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May 23, 1961

Mr. M. R. Prestridge
P. O. Box 613
El Paso, Texas

Dear Mr. Prestridge:

On May 19 I made an inspection of the activities of Arkota Steel Company near Coolidge, Arizona. Messrs. Patrick H. Feeney and E. J. Gustafson took me to the properties and were most cordial. I believe that Mr. Gustafson is one of the participants in the financing of the project.

I found that the mine and nearby magnetic separation plant had been in operation for about one week. The Madaras ore reduction plant at Coolidge is still under construction. I doubt if this plant is in operation on the target date of July 1; it looks like an additional four to six weeks before it will be making steel.

Mr. Lindekugel (whom I did not see) is in charge of the mining operations and magnetic plant at Owlhead. He is mining from a nearby dry wash that is particularly rich in magnetite sand. This area contains from 15% to 20% magnetite, whereas the general average value obtained by drilling a large area was 8.13%. Consequently they are taking "ore" that is much better than the general average.

I was told that the magnetic plant is producing concentrates of the following quality:

Iron	68.00 %
Titania	0.40 %
Phosphorus	0.13 %

The magnetic plant has a capacity of 30 tons per hour but at present is turning out only 14 tons. The trouble is in either the crushing plant or the screens, and factory experts were out there last week for the purpose of correcting the trouble.

The machinery and equipment at the mine look good, and the operation appears to be managed in a competent manner.

I was informed that the Madaras reduction plant is designed for an output of 75 tons of steel per day and that this will require 125 tons of feed derived from the magnetic separators.

The loose magnetic concentrate will be pelletized before going into the reduction retort. This pelletizing machine has not yet been installed, and I believe that Mr. Madaras is now in the east to obtain one of its components.

The reduction plant, situated only a few miles north of Coolidge and now only partly assembled, appears well-designed, and my impression of the job was favorable. A water-well to be drilled to 500-800 feet is now being put down on ground owned near the Gila River.

I was informed that the output of the presently-designed reduction plant could be doubled by an expenditure of an additional $125,000. I believe that this they intend to do if the plant operates successfully. In the conversations of Messrs. Feeney and Gustafson there was no intimation of lack of adequate financing for present plant construction; however, if the capacity were to be doubled, more money would be required and a new participant might make his entry at this point.

My impressions were generally favorable, but it must be kept in mind that they are extracting better than average ore, and on the long pull they will have to get along with leaner material going into the magnetic separators. They also must devise a well thought out waste disposal scheme so as not to have rejected gravel sitting on ore.

I suggest that the project be looked over again in early August when the reduction plant should be in operation.

With best personal regards,

Yours sincerely

E. N. Pennebaker

E. N. Pennebaker

ENP:mc

61

Steel From Arkota Expected In Spring

Plant For Madaras Process Costs One-Fourth That For Blast Furnace

World Industry Depends On Iron

5/19/61

68% Fe
0.4 TiO_2
0.13 Phos
} Conc.

Magnetic
plant capacity
30 tons/hr
last only
putting out 14-
Trouble with
crusher &
screens

Putting in
pelletizer

Mine & magnetic
plant have
been running
about a week

Drilling water
well. Have to
go 500 to 800 ft.

Present
gulch being
mined gives
15% to 20% Fe

Coned Donale
present 75 tons
capacity for
$125,000

Target date
is July 1 but
probably won't
get going
much before
Aug. 1st.

MINING LEASE AND AGREEMENT

DATE: _____, 1959.

LESSOR: SOUTHWESTERN IRON & STEEL INDUSTRIES, INC., an Arizona corporation

LESSEE: PAT FLEENEY AND ASSOCIATES

RECITALS

WHEREAS the Lessor is the Lessee or sublessee or holder of State of Arizona mineral leases or unpatented mining claims situate in Townships 7 and 8 South, Ranges 11, 12 and 13 East, Gila and Salt River Base and Meridian, Pinal County, Arizona, containing approximately 30,000 acres, and consisting of the following claims:

104 ROYAL unpatented placer mining claims on public domain containing 16,640 acres

3 ANTELOPE unpatented placer mining claims on public domain containing 1,440 acres.

18 DONKEY unpatented placer mining claims on public domain containing 2,880 acres

26 COON unpatented placer mining claims on public domain containing 4,160 acres, and

24 ELK unpatented placer mining claims on public domain, containing 3,840 acres

and State of Arizona Mineral Leases No. 667, 668, 669, 670, 671, 672, 673, 711, 712, 713, 714 and 802, containing approximately 9,987 acres under mineral lease from the State of Arizona, a more particular description of which by claim, lease and location notice is attached hereto as EXHIBIT A and made a part hereof by reference, and

28960 ac
9987 a
38947 a

WHEREAS the Lessor has entered into certain agreements with Henry J. Freeman and Rose Marie Freeman, husband and wife, and Jack R. Freeman, doing business as Freeman Bros., a co-partnership, and with Seldon D. Goff and Flora B. Goff, husband and wife; copies of which agreements, with relation to obligations of the Lessor on the protection of surface rights of said parties, are attached hereto as EXHIBIT B; and

WHEREAS the Lessor is obligated under and by virtue of certain underlying agreements by and between the original locators, Black Hills Exploration and Development Co., Omega Mines, Inc., a Nevada corporation, and Garpac, Inc., a Nevada corporation, to pay underlying royalties on production from the hereinabove-described mining claims in an amount totaling not in excess of $1.00 per ton; and

WHEREAS the Lessor is obligated under and by virtue of the terms and provisions of the aforesaid State Leases to make annual payments to the State of Arizona and, in addition thereto, royalty payments as provided in the said leases from the gross production on State Lease claims; and

WHEREAS the Lessee is desirous of leasing and acquiring, by virtue of this agreement, all of the rights and interest of the Lessor in and to the said claims and properties above described for the purpose of operating the said mining properties and claims; and

WHEREAS the Lessee is willing to assume, by virtue of the terms of this agreement, all of the obligations of the Lessor under and by virtue of the above-described leases and agreements, save and except

the underlying royalties due to the original locators, Black Hills Exploration and Development Co., Omega Mines, Inc., a Nevada corporation, and Garpac, Inc., a Nevada corporation, which royalty obligations are to remain the obligations of the Lessor; and

WHEREAS the Lessor is the licensee of a certain license right to the use of the Madaras Process in the production of iron or steel products; and

WHEREAS the Lessor may become indebted to Julius D. Madaras for certain royalties;

IT IS THEREFORE HEREBY COVENANTED AND AGREED by and between the parties hereto as follows:

1. TERM: The Lessor does hereby lease and demise to the Lessee all of those certain unpatented mining claims hereinabove described, and as more particularly described in EXHIBIT A attached hereto, and does hereby sublease or sublet to the Lessee all of its right, title and interest under and by virtue of the aforesaid State Leases and the property therein described for a term of ninety-eight (98) years, beginning with the date of the execution of this agreement and terminating ninety-eight (98) years thereafter. SUBJECT, HOWEVER, to the renewal requirements of the said State Leases. The Lessor does hereby covenant and agree to cause the said State Leases to be assigned or to take such other action with relation thereto as is required in order that the Lessee may acquire the present and renewal rights of the Lessor under and by virtue of the said leases for the term hereinabove set forth.

3. RENTS AND ROYALTIES:

(a) Definitions:

The term "ton", for the purposes of this agreement, shall mean a long ton of 2,240 lbs.

The term "mined", for the purposes of this agreement, shall mean ores extracted, separated, milled or refined, or converted into a salable economic product and shipped from the demised premises, or shipped from the place where the ores are last treated or processed into a salable product.

The terms "fines" or "concentrates", for the purposes of this agreement, shall mean ores or products which have not been processed other than by extraction, separation or milling.

The terms "briquets" or "pellets", for the purposes of this agreement, shall mean the processing of concentrates into bricks or briquets or pellets by means of binders, pressure, heat, or otherwise.

The term "pig", for the purposes of this agreement, shall mean any kind or type of metallic iron or steel to which the concentrates are converted.

The terms "converted" or "conversion", for the purposes of this agreement, shall mean any change or process of the concentrates into a different form or metallic iron or steel within the State of Arizona, or by any entity or company in which the Lessee has a direct or indirect interest or agreement which is not a bona fide arms-length agreement.

(b) Prices: The Lessee covenants and agrees to assume and pay all royalties and percentages and obligations due from Southwestern Iron & Steel Industries, Inc. as Lessee, or as lessee under those contractual agreements, including State Leases, as hereinabove set forth, except the obligations due to the original locators, Black Hills Exploration and Development Co., Omega Mines, Inc., a Nevada corporation, and Garpac, Inc., a Nevada corporation, or their assignees, or royalties due Julius D. Madaras under and by virtue of the terms of the agreement of September 24, 1957 between Julius D. Madaras

SOUTHWESTERN IRON & STEEL INDUSTRIES, INC.
1016 Valley National Building
Tucson, Arizona

October 28, 1959

Mr. Pat Feeney
Pierre
South Dakota

Dear Mr. Feeney:

You are hereby advised that in consideration of your expending not less than $5,000.00 in conducting market surveys and tests in conjunction with evaluating the marketability of an economic product that can be produced from the company's properties prior to January 1, 1960, the company does hereby grant to you, until said date, the privilege of executing the Mining Lease and Agreement heretofore prepared, with a modification in paragraph 2(c) on page 5 thereof amending the said agreement to provide for minimum royalty or money payments commencing five years from the date of the execution of the said Mining Lease and Agreement of not less than $125,000.00 for each quarter.

This option agreement is subject to the approval of a majority of the board of directors of the company.

Very truly yours,

Southwestern Iron & Steel Industries, Inc.

By _____
Harley E. Graff, President

APPROVED:

_____

_____

_____

_____

_____

DIRECTORS

and the Lessor; all of which obligations, liabilities and sums due and payable shall continue to be the obligations of the Lessor and shall be paid, satisfied and discharged by the Lessor. In addition thereto, the Lessee shall pay to the Lessor for each ton of salable product produced from ores, fines or concentrates which have been mined on the demised premises 30¢ per ton for the first 200,000 tons; $1.00 per ton for the next 800,000 tons; and $2.00 per ton for each ton in excess of 800,000 tons.

