, 2 pick-up trucks, a churn drill, and 2 wagon drills.

Milling Statistics

An accurate estimate of milling results cannot be made because sampling of heads and tails was done only during the first month of operation of the old mill. At the new mill, sampling of these products was reportedly renewed about May 1 upon completion of an assay office on the property.

On the basis of incomplete data, it is estimated that the grade of ore treated averaged about 8.2 percent Manganese and that 56 percent was recovered. In these estimates, the average grade of tails for the known period was applied to the production of 7,286 tons of 38 per cent concentrates from 60,229 tons of ore.

Meagre data on a break-in operation of the new mill from March 19 to May 9, 1955 indicate recovery was similar to that of the old mill until finer grinding was put into effect on May 7. During the following 3 day period the grade of ore averaged 10.7 percent Manganese and tailings averaged 2.72 percent. Approximately 1,600 tons of concentrates, averaging about 36 percent Manganese, were produced for the total operating period. Of the 1,600 tons, 1,285 tons were produced during the last 9-day period. Ore treated during this period would be about 1,300 tons per day on the basis of the old mill's 8 to 1 ratio of recovery.

Economics of Operations

The following was taken from a statement of Earnings, for the period August 17, 1954 to February 28, 1955, that was prepared by Linder, Bunk and Stephenson, Certified Public Accountants, Albuquerque, N. Mex. The Statement contains the following foot

note, "This statement was prepared from the books and records of the Company without verification."

Sales of Manganese Concentrates		$ 473,745.52
Cost of Sales:		
Mining	$ 180,225.74	
Milling	107,475.36	
Hauling & transportation costs	28,264.22	
Total	$ 315,965.32	
Less - Inventory of Manganese Concentrates, February 28, 1955	26,500.00	
Cost of sales	$ 289,465.32	
Administrative expenses	15,125.00	
Provision for Federal & State taxes	47,000.00	
Total costs, expenses and taxes		$ 351,590.32
RETAINED EARNINGS		$ 122,155.20

During the pertinent period, 54,786 tons of ore was milled and an additional estimated 5,000 tons of ore was stockpiled. On this basis the recovered value per ton of ore was $9.10 and per ton costs averaged about $6.60. A break down of costs follows: mining, $3.00; milling, $1.96; transportation, $0.68; administration, $0.28; and taxes, $0.86.

The indicated average operating profit of $2.50 per ton is for sorted ore, of which about 75 percent came from the "State Lease" pit. As mining costs were gradually reduced during the operations it is reasonable to assume that the perton profit was more than $2.50 during the last few months of operation of the old mill. It also probably is reasonable to assume the treatment costs will be lowered and a higher recovery will be made at the new mill.

Plans call for transfer of operations to the RFC pit upon depletion of the "State Lease" deposit, providing favorable results

are obtained by the proposed explorations. No decrease in mining costs can be expected at the RFC pit because of the expectable high ratio of waste to ore. However, other costs could be lower and a higher mill recovery is anticipated. On this basis, economic operation of the RFC pit under the present Government price for manganese, would appear to be dependent on the discovery of ore reserves of an extent and grade similar to that of the "State Lease" deposit.

PORPOSED EXPLORATORY PROJECT

The proposed explorations are confined to a 2-stage churn-drilling project on the Red Hill Extension property. Under the first stage, provisions are made for the drilling of an estimated total of 2,300 feet in about 21 holes. Second stage drilling, if warranted, would consist of an estimated 4,400 feet in about 35 holes.

Explorations would be initiated by drilling holes along section A-A' of figure 2 to test for extensions of the 3 indicated ore zones. Testing of the ore zones should be by drilling holes in the following order at intervals of about 35 feet, until essentially barren ground is encountered and then increase intervals to 70 feet. Deposit no. 1, start near western border and proceed westerly; deposit no. 2, proceed westerly from existing hole no. 1; deposit no. 3, start near eastern border and proceed westerly. The order in which the deposits are tested is immaterial and

simultaneous testing of more than one deposit should be allowed.

Under the second stage, indicated extensions of the ore zones would be tested in a similar manner by drilling holes along sections B-B' and C-C', in the indicated order.

ESTIMATED COST OF PROJECT

On the basis of the following information, it is recommended that the drilling be carried out at a fixed price under an independent contract and that other allowable charges be placed on an incurred cost basis.