(c) Minimum Royalties: Commencing two years from and after the date of the execution of this agreement the Lessee during each three-month period shall cause to be paid, by royalty payments as hereinabove provided, or by money payments, or a combination thereof, not less than $50,000.00 per quarter; said payments to be made on the 20th day of the month following each quarter, at which time the Lessee shall pay to the Lessor the difference between the amount of royalties theretofore paid by the Lessee to the Lessor for the previous three-month period and $50,000.00, if the accrued and paid royalties for the said three-month period amount to less than $50,000.00.

(d) Guaranteed Expenditures: The Lessee covenants and agrees to cause to be expended in development, facilities or operations on the leased premises not less than $25,000.00 within one hundred twenty (120) days from the date of the execution of this agreement; not less than $100,000.00 within twelve (12) months from the date of the execution of this agreement; and not less than $300,000.00 within twenty-four (24) months from the date of the execution of this agreement.

8. ASSESSMENT WORK AND TAXES: The Lessee covenants and agrees, throughout the term of this lease, to perform all annual

assessment work on the leased claims and to keep the same, including the State Leases, in good standing in every respect, and to pay all taxes levied and assessed against the said claims or improvements thereon, including all sales or production taxes which may be levied and assessed on the said claims or against the operation as conducted thereon by the Lessee.

4. STOCK PILE: It is hereby acknowledged by and between the parties hereto that there is a stock pile of concentrates on a part of the leased premises which is not involved in this lease, and the Lessee acquires no interest in or to the said concentrates by virtue of the provisions of this agreement.

5. OPERATIONS:

(a) Throughout the term of this lease the Lessee agrees to work with reasonable diligence in what, in the Lessee's sole discretion, it determines to be the best method of exploration and operation of the above-described claims.

(b) Throughout the term of this lease the Lessee agrees to furnish to the Lessor, upon request, copies of all drill logs, maps and factual data obtained by the Lessee from its exploration and operations upon said properties. Lessee agrees that the Lessor may have the right of inspection and sampling at all reasonable times as to all of the surface area and underground workings of the above-described claims, and that further, all of the records of factual data with reference to these claims shall be open to inspection of the Lessor at all reasonable times. PROVIDED, ALWAYS, that any such inspections sampling or

investigations shall be solely at the risk of the Lessor or its agents and shall be done only at reasonable times in such manner as to interfere in the least possible manner with the Lessee's operations, and that such activities shall be at the sole expense of the Lessor.

(c) The Lessee agrees to carry on all exploration and mining operations on the property in conformity with all applicable Federal, State and local laws and regulations, and specifically agrees to carry workmen's compensation insurance, and specifically agrees to indemnify and save harmless the Lessor from any and all liability of any kind and character arising out of its exploration or mining operations on the leased premises.

(d) Lessee shall have the right, so long as this lease is in effect, to sublease, assign or otherwise transfer all or any part of its interests under this agreement.

8. WARRANTIES:

(a) The Lessor does hereby warrant that it has valid and bona fide leases or operating agreements, as hereinabove more specifically referred to, on all of the claims described on EXHIBIT A attached hereto, and does hereby warrant that it will protect and indemnify the Lessee against any loss or damage from any failure of possessory title or contractual title in and to the said claims.

(b) The Lessor does hereby warrant that the total amount due on all underlying royalty and lease agreements, save and except those due the State of Arizona, do not exceed One Dollar ($1.00) per ton of iron ore concentrate.

(c) The Lessor does hereby covenant and agree to make available to the Lessee all agreements, location notices, mining, geological and engineering data, maps and information which it has which in any way pertains to the leases, agreements or claims.

7. OTHER MINERALS: It is covenanted and agreed by and between the parties hereto that if during the term of this lease the Lessee mines or ships from the leased premises ores or minerals other than those consisting of iron concentrates, as hereinabove more particularly described, the said parties will enter into royalty agreements providing for the payment of royalties on any such ores or concentrates; and which royalties shall be in an amount equal to the percentage that the iron royalties bear to the iron products shipped from the leased premises.

8. ADDITIONAL LOCATIONS: It is further covenanted and agreed by and between the parties hereto that if during the life of this agreement the Lessee locates additional mining claims within ten (10) miles of the boundary of any of the leased property, then such claims shall be located by the Lessee in the name of the Lessor and shall immediately become subject to the terms and conditions of this agreement. The Lessee covenants and agrees not to locate any claims, either directly or indirectly, within ten (10) miles of the boundaries of the leased premises except in accordance with the terms of this paragraph.

9. PAYMENT OF OBLIGATIONS: All bills and expenses incurred by the Lessee or those in privity with the Lessee shall be promptly paid by the said Lessee, and by such prompt payment the Lessee shall prevent the filing of any and all liens against the demised premises for or

on account of labor, supplies, materials, equipment or services furnished or performed, and if by reason of the failure of said Lessee to pay such bills or expenses any lien or liens shall be filed against said premises, said Lessee shall contest and defend against such lien, and if as a result thereof any such lien shall be established against said premises, then the Lessee shall promptly pay off and discharge same; and if said Lessee shall fail to do so, then the Lessor shall have the right to pay off and discharge the same and the said Lessee holds itself liable and bound to pay to the Lessor all sums so advanced or paid to clear said premises from such liens.

10. DEFAULT: In the event of violation, breach or default of the Lessee in the performance of any covenant, provision or condition of this agreement, the Lessor shall give the Lessee written notice thereof; and in the event any such violation, breach or default is not remedied and the terms and conditions of this agreement fully complied with in every respect, and this lease restored to good standing within seventy (70) days of the date of the giving of such written notice by the Lessor to the Lessee, then this lease and agreement shall, at the option of the Lessor, without further notice, cease and determine; and the Lessor may thereupon enter upon the said premises and dispossess all persons occupying the same with or without force, and with or without due process of law.

11. NOTICE: Any notices required to be given under the terms hereof by either party may be given by depositing the same in the registered mails of the United States, postage prepaid, and addressed as follows:

LESSOR: LESSEE:

and all such notices shall be deemed to have been given on the date of the deposit of the same in such registered mail

17. NOTICE OF NON-LIABILITY. The Lessee agrees to post on the leased premises all notices required by the laws of the State of Arizona, and to post at the collar of all working shafts, tunnels and entrances to the mining premises, and at all boarding houses, on or before the day the Lessee commences operations and files in the office of the County Recorder of Pinal County, Arizona, within thirty (30) days from the date of this lease, a notice that said mining claims are being operated by the Lessee and that the Lessor will not be liable for labor, materials or merchandise furnished to or performed in the operation or development of said mine or mining claims, and that the said mine or mining claims will not be subject to a lien therefor.

18. STRIKES, LOCKOUTS AND CATASTROPHES: Any time herein provided for the performance of any terms or condition of this agreement shall be deferred for such period of time during which the Lessee is unable to operate the said property by virtue of strikes, lockouts, acts of God, or other intervening cause beyond the control of the Lessee. PROVIDED, HOWEVER, that this paragraph shall not be deemed to include changes or variations in the economic conditions of the Lessee or any change in the market for the products produced from the leased premises.

14. UNDERLYING ROYALTIES -- PAYMENT BY LESSOR: The Lessor specifically covenants and agrees to pay the underlying royalties due to the original locators, Black Hills Exploration and Development Co., Omega Mines, Inc., a Nevada corporation, and Garpac, Inc., a Nevada corperation, and their assignees, and further covenants and agrees to

keep the said royalties paid prior to delinquency and in accordance with the terms and conditions of the respective contracts, agreements, leases or other instruments by which the royalty obligations accrue.

15. RIGHT TO IMPROVEMENTS AND EQUIPMENT: It is further covenanted and agreed by and between the parties hereto that there shall be deemed included in the leased premises all of the equipment and improvements of every kind whatsoever owned by the Lessor and situate on the leased premises. It is further covenanted and agreed by and between the parties hereto that the Lessor contemplates the possible repurchase of certain equipment now situate on the said premises from Moore Brothers; and if and in the event the Lessor reacquires the said equipment the same may be used by the Lessee for a period not in excess of six (6) months without further compensation, during which time the Lessee shall have an option to purchase the said equipment for the amount of the reacquisition cost to the Lessor in reacquiring the said property from Moore Brothers.

16. THIS AGREEMENT shall extend to and be binding upon the heirs, successors and assigns of the parties hereto.

17. IT IS HEREBY COVENANTED AND AGREED that time is of the essence in this agreement.

IN WITNESS WHEREOF the Lessor has caused this agreement to be executed by its duly-authorized president, and Pat Feeney has executed this agreement on behalf of himself and his associates as Lessee as of the day and year first hereinabove written.

SOUTHWESTERN IRON & STEEL INDUSTRIES, INC.,
an Arizona corporation

By _____
Herley B. Graff, President

LESSOR

PAT FEENEY AND ASSOCIATES

By _____
Pat Feeney

LESSEE

STATE OF _____)
) ss.
County of _____)

On this the _____ day of _____, 1969, before me, the undersigned Notary Public, personally appeared HARLEY B. GRAFF, who acknowledged himself to be the president of SOUTHWESTERN IRON & STEEL INDUSTRIES, INC., an Arizona corporation, and that he, as such officer, being authorized so to do, executed the foregoing ~~Mining Lease and Agreement~~ for and on behalf of the said corporation for the purposes and consideration therein expressed.

IN WITNESS WHEREOF I hereunto set my hand and official seal.

My commission expires

_____.

_____
Notary Public

STATE OF _____)
) ss.
County of _____)

On this the _____ day of _____, 1969, before me, the undersigned Notary Public, personally appeared PAT FEENEY, ~~known~~ to me to be the person whose name is subscribed to the foregoing ~~Mining Lease and Agreement~~, and acknowledged that he executed the same for and on behalf of himself and his associates, being authorized so to do, for the purposes and consideration therein expressed.

IN WITNESS WHEREOF I hereunto set my hand and official seal.

My commission expires

_____.

_____
Notary Public

Reduction plant to yield 75 tons steel per day -

Need 125 tons concentrates

To be derived from ±100 tons gravel

To: Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Arizona

From: Ray L. Moore
P. O. Box 613
El Paso, Texas

SUBJECT: OWLHEAD IRON DEPOSITS, PINAL COUNTY, ARIZONA

DATE: 9/9/60

MESSAGE

Dear Mr. Pennebaker:

I have just completed the first reading of your report dated Sept. 7, 1960, on the subject property. I believe that Mr. Prestridge intends that I assist in the checking out of this deal. In addition to your report he gave me copies of some data furnished him by Mr. Feeney, among which was a wet-process reproduction of an undated and unsigned "MINING LEASE AND AGREEMENT" between Southwestern Iron & Steel Industries, Inc., Lessor, and Pat Feeney and Associates, Lessee. This is probably the original lease which you did not see and by reason thereof had to make some assumptions and qualifications in your report. Hence, I made a Thermofax copy of it, which is enclosed.

The "ton" referred to seems to be a long ton, and the royalty would seem to be based on the finished product sold. However, there may be some question about that if such final product is produced off the property. Exhibits "A" and "B" referred to in the instrument were not attached to the copy in Mr. Prestridge's file.

Best personal regards.

P. S. - This may not be a copy of the lease actually signed.

Sincerely,

Ray L. Moore

Ray L. Moore

REPLY

DATE OF REPLY

REPLY TO

To: Mr. E. N. Pennebaker
P. O. Box 817
Scottsdale, Arizona

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El Paso, Texas

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Best personal regards.

Sincerely,

Ray L. Moore

P. S. - This may not be a copy of the lease already supplied.

REPLY

DATE OF REPLY

REPLY TO

$TiO_2 = 1.5\%$

$P = 0.04$

40 kW hours per ton iron out of the furnace

400 kW/H per ton of steel

ONLHEAD NOTES

Strickland

Valley Nat

Bank Bldg

Orig Agree.

1st 10^6 tons

50¢ up to 700,000

700,000

Then 1 oc per

Ton

43,000 acres

13,000 acres
of which is
State Land

OWLHEAD IRON DEPOSITS

PINAL COUNTY, ARIZONA

September, 1960

E. N. PENNEBAKER
CONSULTING GEOLOGIST
SCOTTSDALE, ARIZONA

Excerpts From

WESTERN-KNAPP ENGINEERING CO. REPORT

Owlhead Iron Deposits

Pinal County, Arizona

May 25, 1960

CONCLUSIONS

1. The costs estimates show the following cost/ton of concentrate:

Concentrate Production Rate TPD	1000 Wet	1000 Dry	400 Wet	400 Dry	150 PILOT Wet
Treatment Cost	$3.67	$3.67	$4.5225	$4.52	$8.43
Haulage Cost	1.44	1.44	1.44	1.44	1.44
Depreciation & Interest	1.3827	1.27	1.8878	1.80	5.54
Total Cost	$6.4978	6.38	7.8503	7.76	15.41

   a. While the dry plant shows a slightly lower total cost reflecting the least capital costs, treatment costs including the operating costs, labor and power are virtually the same for wet and dry cleaning plants.

   b. The 1000 tpd wet cleaning plant requires the expenditure of about $370,000 for al7 mile water line which is not required for the 1000 tpd dry cleaning plant. The increased costs of the ball mills and dryer for the dry cleaning plant just about equal the costs of the water line.

2. The costs shown above are for the recovery of 71 pounds of iron (Fe) per ton of ore treated. At the present prices quoted for iron ore the 1000 tpd treatment plant appears economically justified on the assumption the ore body contains 71 pounds of recoverable iron (Fe) per ton of ore. I wish to emphasize that an extended sampling program is required to determine the actual amount of magnetic iron present in the average ore body. The sampling and testwork conducted during March and April 1960 established this figure of 71 pounds of iron as the probable recovery possible for the 27,000 tons of ore treated. The sampling of this tonnage appears to be reliable. No attempt was made to thoroughly sample other parts of the ore body.

3. There does not appear to be any technical or mechanical problem related to treating the ore by the flowsheet 660-1G with final wet cleaning, except the possibility of wet ore during rainy periods. This water in the ore can and has, caused blinding of 5 mesh screens. Proper mining techniques can provide for draining any particularly wet ore in place.

   With our present information concerning the occurrence of the ore, size distribution and moisture content, screening at 1/4" ahead of the rough magnetic separation is readily accomplished. The minus 1/4" undersize from the screens even though damp is amenable to treatment as outlined on flowsheet 660-1G, with final wet cleaning.

Conclusions (Cont'd)

4. We have insufficient information to predict if the magnetite can be concentrated dry to give less than 1.0% TiO_2 in the finished product.

   Wet final cleaning on laboratory scale has demonstrated that all the ores investigated can be concentrated to give a premium grade product containing from 0.54 to 0.91% TiO_2. Other impurities such as As, Cu, Ni, Pb, Zn, are virtually all rejected by the wet cleaning methods. Phosphorous is present to the extent of 0.05% and S to the extent of 0.01%.

   The grade of iron in the concentrates made on laboratory scale wet cleaning varied from 69.0 to 70.0% Fe. TiO_2 as above, and SiO_2 and Al_2O_3 constitute the balance with a ratio of SiO_2/Al_2O_3 of about 4/1.

5. A few samples of ore taken from various different locations of the ore deposit all showed virtually the same chemical and physical characteristics. All were amenable to treatment by the methods outlined in this report with overall recovery and grade as outlined above.

6. Wet cleaning of the magnetic concentrates would not be required provided a market is found for concentrates containing between 2% and 3% TiO_2.

   Dry cleaning without fine grinding will produce an iron concentrate containing 2-3% TiO_2 and up to 66% Fe. A considerable saving in treatment costs could be made if a market is developed for concentrates containing 2-3% TiO_2.

7. The optimum production rate of concentrates has not been accurately established but it appears to be in the order of 1000 tons per day.

1000 TPD

SELLING PRICE FOR Fe CONCENTRATES DELIVERED
at Florence, Arizona

WET CLEANING

	PRICE PER SHORT TON OF CONC.
Concentrate Haulage	1.4400
Treatment Costs	3.6751
Profit Desired before Income Tax	2.0000
Sub Total	7.1151
Amortization and Interest	1.3827
Proposed Price	8.4978

400 TPD
WET CLEANING

Concentrate Haulage	1.4400
Treatment Cost	4.5225
Profit Desired Before Income Taxes	2.0000
Sub Total	7.9625
Depreciation, Interest and Amortization	1.8478
Proposed Price	9.8103

Indicated Reserves

Metallurgical studies indicate that approximately 18 tons of 6% gravel must be mined and processed to obtain one ton of magnetic concentrate assaying 60% metallic iron.

Using a calculated weight of 3287 pounds per dry bank yard and assuming a metallurgical recovery of 80%, this would be equivalent to 10.95 bank yards per ton of 60% concentrate.

To obtain the equivalent of one ton of concentrate, an area of 296 square feet would have to be excavated to a depth of one foot. (10.95 x 27 cubic feet per cubic yard). On this basis, one square mile contains 94,000 tons of concentrate-equivalent for each foot of depth (5280 feet squared and divided by 296). From this, the following table has been prepared. Note that these are "order-of-magnitude" figures only and are subject to revision depending on TiO_2 content and on product specifications regarding contained TiO_2. Also, the accuracy of these figures is commensurate with the accuracy of the sampling program recently conducted by the client.

INDICATED TONS OF 60% CONCENTRATE PER SQUARE MILE

DEPTH IN FEET	TONS
1	94,000
5	471,000
10	942,000
20	1,884,000
40	3,768,000
60	5,652,000

OWLHEAD IRON DEPOSITS

PINAL COUNTY, ARIZONA

Submitted to Mr. M. R. Prestridge

September 7, 1960.

By E. N. Pennebaker

E. N. PENNEBAKER

TABLE OF CONTENTS

OWLHEAD IRON DEPOSITS

PINAL COUNTY, ARIZONA

INTRODUCTION

An extensive occurrence of magnetite-bearing sands and gravels is found along U. S. Highway 80 between Tucson and Florence. This is approximately 45 miles northwest of Tucson and 25 miles southeast of Florence, where there are Southern Pacific Railroad connections arrived at over paved highways. The nearest railroad line, however, is at Red Rock, some 15 miles to the southwest, presently reached by a very poor dirt road. The town of Coolidge, near the Gila River and some 12 miles southwest of Florence, is a possible industrial site also served by the Southern Pacific Railroad.

A branch line of El Paso Natural Gas Company crosses the property, and electric power is also available.

The writer made a very brief inspection of a small part of this magnetite-bearing placer deposit on August 3, 1960, in company with Messrs. J. D. Madaras, Marnel Lindekugel and Pace Foster. This quick viewof the property was supplemented by study of two comprehensive reports. One of these, dated August 20, 1957, is by Mr. O. A. Sundness, an eminent iron mining engineer of many years' experience. This report covers shallow drill hole exploration of a small fraction of the magnetite-bearing ground, metallurgical testing of the samples, and an estimate of the tonnage revealed by this drilling.

A second available report is by Western-Knapp Engineering Company of San Francisco, dated May 25, 1960. This presents a study of metallurgical tests, economic factors, and plant design. It is based on test work by this company and results of pilot plant operations.

The following remarks are largely based on these reports and on discussions with Messrs. Madaras, Lindekugel, Foster and Sundness.

PROPERTY

At the time of the Sundness report (August 20, 1957), the property was stated to consist of 4,160 acres made up of sections 1, 2, 3, 4, 5 and 12, along with the north ½ of Section 11, in T8S; R12E Gila and Salt River Base and Meridian.

We are now advised that the property has been expanded to include all of T8S; R12E (some 23,000 acres) plus other adjacent holdings of about equal amount to give a total of around 43,000 acres, or about 70 square miles. The property now is said to be situate in Townships 7 and 8 South, Ranges 11, 12 and 13 East.