		STAGE I	STAGE II	Total
Drilling -	$7.00/ft.	2,500 ft.-$17,500.00	4,400 ft.-$30,800.00	$ 48,300.00
Casing	2.50/ft.	500 ft.- 1,250.00	880 ft.- 2,200.00	3,450.00
Assays	2.50/sa.	210 - 525.00	350 - 875.00	1,400.00
Totals		19,275.00	33,875.00	53,150.00

Drilling

Independent Contract - Bids were received by the applicant from 3 contractors, Freelove Well Drilling and Pump Sales of Phoenix, Ariz., the Roe Newberry Co., and the Boone Drilling Co. The latter two were drillingon the property during the field investigations. Each of the latter 2 contractors submitted identical bids of $6.00 a foot for drilling, commencing with a 12-inch hole and changing down to a 6-inch hole. Addition charges were $0.25 per foot for necessary casing, the casing to be provided by the contractor and the cost of lost casing to be borne by the Manganese Corporation of Arizona. The Freelove bid contained 2 proposals:

Proposal No.,1

a. Drilling approximately 3,000 ft. ------- $ 10.00/ft.
b. Underreaming or straight reaming ------- 12.00/hr.
c. Setting casing ---------- 12.00/hr.
d. Pulling casing ---------- 12.00/hr.
e. Contractor to furnish casing
f. Owner to pay for any casing lost

Proposal No. 2

a. Drilling, underreaming, straight reaming, setting casing, pulling casing, furnishing all casing, absorbing cost of all lost casing -- $16.00/ft.

Cost of Drilling

The bids of the Newberry and Boone companies are acceptable not only because they are by far the lowest, but because each company has had experience in drilling the deposit under consideration. Experience has shown that the ground is very ravely and must be cased in order to obtain satisfactory samples.

On the basis of casing an estimated 80 percent of each hole, per foot costs of drilling and casing are estimated at---- $ 6.20
b
Other allowable costs (based on daily advance of 40 feet by 2 rigs operating 2 shifts per day and 6 days a week)

Supervision - Applicant requested that no charge be included as company's mining staff will supervise project on part time basis ---------- 0.00

Labor - 1 sampler for each shift at $1.50 per hr.
$ 14.80/shift including overtime and taxes---- 0.74

Materials and supplies (other than casing)
Applicant proposes to furnish at no cost------ 0.00

Equipment
Bulldozer for preparation of drill sites, 100 hrs. at $15.00/hr. for 6,900 ft. of drilling.---------- 0.02

Pick-up truck for transportation of samplers, supervisors and samples - no charge desired as presently owned equipment will be used mainly on company operation	0.00
Miscellaneous, other than assaying Bookkeeping - $50.00 per month	0.05
Total drilling costs per foot	$ 7.01

Non-recoverable casing

Most of the drilling will be in very hard and highly fractured rock that ravels and makes recovery of casing extremely difficult or impossible. Under these conditions, a reasonable accurate estimate of the amount of casing loss cannot be expected. To provide for the cost of lost casing, a total of $3,450.00 is included. This amount, divided into $1,250.00 and $2,200.00 for stages 1 and 2, respectively, will cover average casing cost at $2.50 per foot for 20 percent of the proposed drilling footage. Charges for lost casing should be supported by certified invoices.

Assays

Samples should be obtained of each 5 foot section of hole containing significant amounts of manganese. The samples should be separately assayed only in event a radical difference in grade is noted in the material from 2 adjoining 5-foot intervals. Otherwise, assays should be made of composites of two 5-foot samples. The number of samples to be assayed is estimated at 10 per hole for a total of 560. At $2.50 per sample, the prevailing rate, estimated assay costs would total $1,400.00. Allocation of the $1,400.00 to stages 1 and 2 would be $525.00 and $875.00, respectively. Approval of assay charges should be based on certified invoices.

CONCLUSIONS AND RECOMMENDATIONS

The Red Hill Extension property is the only one of the 3 investigated where conditions are favorable for finding significant reserves of manganese ore. The grade of ore could be similar to that of the nearby "State Lease" deposit where the applicant is presently open-pit mining, and milling in excess of 1,000 tons of sorted ore per day. Daily production of high-grade concentrates is now about 100 tons. Sustained operation of the mill is dependent upon the development of additional ore and the present Government price for manganese.