The writer was informed that this ground is held as unpatented association placer claims, of which 13,000 acres are covered by claims on State Land. This imposes a considerable annual financial burden for assessment work, the actual amount depending upon the precise number of claims involved. Probably this is in the neighborhood of not less than $20,000 to $25,000.

It is the writer's understanding that these claims are held by Southwestern Iron and Steel Industries, Inc., which corporation has recently leased these to Patrick Feeney and associates under the terms of the Supplement Agreement, a copy of which accompanies this report.

GEOLOGY

The "ore" in the area of interest consists of magnetite-bearing sand and gravel. It makes up an alluvial plain that is traversed by several large dry washes whose general course is westerly.

The material containing the magnetite is an unconsolidated, cross-bedded alternation of fine sand and fairly coarse gravel. As described by Sundness the magnetite was deposited "in a non-uniform and irregular manner with worthless, slightly moist.....silt, sand and gravel....." Magnetite occurs in rich streaks, layers and lenses where it is "dry, high grade, and free running.....", making it very difficult to obtain an accurate sample. The magnetite is everywhere fine-grained. Pebbles in the gravel seldom exceed four inches in diameter.

The source area lies to the east, where mountains are composed of granite and schist that contain very minor amounts of magnetite. This has been freed by erosion and rock decomposition and carried westerly where it was concentrated and deposited in the area of interest. Here it occurs as irregular small bodies in sand and gravel in amounts that give a general average iron content of about 5% to the mixture, and the mixture is such that the entire body must be mined in order to win the magnetite.

One troublesome feature is the irregular cementation of parts of the sand and gravel by a limy material called "caliche".

As a result of his sampling procedure, Sundness advises that much of the ground sampled is of a hard, cemented nature. In addition to this, there is evidently a local, roughly horizontal hard cementation by caliche. This is reported from depths as

shallow as 15 feet. The extent of its development in the area has not been determined.

Sundness reports that the magnetite-bearing sands are very dirty where encountered away from the washes. These impurities consist of attached particles of quartz and feldspar, and the magnetite grains are coated with earthy limonite no doubt derived by oxidation of the magnetite grains. Because of this a considerable amount of iron is lost in the treatment process, and the extent and variation of this contamination at depth has not been determined.

SUNDNESS' REPORT
EXPLORATION AND SAMPLE PROCESSING

EXTENT

The Sundness exploration campaign covered about 10 square miles where 57 holes were drilled, all but one to a depth of 28 feet, and generally sampled to a depth of 25 feet. These holes were located at $\frac{1}{8}$ mile intervals on a grid 2 miles wide and running for 5 miles to the east. In addition there are 13 other holes drilled at random locations on the southwest.

DRILLING AND SAMPLING

It is evident that great care was exercised in the drilling and sampling of these holes under Mr. Sundness' supervision. Holes of 40-inch diameter were bored and then cased with slotted iron culverts, the samples being cut through these slots to prevent salting. The actual sample cutting was performed by a man lowered into the hole on a bosun's chair.

Sample intervals of 5 feet were employed, giving a sample volume of .555 cubic feet.

SAMPLE TREATMENT

Screening

The entire sample was weighed and then was put over a 6-Mesh screen. In this manner the coarser material, rarely four inches or more in diameter was discarded. The amount of material thus eliminated was determined by weight to be the following. This is a general average for the entire area tested.

	6-Mesh Oversize	6-Mesh Undersize	Total
Average	41.1% @ 3.03 % Fe	58.9% @ 6.53 % Fe	100.00 @ 5.09% Fe
High	44.7% @ 3.50 "	61.0% @ 6.96 "	
Low	39.0% @ 2.96 "	55.3% @ 7.81 "	

Thus about 40% of the material was eliminated from further handling. This reject contains a substantial amount of iron that can be recovered, but it has not yet been established that it can be done at a profit.

Density Determination

The weight per cubic foot of material in place was estimated to be as follows:

	Cu. Ft.
Average	120 lbs.
High	135 lbs.
Low	100 lbs.

It is stated that the density varies more with the physical characteristics of each 5-foot sample than it does with the iron content.

From the foregoing, Mr. Sundness derived the following general averages:

18.66 cu. ft. in place equals 1 long ton

16.66 " " " " " 1 short ton

There are 1.45 long tons in each cubic yard

There are 1.62 short tons " " " "

Moisture Content

The moisture content of the 6-Mesh undersize was found to be generally low, the average being 2.0%.

Rough Magnetic Recovery

The 6-Mesh undersize material was dried in the University of Arizona School of Mines laboratory. It was then subjected to dry magnetic separation to produce a "Dirty Concentrate" containing, if possible, all of the magnetic material in the 6-Mesh undersize. This gave the following results for the 10 square miles tested:

6-Mesh Undersize

	Magnetic Fraction	Non-Magnetic Fraction	Total
Average	13.8% @ 28.17 % Fe	86.2% @ 3.09 % Fe	100 @ 6.53 % Fe
High	16.4% @ 24.46 "	88.8% @ 3.23 "	
Low	11.2% @ 26.21 "	83.8% @ 3.36 "	

From this we determine that, on the average, 8.13% (13.8% x 58.9%) by weight of the total material in place goes into the "dirty magnetic concentrate". It will be noted that here we have a very substantial loss of non-magnetic iron (which has been determined to be in the form of limonite).

Further Grinding and Magnetic Separation

The "dirty concentrates" were ground to 80 and 150 mesh, and the products were further separated by the wet magnetic method, with the following average results for the total area tested.

Recovery From 80-Mesh Grind of the "Dirty Concentrates"

	Magnetic Concentrate Recovery	% TiO_2	% P	% S
Average	35.5% @ 65.68 % Fe	1.48	0.072	0.009
High	41.1% @ 66.62 "	2.00	0.084	0.028
Low	31.4% @ 64.74 "	1.01	0.063	0.006

From which we derive: 35.5% x 8.13% is 2.89% recovery of iron from total sand and gravel dug.

Recovery from 150-Mesh Grind of Dirty Concentrates

	Magnetic Concentrate Recovery	% TiO_2	% P	% S
Average	34.2% @ 67.18% Fe	0.86	0.047	0.007
High	38.4% @ 68.06% "	1.08	0.072	0.011
Low	28.0% @ 66.35% "	0.50	0.034	0.005

From which we derive: 34.2% x 8.13% is 2.78% recovery of iron from total sand and gravel dug, but the amount of contained titanium and phosphorus has been substantially lowered.

APPROXIMATE TONNAGE

Mr. Sundness states in his report (page 14), "With drill holes spaced ½ mile apart and samples taken to only 25 foot depth in this 10 square mile area, no accurate estimate of recoverable magnetite can be made. However, since some approximate figure must be developed", he arrives at the following approximation as a yard stick:

1 acre contains	43,560	sq. ft. of sand in place
to a 25 ft. depth	1,089,000	cu. ft. " " " "
@ 120 lbs/cu. ft.	130,680,000	lbs. " " " "
2240 lbs/long ton	58,339	tons " " " "
@ average magnetic recovery, as derived, 2.9%	1,692	tons magnetite @ 65% Fe
on 40 acres	67,680	" " " "
on 640 acres (1 sq.mi.)	1,082,880	" " " "
Area sampled (10 sq.mi.)	10,828,800	" " " " to 25 ft. depth

In other words, this approximation indicates about 1 million tons of recoverable magnetite assaying 65% Fe for each square mile to a depth of 25 feet, based on the average magnetic recovery of 2.9%.

With a daily production of 1,000 tons of concentrate per day this amounts to a life of about 30 years.

A POSSIBLE OPEN PIT AREA

Mr. Sundness has selected an area in the southerly part of the 10 square mile area tested as being richer than the average and suitable for an open pit. The estimate here is for a recovery

of 4.36% of magnetite vs. the general average of 2.9% (or about 97½ vs. ~~62½~~ 65 lbs. recoverable magnetite per long ton of sand and gravel in place). He estimates that this richer section will provide about 8 million tons recoverable magnetite from 5 square miles to a depth of 25 feet. At production rate of 1,000 tons per day of product, this would last for about 24 years.

SUNDNESS CONCLUSIONS

These are as follows:

1. His study has proved that this placer deposit contains a magnetite content of varying amounts, which can be processed by fine grinding and wet magnetic separation into a very desirable product with no deleterious components.

2. The continuity at depth has not been proved below 25 feet, but one hole that goes to 43 feet shows that iron units from 25 to 43 feet were nearly double the units from 0 to 25 feet.

3. No local supply of water has yet been developed.

4. It may be possible to recover some iron from the screened oversize, and tests should be made to determine the economic feasibility of treating this fraction.

5. An economic study should be made of the most desirable separation point in the screening operation.

WESTERN-KNAPP REPORT

Western-Knapp Engineering Company of San Francisco issued a comprehensive report under date of May 25, 1960. This presents a study of metallurgical tests, economic factors, and plant design. This report was available to the writer for a short time only, and the following conclusions and excerpts were taken from it.

The locality tested was apparently in the westerly part of the higher grade area pointed out by Mr. Sundness. Here Western-Knapp obtained a recovery of 71 pounds of iron per (short?) ton of ore treated, and its figures are based on this amount, whereas the Sundness general average figures are based on 2.9% recovery or 65 pounds of magnetite (47 pounds of metallic iron) per long ton. Consequently the Western-Knapp reserve estimate per square mile is much larger than the Sundness figure.

The Western-Knapp conclusions are quoted as follows:

1. The cost estimates show the following cost/ton of concentrate:

Concentrate Production Rate TPD	1000 Wet	1000 Dry	400 Wet	400 Dry	150 PILOT Wet
Treatment Cost	$3.67	$3.67	$4.5225	$4.52	$8.43
Haulage Cost	1.44	1.44	1.44	1.44	1.44
Depreciation & Interest	1.3827	1.27	1.8878	1.80	5.54
Total Cost	$6.4978	6.38	7.8503	7.76	15.41

a. While the dry plant shows a slightly lower total cost reflecting the least capital costs, treatment costs including the operating costs, labor and power are virtually the same for wet and dry cleaning plants.

b. The 1000 tpd wet cleaning plant requires the expenditure of about $370,000 for a 17 mile water line which is not required for the 1000 tpd dry cleaning plant. The increased costs of the ball mills and dryer for the dry cleaning plant just about equal the costs of the water line.

2. The costs shown above are for the recovery of 71 pounds of iron (Fe) per ton of ore treated. At the present prices quoted for iron ore the 1000 tpd treatment plant appears economically justified on the assumption the ore body contains 71 pounds of recoverable iron (Fe) per ton of ore. I wish to emphasize that an extended sampling program is required to determine the actual amount of magnetic iron present in the average ore body. The sampling and testwork conducted during March and April 1960 established this figure of 71 pounds of iron as the probable recovery possible for the 27,000 tons of ore treated. The sampling of this tonnage appears to be reliable. No attempt was made to thoroughly sample other parts of the ore body.

3. There does not appear to be any technical or mechanical problem related to treating the ore by the flowsheet 660-1G with final wet cleaning, except the possibility of wet ore during rainy periods. This water in the ore can and has, caused blinding of 6 mesh screens. Proper mining techniques can provide for draining any particularly wet ore in place.

With our present information concerning the occurrence of the ore, size distribution and moisture content, screening at 1/4" ahead of the rough magnetic separation is readily accomplished. The minus 1/4" undersize from the screens even though damp is amenable to treatment as outlined on flowsheet 660-1G, with final wet cleaning.

4. We have insufficient information to predict if the magnetite can be concentrated dry to give less than 1.0% TiO_2 in the finished product.

Wet final cleaning on laboratory scale has demonstrated that all the ores investigated can be concentrated to give a premium grade product containing from 0.54 to 0.91% TiO_2. Other impurities such as As, Cu, Ni, Pb, Zn, are virtually all rejected by the wet cleaning methods. Phosphorous is present to the extent of 0.05% and S to the extent of 0.01%.

The grade of iron in the concentrates made on laboratory scale wet cleaning varied from 69.0 to 70.0% Fe. TiO_2 as above, and SiO_2 and Al_2O_3 constitute the balance with a ratio of SiO_2/Al_2O_3 of about 4/1.

5. A few samples of ore taken from various different locations of the ore deposit all showed virtually the same chemical and physical characteristics. All were amenable to treatment by the methods outlined in this report with overall recovery and grade as outlined above.

6. Wet cleaning of the magnetic concentrates would not be required provided a market is found for concentrates containing between 2% and 3% TiO_2.

Dry cleaning without fine grinding will produce an iron concentrate containing 2-3% TiO_2 and up to 66% Fe. A considerable saving in treatment costs could be made if a market is developed for concentrates containing 2-3% TiO_2.

7. The optimum production rate of concentrates has not been accurately established but it appears to be in the order of 1000 tons per day.

(End of quotation)

The following excerpt gives the production cost of magnetite concentrate plus a profit of $2.00 per short ton, as derived by Western-Knapp. The quotation is as follows:

SELLING PRICE FOR Fe CONCENTRATES DELIVERED
at Florence, Arizona

1000 TPD

WET CLEANING

	PRICE PER SHORT TON OF CONC.
Concentrate Haulage	1.4400
Treatment Costs	3.6751
Profit Desired before Income Tax	2.0000
Sub Total	7.1151
Amortization and Interest	1.3827
Proposed Price	8.4978

400 TPD

WET CLEANING

Concentrate Haulage	1.4400
Treatment Cost	4.5225
Profit Desired before Income Taxes	2.0000
Sub Total	7.9625
Depreciation, Interest and Amortization	1.8478
Proposed Price	9.8103

(End of quotation)

To the above should be added the royalty of $0.50 to $1.00 per ton of concentrates.

The following excerpt from the Western-Knapp report gives the indicated tons of recoverable concentrate in a square mile. This is based on results obtained in the area tested by Western-Knapp, which is richer than the general average obtained by Sundness. Also the grade of concentrate is 60%, compared to the 65% used by Sundness, and apparently the tonnage is expressed

as short tons. The quotation is as follows:

INDICATED RESERVES

Metallurgical studies indicate that approximately 18 tons of 6% gravel must be mined and processed to obtain one ton of magnetic concentrate assaying 60% metallic iron.

Using a calculated weight of 3287 pounds per dry bank yard and assuming a metallurgical recovery of 80%, this would be equivalent to 10.95 bank yards per ton of 60% concentrate.

To obtain the equivalent of one ton of concentrate, an area of 296 square feet would have to be excavated to a depth of one foot. (10.95 x 27 cubic feet per cubic yard). On this basis, one square mile contains 94,000 tons of concentrate-equivalent for each foot of depth (5280 feet squared and divided by 296). From this, the following table has been prepared. Note that these are "order-of-magnitude" figures only and are subject to revision depending on TiO_2 content and on product specifications regarding contained TiO_2. Also, the accuracy of these figures is commensurate with the accuracy of the sampling program recently conducted by the client.

INDICATED TONS OF 60% CONCENTRATE PER SQUARE MILE

DEPTH IN FEET	TONS
1	94,000
5	471,000
10	942,000
20	1,884,000
40	3,768,000
60	5,652,000

(End of quotation)

PENNEBAKER COMMENTS

Based on the foregoing reports, various discussions, and the writer's very brief inspection of the ground, the following comments are offered:

GENERAL

There is a vast amount of iron in the area under consideration, but exploration to date is inadequate to prove the extent, depth, tonnage, and average recoverable iron content of the entire deposit.

DEPTH

Drilling and sampling in a 10 square mile tract of the 70 square miles controlled has been to a depth of 25 feet, except for one hole to 43 feet. The latter showed iron values much improved at depth, but the results of this one hole do not yet warrant extension throughout the entire property.

At present a deep hole in search of water is being drilled by a Government agency a short distance off the northeast side of the highway. To a depth of over 400 feet this shows substantial amounts of magnetite, but the water well samples are not suitably taken to provide an accurate estimate of the amount of magnetite in place at depth. Below 400 feet in this hole, magnetite persists but is associated with somewhat more clay. Iron was still abundant in the bottom of the hole on August 30, which was at about 650 feet. The results of this hole are generally encouraging, but how far laterally its results can be projected is problematical.

In about 1949 Magma Copper Company drilled a number of deep holes in this area in search of copper. It is rumored that a considerable thicknessof iron-bearing sand and gravel was cut by these holes.

GRADE

The Sundness drilling showed the crude sand and gravel to average 5.09% iron (Fe) in the area tested, of which 2.9% of the total was contained magnetite that was recoverable. About half of the tract, amounting to 5 square miles, was richer, with an estimated recoverable magnetite content of 4.36%. The Western-Knapp results are based on a 6% (Fe?) gravel from which 71 pounds of iron per

(short?) ton were recovered.

The above make it evident that there are substantial variations in the recoverable magnetite content of the sand and gravel in various nearby areas, and that more drilling is needed to outline the tracts where operations might be profitable. In discussions the writer was advised that several promising areas are evident by visual examination and that certain dry washes are locally far richer than the average. There is also the suggestion that the magnetite may be replenished in a "mined out" wash by subsequent rainwash and flash floods.

FURTHER EXPLORATION

It is obvious that the drilled area needs more and deeper holes at closer spacing and that drilling should be carried into adjacent areas. The annual expenditure for assessment work can be used to advantage to help accomplish this.

The drilling exploration technique employed by Mr. Sundness is admirably suited to this testing, but it is undoubtedly expensive and the depth to which this type of sampling can be carried is problematical.

It might be desirable to drill experimental auger holes along-side the Sundness holes and alongside operating excavations in order to try to develop an empirical factor relating the quickly and cheaply taken auger samples to recoverable magnetite.

Regardless of the type of exploration employed, it should be under Mr. Sundness' experienced direction.

RESERVES

There is considerable difference in the amount of recoverable magnetite in an average square mile as estimated by Mr.

Sundness and by Western-Knapp, but the bases of their estimate are somewhat different in a number of respects. The range is from about 1 million to 2 or more million tons of recoverable concentrate per square mile to a depth of 25 feet, and the problem is to select the richer tracts for initial production.

SCALE OF OPERATIONS

Western-Knapp concluded that at present prices quoted for iron ore, the 1000 tons per day treatment plant appears economically justified on the assumption that the ore body contains 71 pounds of recoverable iron (Fe) per (short?) ton of sand and gravel in place.

Consequently a pilot plant type of operation at a much smaller concentrate output per day will necessitate a richer magnetite-bearing sand for a profitable operation. Feeney, Lindekugel and associates believe such is available at certain localities.

HAZARDS

There are two hazards to watch out for, neither of which can be properly appraised at present.

One is the amount of ground cemented irregularly at depth by hard caliche. An abundance of this material could seriously interfere with low-cost mining.

The other is the amount of oxidization of the magnetite grains laterally and at depth, which would affect the iron recovery by the magnetic process.

TITANIUM CONTENT

The writer was advised that the titanium content can be reduced satisfactorily by sufficient grinding and dry magnetic concentration.

PAST PRODUCTION

Pilot plant recovery operations have recently been conducted at the property and these have produced a substantial pile of good-looking magnetic iron concentrates.

BUSINESS ARRANGEMENTS

Feeney, Lindekugel and associates have recently leased the property from Southwestern Iron and Steel Industries, Inc., under the terms of an Agreement and a Supplement Agreement. The writer has not seen a copy of the original Agreement, but a copy of the recently executed Supplement Agreement is attached as an appendix to this report. As provided by the two agreements, it is the writer's understanding that the royalty paid by Feeney, Lindekugel and associates shall be 50 cents per ton of concentrates for the first 200,000 tons and then $1.00 per ton from there on out. (The original Agreement should be checked to determine whether this is on a long ton or short ton basis, and to make sure that it is based on concentrate production of a specified grade.)