Exploration of the Red Hill Extension property by churn drilling is a feasible method and can be expected to yield adequate data for ore reserve estimates at a relatively low cost. The applicant can be expected to carry out the proposed exploratory program in a satisfactory manner.

For the above reasons, approval is recommended for the proposed 2-stage churn drilling program that can be completed in 8 months at an estimated total cost of $53,150.00. Estimated costs of stage 1 and 2 are $19,275.00 and $33,875.00, respectively.

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Defense Minerals Exploration Administration
Denver Federal Center
Denver, Colorado

DMEA
Date Rec'd.
JUL 12 1955
BUREAU OF MINES
Denver, Colorado

July 11, 1955

TRANSMITTED
JUL 13 1955

Memorandum

To: DMEA Field Team, Region III

From: E. N. Harshman

Subject: DMEA Docket 3607 (Manganese), Manganese Corporation of Arizona, Socorro County, New Mexico

Enclosed are the original and eight copies of a geologic report by Leonid Bryner, U. S. Geological Survey, covering his examination of the subject property.

The report describes the geology of the area and the known ore deposits. Certain recommendations regarding exploration with Government assistance are made.

The recommended exploration program outlined in detail in the engineering report appears justified.

E. N. Harshman

E. N. Harshman
Member, Field Team

Enclosures (9)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Box 4126 University Station
Tucson, Arizona

IN REPLY REFER TO:
MINERAL DEPOSITS
DMEA
RECEIVED
JUL 8 1955
U. S.
GEOLOGICAL SURVEY
DENVER, COLORADO

July 6, 1955

DMEA
Date Rec'd.
JUL 12 1955
BUREAU OF MINES
Denver, Colorado
TRANSMITTED
JUL 13 1955

MEMORANDUM

To: Mr. E. N. Harshman

From: Leonid Bryner

Subject: Docket DMEA 3607 (Manganese) Manganese Corporation of Arizona, Socorro County, New Mexico

Enclosed are the original and 8 copies of my report of examination of properties belonging to the above company. The discrepancy between the geologic and engineering reports was due, as you suggested in your letter of June 20, to an oversight. Before the report was submitted to you, the geologist and the engineer had already agreed on the exploration plan described in the engineering report. The geologic report, therefore, has been altered to fit its original intent, and is being resubmitted to you in its revised form.

Leonid Bryner
Leonid Bryner

LB:ms

cc. Mr. Harshman (8)
Mr. Storms

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Box 4126 University Station
Tucson, Arizona

DMEA
Date Rec'd.
JUL 12 1955
BUREAU OF MINES
Denver, Colorado

June 3, 1955

MEMORANDUM

To: Mr. E. N. Harshman

TRANSMITTED
JUL 13 1955

From: J. N. Faick

Subject: Docket DMEA 3607, Manganese Corporation of America, Socorro County, New Mexico

Enclosed are the original and 8 copies of Leonid Bryner's report of examination of properties belonging to the above company. This report recommends Government participation in exploration of the Red Hill Extension property because of relatively large amounts of probably commercial grade ore. Government participation in exploration of the Big Basin and West Niggerhead deposits is not recommended.

This report has my approval.

J. N. Faick
John N. Faick

JNF:ms

cc: Harshman (8)
Storms

MINERAL DEPOSITS
DMEA
RECEIVED
JUN 7 1955
U. S.
GEOLOGICAL SURVEY
DENVER, COLORADO

DMEA
Date Rec'd.
JUL 12 1955
BUREAU OF MINES
Denver, Colorado

U. S. DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REGION III

GEOLOGY

EXAMINATION REPORT

DMEA 3607

MANGANESE CORPORATION OF ARIZONA
SOCORRO COUNTY, NEW MEXICO

(Manganese)

By
Leonid Bryner
Geologist
U. S. Geological Survey

June 5, 1955

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
FIELD TEAM III

EXAMINATION REPORT

DMEA 3607
MANGANESE CORPORATION OF ARIZONA
SOCORRO COUNTY, NEW MEXICO
(Manganese)

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INTRODUCTION

In an application to the Defense Minerals Exploration Administration, dated December 7, 1954, Victor J. Morgan, president of the Manganese Corporation of Arizona, requested government participation in a program estimated to cost $86,790, to explore for manganese on the Red Hill Extension, Big Basin and West Biggerhead claims, Socorro County, New Mexico.