Feeney, Lindekugel and associates propose to produce magnetite concentrates from the property and to reduce them to sponge iron by the so-called Madaras process. For this purpose they have contracted with Julius D. Madaras and Madaras Corporation for use of the process and for a certain ore reduction pilot plant now at Longview, Texas. A copy of this agreement (which was signed by Lindekugel and Madaras in the writer's office on September 1, 1960) is attached as an appendix to this report.

It will be noted that as a condition of this agreement, a corporation to be set up by Feeney, Lindekugel and associates

shall have an exclusive right to license the use of the Madaras process in Arizona (only), provided:

1. Southwestern Iron and Steel Industries, Inc. assigns its license to use and sub-license the Madaras process to this corporation, and
2. That, after two years, only as long as the new corporation "expands production and adds facilities..... .....as long as a profitable market develops for sponge iron or pig iron or steel".

This requirement of continuous expansion could prove burdensome and should be modified.

PENNEBAKER CONCLUSIONS

It is difficult to analyze the property and the project at the present stage of its development. The writer is generally optimistic but inclines to the view that a small-tonnage pilot plant for concentrate production may turn out to be a high-cost operation.

Nevertheless, the showing is so large that it warrants adequate exploration and investigation.

E. N. Pennebaker

E. N. PENNEBAKER

Scottsdale, Arizona
September 7, 1960

SUPPLEMENT AGREEMENT

BETWEEN

SOUTHWESTERN IRON AND STEEL INDUSTRIES, INC.

AND

PATRICK FEENEY AND ASSOCIATES

DATED JULY 14, 1960.

SUPPLEMENT AGREEMENT

THIS SUPPLEMENT AGREEMENT made and entered into the 14th day of July, 1960, by and between SOUTHWESTERN IRON AND STEEL INDUSTRIES, INC., an Arizona corporation, lessors, and PATRICK FEENEY and associates, hereinafter called lessees, WITNESSETH:

WHEREAS, the lessors and the lessees entered into a lease agreement on or about the 30th day of December, 1959, a copy of which is attached hereto and made a party hereof; and,

WHEREAS, the lessees have presented ample proof that they are unable to fulfill and perform all the terms and conditions of said lease agreement due to the critical financing problems; and,

WHEREAS, the lessees desire certain modifications and amendments to said lease agreement so that the financing problems can be solved; and,

WHEREAS, the lessors are willing to make said modifications and amendments based upon certain additional consideration being forth coming.

NOW THEREFORE, it is hereby covenanted and agreed as follows:

1. The lessor hereby covenants and agrees to remove all minimum royalties and production schedules and set forth in paragraph two (2) B and C of the original lease agreement mentioned heretofore.

2. Both parties hereto covenant and agree that all of the State of Arizona mineral leases or unpatented mining claims mentioned in the original lease agreement and clearly set forth in the recitals on page one (1) be delivered to an escrow agent and remain in escrow until such time as the lessee has built and is maintaining a 500-ton-per-day Madaras reduction plant producing not less than 500 tons per day of sponge iron in which the total F. E. is ninty-five per cent (95%) reduced to metallic iron, using

the lessor's ore exclusively. Lessee further agrees that the above mentioned plant shall reach the 500-ton-per-day capacity in not less than five (5) years from the date of this agreement. The purpose of the escrow is merely to maintain expenses at the lowest level.

3. The lessor hereby covenants and agrees that in the event the lessee presents sound and definite evidence that it is necessary to have all leases assigned to them in order to obtain the financing necessary in their mining program, that they will release the escrow and assign and deliver unto the lessee all leases necessary to acquire the financing desired. The expenses involved in this assignment is being born and paid for by the lessee.

4. The lessor hereby covenants and agrees to reduce the minimum royalties or payments due to the lessee from the lessor as set forth in paragraph two (2), section B on page 4, from TWO DOLLARS ($2.00) per ton to ONE DOLLAR ($1.00) per ton for each ton in excess of one million (1,000,000) tons. All royalties or payments due from the lessee to the lessor belwo the one million (1,000,000) ton level shall be payable on the terms and conditions of the original agreement.

5. The lessees hereby covenant and agree to sublicense to lessees the exclusive use of the Madaras process within the State of Arizona subject to and conditioned to any and all terms, restrictions, and covenants contained in that certain agreement between BLACK MINING & EXPLORATION COMPANY and JULIUS D. MADARAS executed on the 24th day of September, 1957 and assigned to the lessors.

6. The lessees hereby covenant and agree to commence within sixty (60) days from the date of this agreement to erect and construct a Madaras reduction plant having a capacity of not less than fifty (50) tons per day of sponge iron using the lessor's ore exclusively and to be completed and in production on or before eight (8) months thereafter.

7. The lessees hereby covenant and agree that they will expand production and add facilities including melting equipment as rapidly as a profitable market develops for sponge iron or pig iron or steel and that they further agree that within five (5) years from date of this agreement, the plant mentioned heretofore shall have an output capacity of not less than 500 tons per day. The lessees further agree that ten (10) years from date of this agreement they will pay and guarantee a minimum royalty to the lessee of not less than FIVE HUNDRED THOUSAND DOLLARS ($500,000.00) per year payable in semi-annual installments or by agreements of the parties hereto. In the event the lessees are unable to pay the above mentioned sum they hereby covenant and agree to return and reassign at their expense seventy-five per cent (75%) of all leases or unpatented mining claims mentioned heretofore and the Madaras process with the exception that the lessees may select the twenty-five per cent (25%) to be retained by them plus having the right to use the Madaras process on that property using the lessee's ore exclusively.

8. The lessee hereby covenants and agrees that they shall pay to the lessor the sum of FIVE HUNDRED DOLLARS ($500.00) per month to commence on August 1, 1960. This sum is being applied on the purchase price of the equipment located on the lessor's property with a total purchase price to be agreed upon by the parties hereto or as advanced royalties of the lessee's option.

THIS SUPPLEMENTAL AGREEMENT is subject to and conditioned upon the approval of two-thirds (2/3) of the stockholders of SOUTHWESTERN IRON & STEEL INDUSTRIES.

IN WITNESS WHEREOF, the lessor has caused this agreement to be executed by its duly-authorized president, and PATRICK FERNEY and MARNEL LINDEKUGEL have executed this agreement on behalf of themselves and their associates as lessee as of the day and year

first here and above written.

PATRICK FEENEY - LESSOR

MARNEL LINDEKUGEL and ASSOCIATES

SOUTHWESTERN IRON & STEEL
INDUSTRIES, INC.

By HARLEY W. GRAFF

AGREEMENT

THIS AGREEMENT made the 14th day of July, 1960, by and between SOUTHWESTERN IRON & STEEL INDUSTRIES, INC., first party, and JULIUS D. MADARAS, second party, WITNESSETH:

WHEREAS, second party will benefit materially if first party enters into the above contract with PATRICK H. FEENEY and MARNEL LINDEKUGEL; and,

WHEREAS, first party will benefit materially if paragraph two (2) page two (2) in that certain agreement by and between BLACK HILLS MINING & EXPLORATION COMPANY and JULIUS D. MADARAS entered into on the 24th day of September, 1957, is modified whereby second party does not have a continuing fifteen per cent (15%) of SOUTHWESTERN IRON & STEEL INDUSTRIES INC. capital stock issued and outstanding; and,

WHEREAS, second party hereby agrees that the consideration received is the consent of SOUTHWESTERN IRON & STEEL INDUSTRIES INC. to enter into the above mentioned contract.

NOW THEREFORE, it is hereby agreed as follows:

1. First party hereby covenants and agrees to enter into and execute the above mentioned contract with PATRICK H. FEENEY and MARNEL LINDEKUGEL.

2. Second party hereby agrees and covenants to relinquish all right, title, and interst that he may have to any and all capital stock of first party with the exception of the capital that is now within his possession.

3. Both parties hereby agree and covenant that this agreement is conditioned upon the following:

A. the execution of the supplemental agreement by and between SOUTHWESTERN IRON & STEEL INDUSTRIES INC. and PATRICK H. FERNEY and MERNEL LINDERUGEL.

B. the acquisition of SOUTHWESTERN IRON & STEEL INDUSTRIES INC. board of directors approval and stockholders approval

C. the erection of the fifty (50) ton per day plant mentioned in the supplemental agreement.

IN WITNESS WHEREOF the parties hereto have executed this agreement the day and year first above written.

JULIUS D. MADARAS

SOUTHWESTERN IRON & STEEL INDUSTRIES INC.

By_____

HARLEY B. CRAFT

MADARAS AGREEMENT

BETWEEN

PATRICK FEENEY AND MARNEL LINDEKUGEL

AND

JULIUS D. MADARAS

AND

MADARAS CORPORATION

DATED SEPTEMBER 1, 1960

This AGREEMENT made the _____day of _____, 1960, between PATRICK H. FERNEY, of Pierre, South Dakota, and MARVEL LINDEKUGEL, of Mitchell, South Dakota, first parties, JULIUS D. MADARAS, of Longview, Texas, second party, and MADARAS CORPORATION, a Delaware corporation, whose principal office is located at 3456 Penobscot Building, Detroit, Michigan, third party:

WHEREAS, first parties have leased from Southwestern Iron & Steel Industries, Inc., an Arizona corporation, hereinafter called Southwestern, for a term of 98 years commencing in 1959, certain mineral leases and mining claims situate in Townships 7 and 8 South, Ranges 11, 12 and 13 East, Gila and Salt River Base and Meridian, Pinal County, Arizona, from which first parties propose to produce iron ore concentrate;

AND WHEREAS, second party has invented and developed a process, hereinafter called the Madaras process, for reducing to sponge iron the type of iron ore concentrate which first parties propose to produce, using natural gas as fuel;

AND WHEREAS, second party controls the disposition of certain machinery and equipment at Longview, Texas, constituting the pilot plant in which the Madaras process was developed, hereinafter called the Longview equipment;

AND WHEREAS, third party holds the United States patents pertaining to the Madaras process, and has the right to license the use of the process in Arizona, subject only to a non-exclusive license granted to Southwestern by agreement dated November 30, 1957, with which first parties are familiar;

AND WHEREAS, the parties intend to move the useful parts of the entire ore reduction plant at Longview, Texas, excepting the buildings and the parts originally put up by the Madaras Steel Corporation of Texas, to the vicinity of the mineral leases and mining claims abovementioned, and reerect them there, together with such additional equipment as may be necessary, for the purpose of produ-

cing by means of the Madaras Process 50 tons/day of sponge iron from the iron ore concentrate which first parties propose to produce from said property:

IT IS AGREED:

1. First parties forthwith will negotiate with Southwestern, Inc., for an equitable adjustment of the severance royalty payable under their lease of the mining property above-mentioned, and for an assignment of Southwestern's license to use and sublicense the use of the Madaras process in Arizona. The obligations of all parties under this agreement are contingent upon the satisfactory conclusion of such negotiations within sixty days from date and notice to second party.

2. First parties will organize a corporation, hereinafter called X Corporation, with an authorized capital stock of not less than $1,000,000.00 divided into 1,000,000 shares of $1.00 par value. First parties will subscribe and pay cash for 250,000 shares at par, such cash to be paid into X Corporation as rapidly as required by the purposes of this agreement, and first parties will transfer to X Corporation their lease from Southwestern of the mining properties above-mentioned in consideration of the issuance to them of an additional 400,000 shares. Second party will cause to be transferred to X Corporation the parts of the Longview equipment selected by first parties in consideration of the issuance to him or to his order of 50,000 shares, and payments to him or to his order of the additional sum of $25,000.00, such additional payment to be made, however, only as and when earned from the operation of the proposed ore reduction plant. For other good and valuable consideration, receipt of which is hereby acknowledged by first parties, X Corporation shall issue to second party or to his order an additional 50,000 shares. The Balance of the unissued authorized capital stock of X Corporation, consisting of 250,000 shares, shall be subscribed or sold for cash only, at par.

3. Third party consents to assignment by Southwestern to X Corporation of its license to use and sublicense the use of the

Madaras process in Arizona, and agrees that it will not license the process for use in Arizona, by any one other than X Corporation for a period of two years from date, nor thereafter as long as X Corporation expends production and adds facilities, including melting equipment, as rapidly as a profitable market develops for sponge iron or pig iron or steel.

4. Second party will prepare adequate drawings and specifications for construction of the proposed ore reduction plant at a cost not to exceed $6,000.00, this amount, however, not to include the fees for services rendered by Julius D. Madaras, M. M. Rose and Ralph J. Fenton. Second party will be consulted in the selection of the plant site, will supervise the removal and reconditioning of the Longview equipment and the construction and initial operation of the proposed ore reduction plant, will keep accurate records of all costs and expenses and submit a monthly accounting for audit, and will submit to X Corporation for advance approval all contracts for expenditure of $1,000 or more. For such services second party will receive from first parties the consulting fee of $1,500.00 per month, payable in advance, commencing on the date of the notice specified in paragraph 1, plus his actual expenses for travel and subsistence away from Longview, Texas. The expenses and fees due to M. M. Rose and Ralph J. Fenton shall be paid by X Corporation.

5. Second party undertakes that the proposed plant will be ready to operate within eight months from the date that sufficient funds are paid into X Corporation to commence the work, and that the total cost of the completed plant, including second party's consulting fee, but excluding the cost of the plant site, ad valorem taxes, insurance, any deposits or other payments required to bring utilities to the plant site, the value of the shares issued for the Longview equipment, and any expenditures not recommended by second party, will not exceed $250,000. Delays caused by acts of God, labor trouble, failure of suppliers to meet promised delivery dates, personal illness of second party, or other causes beyong the reasonable control of second party will not be counted as part of the eight

months, and the cost limit assumes no significant increase in present labor rates, freight rates, steel prices, and quotations for fabrication and installation of equipment.

6. Second party undertakes that the completed plant, after a reasonable period for training crews and balancing the operation, will be capable of producing 50 tons per day of sponge iron in which the total Fe is 95% average reduced to metallic iron, at a cost for materials and direct labor of not more than $40.00 per long ton of sponge iron, assuming that iron ore concentrate containing 67% Fe minimum average is delivered to the plant at $8.50 per long ton, dry basis; that bentonite is delivered to the plant at $20.00 per ton; that natural gas of 1000 BTU/cu. ft. minimum is available at 35¢ per 1000 cu. ft. maximum; that electric power is available at 1¢ per KWH maximum; that no charge is made for water; and that present labor rates in the area are substantially maintained.

7. Second party pledges to first parties his 132,500 shares of Southwestern and his right to receive an overriding royalty on ore mined from the Southwestern property, and the 50,000 shares of X Corporation to be issued for the Longview equipment, as security for performance of the undertakings set forth in paragraphs 6 and 7.

8. Second party will indemnify first parties and X Corporation on account of patent infringement arising out of any part of the original ore reduction plant built for first parties; provided, however, that said obligation may be satisfied in full by transferring to the indemnitee the assets mentioned in paragraph 7.

9. X Corporation will make the proposed plant available for testing other ores upon payment of the direct cost of materials and labor plus 200%, and the plant and all operating records will be open to unlimited inspection by any person authorized in writing by second party.

10. If work on the proposed plant is stopped by reason of the failure of first parties to pay into X Corporation the cash stipulated in paragraph 2, first parties will cause the Longview equipment,

together with all additions thereto which may have been made during the progress of the work, to be reconveyed to second party free and clear of all encumbrances, or if the alternative will cause the Arizona plant site, together with all improvements, to be conveyed to second party free from encumbrances; and thereupon all rights of first parties and X Corporation to use or sublicense the use of the Madaras process, will cease and terminate.

IN WITNESS WHEREOF the parties have executed this agreement on the date first above written.

PATRICK H. PENNEY

MARNEL LINDERUGEL

JULIUS D. MADARAS

MADARAS CORPORATION

By JULIUS D. MADARAS, President

HARRISON SCHMITT
Mining Geologist
Cottage Sanatorium Road
Silver City, New Mexico

July 16, 1956

Omega Mining & Exploration Co.
516 Luhrs Bldg.
Phoenix, Arizona

Gentlemen:

I am enclosing my report and statement on the Owlhead magnetite prospect.

In order to start mining at an early date there is no doubt but that trucks and shovels would have an advantage in prompt starting and flexibility. No long belt conveyors would be needed at first, the tailing could be stacked near the mill.

A five and one half yard shovel will move up to 6000 tons a shovel shift and would require about five trucks for the shovel capacity if the haul to the mill is not over a mile. The total investment in trucks and a shovel would be around $450,000 without a shop, etc.

Yours very truly

/s/ Harrison A. Schmitt

July 14, 1956

Omega Mining & Exploration Co.
516 Luhrs Bldg.
Phoenix, Arizona

Subject: Owlhead Magnetite Prospect, Arizona

The Owlhead magnetite prospect lies principally in R12E, T8S and R11E, T8S. The area you control is covered by placer claims and is eight miles east and west by about four miles north and south. The prospect is 42 miles northwest of Tucson and lies astride highway 80-89. The nearest railroad is the Southern Pacific which is 15 miles west at Red Rock, Arizona. An electric power line and a natural gas line cross the property.

The area is an alluvial plain traversed by several large washes. The drainage is toward the west. The surface rock is largely unconsolidated, moderately-sorted, cross-bedded alluvium ranging from fine sand to coarse gravel. There apparently has been a good deal of reworking during a history of many erosional and depositional cycles. The unconformities resulting from these cycles are visible in shallow pits that have been dug. The rock material was largely derived from a granite, schist and volcanic rock terrane to the east. These rocks supplied the magnetite which is always fine grained compared with the rock particles in the gravel which may reach three inches in diameter. There is some local, layered, cementation of the gravel by caliche. This appears in depth as shallow as 15 ft. as revealed by at least two test pits, but may have poor continuity and cause only local trouble when the ground is excavated.

The magnetite is distinctly segregated in the fine sandy layers. Little to none is seen in the gravel layers. The coarse

material represents a deposition of gravel at stream velocities too great to permit the deposition of fine magnetite. The segregated magnetite layers are often relatively rich and may in cases be composed of up to 50% magnetite. Apparently the ground has been eroded andredeposited many times. The cycles of erosion and deposition have presumably increased the concentration of the magnetite to greater than the amount normally found in sands.

The preliminary drilling test pitting and surface observations have given a qualitative to rough quantitative idea of the distribution of the magnetite. After discussing the work done to date it was concluded that the best and most rapid method of sampling probably would be by drilling with an auger-type drill. To avoid handling a great deal of spoil all the material would be tested as it came out of the hole by means of a truck mounted concentration plant with screen, magnetic pully and sample cutter. The latter would be needed to cut a sample from the minus screen product. All products would be weighed and allbut the plus screen product would be analyzed for their magnetite content. Possibly a sample cut should be taken from the bailing also although the magnetite in the tailing could be arrived at indirectly.

The first problem appears to be to determine the area or areas of magnetite concentration that have the best economic possibilities. The possibilities may be narrowed down by surface observation and a few test pits and then further delimited by drilling. It is suggested that the drill holes be around 12 inches in diameter and placed on an equilateral triangle pattern at 2500 ft. intervals. When a desirable ore body is found these intervals may be reduced to 1250 ft. or less. The samples at first, at

least, should be taken at not more than three foot vertical intervals. The holes should penetrate to around 100 ft. but every seventh hole (center of the hexagon developed by the equilateral pattern) should go down to at least 200 ft. The magnetite concentrations can conceivably have formed at considerable depth, since the alluvial plain has been built over a long period of time. Possibly several test holes should go down deeper than 200 ft. to test for ore and to find water if possible.

Everything being equal, the most desirable ore body would seem to be one of some thickness (depth), say, up to a hundred feet or more and, of course, as high a grade in magnetite as possible, and with a minimum of caliche beds. In order to find the ideal situation an extensive drilling campaign would seem to be justified.