The Red Hill Extension and Big Basin groups are respectively south and north of Mineral Tank Canyon in Secs. 17, 18, and 20, T. 4 S., R. 1 W. They are about 12 miles by road from the town of Socorro. The workings and the roads leading to them are shown in the U. S. Geological Survey topographic map of the San Antonio Quadrangle. The West Biggerhead claim is in Sec. 32, T. 3 S., R. 2 W. It is about 10½ miles by road west of Socorro, in Six Mile Canyon. The location and extent of the above properties is shown in figure 1. The Red Hill Extension and the Big Basin claims are held by the applicant under a lease and option agreement with the Socorro Corporation which, in turn, holds the claims under a lease and option agreement with the Reconstruction Finance Corporation.

The examination was made during March 29 to 31, 1955 by T. M. Bonale of the U. S. Bureau of Mines and the writer. Most of the writer's time was spent at the Red Hill Extension deposit because this area offers the best possibility for finding a substantial tonnage. A program of churn-drilling is recommended for the Red Hill Extension area, but exploration is not recommended on the other properties.

The Red Hill Extension under the name "Van Felt deposits", was examined for the War Production Board by S. K. Neuschel of the U. S. Geological Survey, and described by him in an unpublished Memorandum Report in 1943. It is also described by W. R. Sterns, of the U. S. Bureau of Mines, in an unpublished Memorandum Report dated January 3, 1943. Both writers estimated considerably lower tonnages of ore than in the reserve estimates of the present report. But these lower estimates of reserves apparently are due to the higher grade cut-off used and also to the fact that recent pit operations have exposed ore that was not known to exist when the earlier examinations were made.

GEOLOGY

The manganese deposits occur in or near the Chupaderos Mountains, a low, northerly-trending range 6 to 8 miles west of the Rio Grande. Tertiary rhyolite, rhyolite tuff, and rhyolitic agglomerate underlie most of the range. These rhyolitic rocks are overlain in many places by poorly sorted, bouldery gravels that may be Tertiary or Quaternary in age. A well near the mill, located one and a half miles east of the deposits, penetrated 320 feet of gravels without reaching bedrock. North of the manganiferous area Quaternary basalt flows form a prominent capping on much of the gravel. The drainage is mainly easterly across the Chupaderas to the Rio Grande.

Red Hill Extension Deposit

The geologic setting of the mine area is best seen in the deep, easterly trending canyon immediately north of the deposit, called,

in this report, "Black Rock Canyon". Here the rocks are predominantly reddish, porphyritic rhyolites. Much of this rhyolite is vesicular, and most of it contains fragments of foreign material. The fragmental character ranges from almost pure rhyolite to coarse rhyolitic agglomerate containing boulders over one foot in diameter. Most of this foreign material is volcanic but in some places boulders of granite and schist were recognized in the rhyolitic matrix. The rock referred to as "rhyolitic tuff" in other reports probably corresponds to this agglomerate. The vesicles in the rhyolitic rocks are almost invariably oval and oriented to give the rock a planar flow structure. This structure shows a quite persistent N15° to 30° W strike and a dip that is generally within a few degrees of vertical. Apparently the Tertiary flows have been tilted almost 90 degrees from their original attitude.

There appears to be a minor amount of shearing in zones that outcrop in the bottom of the canyon and trend parallel to the primary flow structures. The widest of these shears is about 10 feet across and did not show any gouge or much brecciation. It contains open fractures and cavities lined with minute quartz crystals, but no manganese minerals. Such zones apparently are not everywhere continuous from the floor to the brink of the canyon. The shear zones in the brink of the canyon contain manganese deposits but the lower zones contain little or no manganese.

The ore minerals occur as incrustations in fractures or cavities on the rhyolitic rocks. The manganese values are almost entirely in psilomelane with very minor amounts of pyrolusite or wad.

The surface of the pailomelane generally is botryoidal and sections across layers show a fine-banded, spherulitic structure.