The deeper and richer the ore body the less moving about of equipment would be necessary. It may be and probably is possible to stack or return the mill tailing to those areas from which the ore has been removed. If in the beginning, however, some considerable tonnage must be stacked on the surface, some effort by drilling may be advisable to find a low grade or waste area for tailing storage.

The test drilling should penetrate through the caliche layers if they are not so thick as to make the area obviously non-commercial. Each hole should be carefully logged for caliche layers, thickness and character of the gravel and sand, water, etc.

In order to arrive at some idea of the tonnage and grade necessary to constitute a commercial operation it is no doubt worth while, even at this early stage, to make some rough estimates of probable costs. A number of methods of course are used to move large volumes of gravel. Hydraulicing and wet dredging would seem to be out of the question because of the porosity of the gravel

and sand and lack of sufficient water. Of course, if on the off chance much water is encountered at a depth at, say, not greater than 150 ft. a dredge might be feasible.

Joy loaders with an especially great width and carrying or dragging a screening, concentrating and waste disposal might be considered. The gravel could be assisted by bulldozers and a roughed-out concentrate could be pumped to a central plant for cleaning. Such an outfit might have advantages for small production such as at the beginning and/or for scavenging the rich streaks in the arroyos, etc. This would have about the same function as the dry land dredge that has been suggested. The latter, presumably, would have a greater capacity.

Probably the cheapest known method of moving large volumes of dry gravel is by dragline and next to this shovels andtrucks. The dragline should show direct costs not exceeding $.08 a ton (or $.12 a yard) including delivery to the mill by belt conveyors, and the shovels and trucks not over $.15 a ton (or $.225 a yard) if the haul to the mill is not over a mile ad does not have grades over, say, 3.5%. The tailing probably should be disposed of by belt when using either method. Belt conveyance may cost around $.03 a ton mile.

The first cost for the dragline as compared with shovels and trucks should be much less for the same capacity, but one could start on a small scale and get started very soon with, say, a 5½ yard shovel and several 30-ton trucks. The shovel would cost around $200,000 and the trucks around $50,000 apiece. Two 6o in. 3000 ft. belt conveyors would cost around $500,000.

A dragline plant which is likely to be favored for large tonnages and for a period of operation of many years would require much less labor, power and original capital than trucks and shovels. The following costs are estimated:

Mining (1,000,000 tons conc. year)	$ .05
Delivery to plant possibly by belt (?)	.03
Concentration	.20
Tailing disposal	.03
Capital charge including R.R.($2,000,000)	.0200
Overhead	.0125
Taxes	.0250
	$ .3675

One ton of magnetite concentrate would require 1.2 tons of magnetite in the equivalent head fee if the recovery is taken at 80% where a siliceous middling must be wasted to keep the silica low enough to allow for the use of cement for pelletizing.

If the concentrate is worth $11.00 F.O.B. mill, the tailing and middling loss would reduce this to $9.16 ($\frac{\$11.00}{1.2}$) in terms of value in the raw ore. This divided by $037 (the cost) gives 24.5 therefore the minimum tons of ore required to break even for one ton of concentrate. That is the concentration ratio is $\frac{24.5}{1}$. A concentrate that assays 64.0% iron is said to be possible according to tests so a mill head or ore value that assays $\frac{64.\%}{24.5}$ Fe equals 2.61% Fe which is the estimated break-even grade. This is equivalent to 3.62% magnetite so it would seem that in blocking out ore 5% or better grade of magnetite would be the target to aim for.

Besides the production of magnetite the plant should be able to make clean, sized gravel and sand as a low cost by-product. A large quantity of this should have a market in southern Arizona for road building and construction work.

A square mile of gravel that assays 3.60% Fe (5.0% magnetite) would produce 1,000,000 tons of concentrate if mined to a depth of 24 ft. One square mile foot contains about 1,000,000 tons of gravel.

/s/ Harrison A. Schmitt

Longview, Texas
August 24, 1960

Mr. M. R. Prestridge
Prestridge Lumber Co.
El Paso, Texas

Dear Bill:

It was nice to talk with you yesterday. My plane, Am. Air Flight 911, arrives in El Paso, Sunday 3:20 P.M., and I will appreciate seeing you if it will not interfere with your plans and Sunday afternoon with your family. The next plane leaves for Tucson at 4:00 P.M. but that would hardly leave us enough time to discuss anything. A later plane is at 8:45, which looks much more practical. It may be more convenient for you to meet me at the Hilton Inn and if I don't see you at the airport I will just go there directly.

Feeney and Lindekugel are planning to meet me in Tucson at Hotel Westerner Monday forenoon. Among other things, we want to choose the plant location, make agreement for power, gas and water, incorporate the company, discuss melt plant, size and type of building, moving equipment, construction of all facilities, etc. We all hope that you can participate in all these discussions from the start.

The necessary ore reserve has been sufficiently proven and easily checked. A few places showed that the recovery of 67%-69% Fe concentrate was 5% of the total weight. At many places the magnetite sand content is quite richer and improves with depth. At the above rate, the recovery is 120 tons per acre foot or 18,000 tons for 150 foot depth, which makes 10 million tons of concentrate in a section to 150 foot depth. Previous drilling data indicates that at some places the magnetic iron content more than doubles with depth and the rock bottom has not been found at 500 feet yet. We have the lease for about 70 sections of alluvial gravel, some of them probably more rich and others less, but in any case it indicates a huge reserve, possibly running into hundreds of millions of tons.

The gravel is put over a screen and magnetic concentrating belt, which gives about 50% Fe "dirty concentrate". This dirty concentrate is milled in a rod mill or ball mill to about minus 60 mesh and further concentrated magnetically. About 1½ tons dirty concentrate should give one ton final concentrate. Naturally, the material is handled twice, once in mining and second as tailings, which should be used as refill. The concentrating can be done with movable equipment to cut down the distance of hauling the gravel and tailing. In other words, roughly, about 40 tons of material has to be handled on the average to make a ton of high grade concentrate.

On the other hand, we found places where the recovery showed about 15% to 18%. This, we considered a conservative estimate. We dug holes with a pole digger without any indication of salting, then separated magnetically all the dug out gravel, each separately and weighed both the concentrates and tailings which gave us more reliable results than quartered samples. It also simulated field operations.

I would be in favor of carrying on selective mining at the beginning to cut down the cost of concentrate considerably. By the time we increase the plant capacity and make a million tons of steel or so the cost of mining on a larger scale will come down and we can probably afford a somewhat higher cost of concentrate.

I hope that from this duscussion you may be able to estimate the approximate cost and price of the concentrate. If there is no sufficient ore found for Alamogordo within a short shipping distance, this may be a source of ore. The Southern Pacific Railroad quoted $8.00 freight per short ton concentrate from Redrock, which is near the property to Houston and said it could possibly be lowered. This indicates that we could expect a $4.00 maximum rate per long ton to Alamogordo, or about $5.50 to $6.00 per long ton of iron. If necessary, you may consider this possibility if you run into difficulty in finding sufficient good ore reserve for the Alamogordo project.

With your background and experience you may have close enough estimate of the cost of making concentrate. In my contract with Feeney and Lindekugel, $8.50 per long ton of concentrate was only mentioned as a basis for guaranteeing a certain cost of sponge iron but it does not mean that Lindekugel will or can charge as much even at the beginning on a small scale operation, something

like 120 to 150 tons of concentrate per day. After meeting with you in El Paso, we discussed this question with Feeney and Lindekugel and they both agreed that the mining and concentrating have to be competitive and that the company must be operated as a regular stock company. Marnel (Lindekugel) said you would be welcome to join him in mining or concentrating, or both, or shipping the concentrate, or handling any of it, whatever may work out to be practical. He realizes that he will not control the company and is not after an unreasonable mining contract.

This brings us to the question of where will you fit into the company. This question is hard to answer except that any time the logic of the situation and circumstances will develop and determine it as the whole program develops, grows and changes.

At this initial step you will be on the board just like the others and will participate in major decisions and control of the company. If you want to take a hand in the construction of the initial plant that is grand. Then, we have to organize and operate the plant, take care of the sales and all company business.

As far as I am concerned, I would not want to operate the plant but only advise and step in when necessary. Certainly, Feeney is not the one, neither is Lindekugel, though he could run an operating company with some help. He has his own extended operation.

But this small plant is only the kernel of the whole enterprise. At once, expansion has to be planned, financed, market worked out, deals made with various users of ingots, steel mills attracted to use the product or our process and iron oxide. Right now, a rolling mill on the scale of 4000-5000 tons a day is anticipated by a large steel company from the East. Others are interested. Somebody has to do the work if it will be done at all. When I mentioned the possibility of your participation, it was not just the financial participation I had in mind. We can get that and know where to get it.

I was thinking much further though. Participating in this step would give you an excellent chance to know the process, the numerous groups that are interested now in using it and with my help and guidance you quickly would have a feel of the situation. Your interest in the Alamogordo project will help too. I will and do have a lot to do and need to build up an organization with the proper people.

In my travels and negotiations, I have built up contacts with people who expressed a great interest in joining me, but not now, some of them only after we have the first plant in operation. Such talk does not interest me at the moment. On the other hand, able, experienced, financially independent and energetic people are not foot-loose, they are usually busy and tied up. So are you, as I see it, except that at this moment you happen to be ready and quite eager for a change. It also happens that from the start we seemed to understand each other and got along very well.

There is one thought I would like to express and correct. I often hear the opinion that this plant will be the trigger for many other plants, which is true. But it is untrue that this plant is so essential. In fact, I have wasted too much time and energy on it. Any of the dozen possibilities would realize, possibly faster or easier, wherever I chose to concentrate my efforts. On the other hand, I thoroughly and heartily appreciate any tangible help and interest at present as well as later.

I hope this letter will help you to see the Arizona project as well as your possible place in it and with me and with my various processes in a clearer perspective. It should also facilitate our discussion of the various projects even at our next meeting.

With best personal regards.

Very sincerely yours,

Julius

Julius D. Madaras

cc - 1617 Rim Road
El Paso, Texas