Calcite is the predominant gangue mineral. It generally occurs as an incrustation on the pailomelane. A coarsely crystalline, radiating structure is usual. Incrustations of small quartz crystals also occur with the pailomelane but are much less abundant than calcite. It is not unusual to find angular fragments of pailomelane imbedded in a layer of calcite or quartz. Evidently the pailomelane was deposited prior to the calcite or quartz.

The deposit, marked by several large open cuts, is in the head of a draw that drains north to Black Tank Canyon (fig. 2). This draw heads in an easterly trending ridge. Above the head of the draw this ridge has a rather flat profile. The most easterly pit is located where the ridge merges with Red Hill and the most westerly pit is located where the ridge ends in a northerly trending spur. These features are shown in figure 2. On the south flank of this same ridge erosion has not cut to nearly as great a depth as on the north flank, and there has been only enough mining to suggest that the deposit does extend through the ridge to the south flank, but not enough to show the size or shape of this southerly extension. The maximum known width of the deposit is about 1000 feet in an east-west direction and the maximum known length in a north-south direction is about 800 feet. The maximum thickness

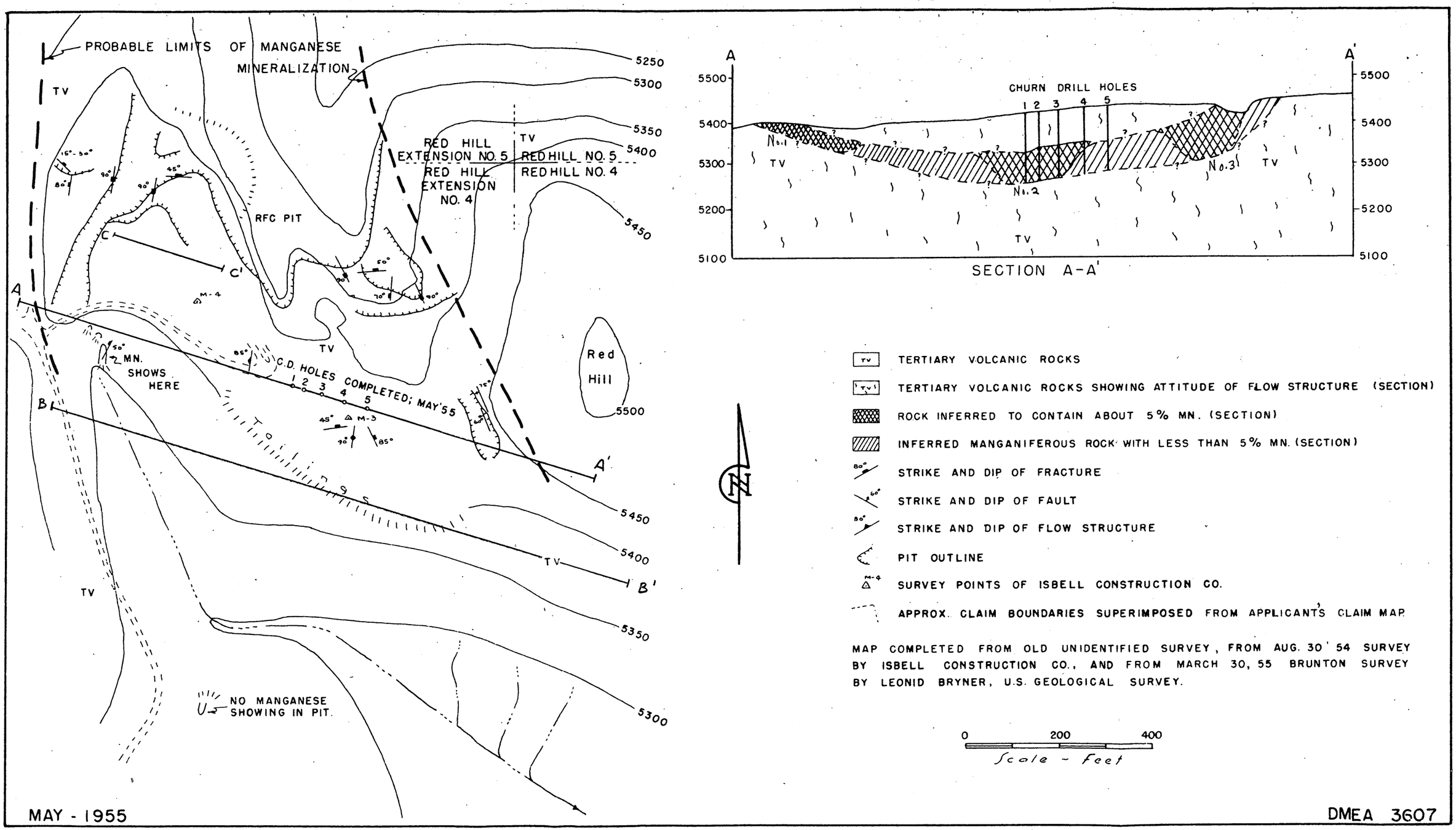

FIGURE - 2 - GEOLOGIC AND EXPLORATION MAP, RED HILL EXTENSION MANGANESE ZONE
MANGANESE CORP. OF ARIZONA, SOCORRO COUNTY, NEW MEXICO

revealed by mining and churn drilling is about 70 feet. There undoubtedly are barren or very low grade zones within these boundaries as indicated in section A-A', figure 2. The two northward promontories of rock that separate the mine pits may correspond to "horses" of submarginal grade rock which very likely persist southward through the ridge. On the other hand, the extreme east and west pits are likely to represent higher grade zones that extend through the ridge. The deposit does not persist to the floor of Hiera Bank Canyon nor, except in places, to the crest of the ridge above the canyon. It is contained within a maximum vertical span of about 200 feet. The top of the deposit apparently is deeper at the center and comes to the surface at the east and at the west edges. Some of these features are shown in figure 2. The same figure also shows the direction and location of some of the more prominent fractures and fracture systems. Faults, the most persistent fractures, and shear zones of brecciated rhyolite strike from about north 15° east to about north 30° west and dip from vertically to about 30° west. Less prominent, but quite widespread, fracturing strikes at about right angles to the above strike directions and dips from 15° to 30° north. There is a third still less prominent direction of fracture. It also strikes at about right angles to the main system, but dips to the south.

The tenor of the ore shows a direct relationship to the degree and type of fracturing. The more persistent open fractures and the faults of the dominant northerly system contain the thickest

bands of psilomelane; thicknesses up to several inches were observed, and thicknesses up to one foot are reported from the area about a thousand feet to the east where present mining is in progress. The zones of brecciation, presumably shear zones related to the faulting, are the next highest grade and, because of their greater width, contain a greater tonnage of ore per foot of depth than do the main faults and fractures. In these breccias the psilomelane occurs in seams less than an inch thick as the cementing substance between blocks of rhyolite. In the areas outside of these more favorable zones the psilomelane occupies the numerous intersecting fractures that are characteristic of the entire manganese zone. The larger proportion of unfractured rock in these areas makes for lower grade material.

Two unusual types of manganese occurrences in this deposit are the cavernous fillings and the clastic dikes. The cavernous fillings occur in rock with openings as much as one foot in diameter. These caverns in places are lined with psilomelane and calcite, and pinch to a narrow seam. It appears as though the cavity originated by the sagging of the walls of a fracture, and that later the manganese was deposited on these walls. The clastic dikes have not been positively identified as such. They are generally regarded as shear zones in the rhyolite since they do parallel the shear zones. However, they otherwise differ strikingly from the usual shear zones in that they consist of a sandy to powdery unconsolidated matrix containing scattered chips of psilomelane evidently derived from a previously

deposited fracture coating of psilomelane. Though no gravels were recognized on the top of the ridge the limey cement characteristic of the older gravels fills crevas in the bedrock near the surface. Remnants of these same gravels also were recognized as a veneer on the walls of Micro Tank Canyon.

Big Basin Deposit

The Big Basin deposit occupies the crest of a ridge half a mile north of Micro Tank Canyon. The area proposed for exploration is about 300' by 300' in extent and contains four or five small cuts having a maximum depth of about 20 feet. The country rock is a rhyolitic agglomerate. The fractures that contain manganese have attitudes of N 20° E, 80° W; N 40° W, 75° W; due N, 80° W. The psilomelane occurs as coatings up to an inch thick in these fractures and as a widespread staining on the intervening rock. There is little or no brecciation so the fractures are the only receptacle for psilomelane. The rock as a whole appears to be much lower grade than that of the Red Hill Extension Deposit.

West Biggerhead Deposit

The West Biggerhead deposit is about a quarter of a mile upstream from the main Biggerhead deposit which has been described in U. S. Bureau of Mines R. I. 4084 and in unpublished reports to the War Production Board by Sherman Brunhal of the U. S. Geological Survey and H. G. Huntington of the National Zinc Corp. In its geologic setting the West Biggerhead deposit resembles the Biggerhead.

The workings occupy a recess in the north wall, about 25 feet above the floor of the canyon. A 100-foot adit, trending about N 40° W, penetrates the outcrop. At the adit level the outcrop has been trenched horizontally for about 200-feet, and about 120-feet vertically above this trench another trench almost 50 feet long has been dug. A short distance above this trench the canyon wall levels out in a flat area, underlain by Tertiary or Quaternary gravels.

The host rock is rhyolite porphyry in crude layers that strike about N 25° W and dip about 30° NE. The main fissure system strikes N 50° W and dips 70° W. There are subsidiary fissures that strike about NE and dip steeply to the north. On the whole there is little or no brecciation. But about 40 to 60 feet east of the adit and 15 feet lower there is a 20 foot wide brecciated zone that strikes north and dips vertically to 85° west. About 15' up the slope on this breccia zone the degree of brecciation declines to only a few thin breccia seams in the same 20-foot interval. The recessed canyon wall here, as at the main Biggerhead working, probably is a result of more effective erosion in places where the rock is more highly fractured. The total fracture zone is considerably narrower than at the Red Hill Extension and the expectable tonnage of this deposit correspondingly small.

The manganese occurs as psilomelane fracture coatings up to an inch thick. Some of these coatings are quite rusty-looking, indicating admixed iron oxides. Huntington conducted a channel sampling program here that showed an average grade of 8 percent manganese. To both consumers the deposit has the appearance of being considerably lower grade than this.

Guides to Ore

One of the most striking things about the geology of these deposits is their relationship to topography. They are in the tops of southerly trending divides, generally where these divides have a rather flat profile. In such places the divides are capped with older gravels or show vestiges of the limey cement characteristic of these gravels. The flat parts of the divides generally lie in southerly-trending belts probably representing ancient drainage lines at right angles to the present drainage system. So the deposits show a correlation with topography as well as a correlation with the degree or extent of fracturing in the rhyolite. The vertical range of the deposits is short, probably not exceeding 200 feet.

The deposits appear to be of supergene origin. Possibly the manganese was carried by streams in an ancient southerly-trending drainage system, and deposition of the minerals was by downward percolation of the stream waters into underlying fractures.

PRODUCTION AND GRADE

Only the Red Hill extension area is considered in this section as the other two deposits are comparatively unattractive as large tonnage possibilities.

The early history of the Red Hill Extension deposit is incomplete. The extreme east part of it apparently corresponds to the Van Pelt deposit, described by Rosenhal. There were some shipments from here during World War II. Rosenhal estimated reserves of 2,000 tons of 15 percent manganese in this deposit.

During World War II a stripping operation revealed low grade manganese in an area approximately 200 by 180 feet, which probably corresponds to that is now called the "BFU" Pit (fig. 2). In the summer of 1954 the applicant began exploration by wagon drilling in the floor of the "BFU" Pit. The assay returns from some of these holes as given by the applicant are as follows:

TABLE I

Assays of Wagon Drill Holes in floor of "BFU" Pit

Hole No. 1		Hole No. 2		Hole No. 3		Hole No. 4		Hole No. 5		Hole No. 6	
Interval	% Mn.	Interval	% Mn.	Interval	% Mn.	Interval	% Mn.	Interval	% Mn.	Interval	% Mn.
8'	5.75	(0'	5.75)	(0'	3.07)	(0'	5.18)	(0'	13.18)	(0'	11.08)
(8'	8.23)	8'	8.98	8'	6.68	8'	3.89	8'	7.88	8'	4.03
16'	8.70	16'	5.51			16'	5.90	16'	5.45		
24'	3.87	24'	35.67					24'	3.51		
28'	4.30	(32'	31.13)					32'	8.91		
		36'	1.19					36'	7.54		

Some intervals in this table are parenthesized because of the writer's doubt as to their significance. The location of these holes is not known beyond their having been drilled in the floor of the main pit. The applicant, under item 4 (a) of the docket, states that approximately 50 wagon drill holes were sunk in the floor of the pit. Many of the holes, therefore, are not included in the above table, but probably the results given above are fairly representative of this work.

In July 1954, the applicant began churn drill exploration on the ridge immediately south of the "BFU" pit. The location of the churn drill holes are shown in figure 2 and the results of this drilling as of May 1955 are shown in the table below.

TABLE II

Assays from churn drill holes - Red Hill Extension

Hole No.	Interval (feet)	Grade of Mn. (percent)	Remarks
1	83-155	5.72	-
2	78-149	5.87	-
3	81-152	5.45	-
4	76-92	4.8	-
5	-	-	Applicant reported one barren hole; it is presumed to be No. 5

The applicant reports that other drilling and stripping tests near the "RFU" Pit showed results that averaged 7 to 12 percent manganese. There undoubtedly is rock of this grade in that area, but the above churn drill results probably are more nearly representative of the average grade of such large tonnages as might be mined in an open pit operation.

In January and February 1955 the applicant mined about 14,000 long tons from the "RFU" Pit but no grade data on this ore is available. This ore, however, was treated together with the ore from the nearby State Lease Pit (fig. 1) and the average grade treated was about the same as that of the State Lease pit in later months after production from the "RFU" Pit had ceased, suggesting that the grade of both pits is about the same.

Present production is from the applicant's State Lease Pit, about 900 feet east of the Red Hill Extension deposit. As of March 19, 1955, this pit which is geologically very similar to the "RFU" Pit, produced about 45,000 long tons of a total of about 60,000

tons of material that averaged about 8 percent manganese. This grade applies to rock that was milled. About half the rock mined, however, was rejected as waste before milling, so that the average grade of material in the Stake Lease Pit probably is on the order of 4 percent manganese.

EXPLORATION

The exploration so far conducted on the Red Hill Extension group has been outlined above. In their BGSA application, the Manganese Corporation of Arizona proposed to explore this property with 42 churn drill holes each about 200 feet deep. His drilling plan called for spacing the holes 35 feet apart in parallel lines 100 feet apart. This "ladder" pattern would have a N-S orientation beginning at the present site of churn drilling (fig. 2) and extending due south about 600 feet. This pattern is based on an assumed narrow width and a N-S elongation in the deposit. The examiners, however, have the impression that the mineralized zone is much wider and much shorter than the applicant pictures it to be. Therefore a modified pattern of drilling in two stages, which meets the approval of the applicant, is presented below as more suitable for exploring this area.

Stage 1: About 2,500 feet of churn drilling to be conducted along section A-A' (fig. 2), by drilling at 35-foot to 70-foot centers from the 3 known mineralized zones (see A-A', fig. 2) toward the inferred edges of these zones. The cost of this work is estimated at $19,275.

Stage 2: If ore is found along section A-A' under Stage 1, then extensions of this ore will be sought along sections B-B' and C-C' (fig. 2). Exploration along sections B-B' and C-C' will be conducted in a manner similar to that along section A-A', that is, at 35- to 70-foot centers and from the more favorable to the less favorable ground. This stage is estimated at 4,500 feet, costing about $13,875.

RESERVES

The reserves below are calculated only for the Red Hill Extension deposit.

Total indicated and inferred reserves amount to about one million long tons of rock containing about 5 percent manganese. This estimate is based on northerly and southerly projections of 100 to 200 feet from the pit faces and from ore in churn drill holes.

If exploration is successful in the second stage of drilling total reserves of all classes might be increased by about half a million tons.

CONCLUSIONS AND RECOMMENDATIONS

The Red Hill Extension property shows promise of a significant tonnage of milling-grade manganese ore. This deposit can be fairly easily explored by churn-drilling as outlined under "Exploration".

The applicant is agreeable to this exploration plan and seems competent to carry it out. Therefore government participation in this exploration is recommended.

Because of the low grade of the Big Basin Group and the small exportable tonnage of the West Biggerhead deposit, government exploration on these properties does not appear to be justified.