5-52:

Could be extended from April 1st, 1951 to Sept. 1, 1951, ~~to~~ and including April 1st 1952, upon Payment of $12,500.00 together with interest @ 4% per year on $212,500.00 from April 1st 1951 to April 1st 1952.

Survey description of Leased Area is incomplete.
(Range not specified

Note: 1-25-1952 - The matter of Leases - property Rights - and specific Survey description of the property, should be presented to the Legal Dept and their decision Requested. Question by G.G. - Has this been done?

To Field Team (b, Chapman) - ?

(2) Must exercise option by April 1902. Will they or have they done so.

(12). No evidence that applicant has leasehold rights.

(3). Is it proposed that Foley Brothers, Inc. will be party to the contract.

(4) Subordination Agreement?

Not available

assignment

Utah Court

1829X

Notes on Leases and Subleases

Andyck Corp to Todd & Scallon
Section 23 T48N R27W - (640 acres)
Note that lease does not describe the property correctly - "N" and "W" being omitted
Down payment $1,136.93 -
50 yr - lease -
Royalty 2 1/2 % on all ore shipped
escalated on Non Bessemer Mesabi Iron ore prices
Minimum 2500 $/yr for 1st 3 yrs
5000 $/yr 4th thereafter

Contract of Assignment
Todd, Scallon and wives to United Std Mining, Nellie B Mining Co, Hubert Howard, Harold Laddatz, Wm Hayden
Consideration not stated - Same Sect on 23 - Period - to July 1 - 1999 -
Royalty sliding scale starting with 18% Mon Ore, 0.60/gt.
20% Mon $1.20 /gt.
escalated with Mesabi non Bessemer prices -
Royalty -
Minimum annual $25,000.00

Option - from Todd & Scallon wives to United Std - Nellie B Hubert Howard, Harold Laddatz, Wm Hayden.
Cash payment $25,000.
Purchase Price of contract of Assignment $225,000 -
or renew on payment of $12,500 - and $12,500 (quarter)
and so on each quarter

No Lease to Utah Construction Co and associates has been furnished - though Utah Const Resources state they are lessees -

MF-200
(June 1951)

Docket No. DMA 1829X
Commodity Manganese

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT[1]

It is agreed this _____ day of _____, 195__, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and [2] The Utah Construction Company and Associates
1 Montgomery Street
San Francisco, California

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Minnesota, County of Aitkins described as follows: [3] Section 23, Township 48 North, Range 27 West

with respect to which the Operator represents and undertakes: [4]

(*a*) ~~That he is the sole owner, in possession and entitled to possession, and that the property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached~~:

(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within 30 days from the date of this contract shall commence work on a project of exploration for [5] Manganese; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of [6] 12 months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Any additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute currently its agreed pro rata share, are listed in Exhibit "A" attached hereto. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro rata share.

6. *Operating equipment.* Any operating equipment to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or depreciation, as the case may be, is listed under appropriate headings in Exhibit "A" attached hereto. As to equipment purchased for the project, the Government will contribute its agreed pro rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of property.* All facilities, buildings, fixtures, equipment, or other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* An itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project is set forth in Exhibit "A" attached hereto.

9. *Rehabilitation and repairs.* A statement of the cost of any necessary rehabilitation or repairs to put existing facilities, buildings, installations, and fixtures into useful and operable condition and which are to be allowed as costs of the project is included in Exhibit "A."

10. *Allowable costs of the project.* The costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, analytical work, accounting, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in this contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, taxes, or any other indirect costs not expressly allowed by these provisions, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

11. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

12. *Progress reports.* The Operator shall provide the Government with monthly reports of work performed under the contract upon forms to be provided by the Government. Each monthly progress report shall bear the certification of the Operator and shall constitute the Operator's invoice of costs incurred on the project during the period covered by the report.

13. *Payment to the Operator.* The monthly progress report (invoice), to the extent approved by the Government, shall be processed for payment by the Government. Payment shall be made in the amount of 75 percent of the approved costs incurred; *Provided,* That the aggregate total of all sums paid by the Government under this agreement shall not exceed $187,500.00, which is 75 percent of the agreed estimated total cost of this project, $250,000.00.

14. *Final reports by Operator.* Upon completion of the project or termination of this contract, the Operator shall provide the Government with a comprehensive geologic and engineering report, including an estimate of ore reserves, to the best of his ability. Four copies of all reports shall be furnished to the Government.

15. *Repayment by Operator.* If, upon the completion of the exploration project or termination of the contract, the Government considers that a discovery or development has resulted from the work from which commercial production of ore may be made, the Government, within 6 months thereafter, shall so certify to the Operator, particularly describing and delimiting its estimate of the discovery or the development. Thereafter, if and as ore is produced as a result of such discovery or development, the Operator and his successor in interest shall be and become obligated to pay to the Government a percentage royalty on the net smelter returns or other net proceeds realized from such ore, concentrates, or metal produced within ten (10) years from the date of this contract, until the total amount contributed by the Government, without interest, is fully repaid or said 10 years have elapsed, whichever occurs first, as follows:

Of net smelter returns or other net proceeds not in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent.

Of net smelter returns or other net proceeds in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent, plus one-half (½) percent for each additional full fifty cents ($0.50) in excess of eight dollars ($8.00) per ton of ore, but not in excess of a maximum of five (5) percent.

This obligation to repay from net returns or proceeds shall be and remain a claim and lien upon the mineral deposit which is the subject of the exploration project and upon any production resulting from such discovery or development, in favor of the Government, until fully paid, or until said 10-year period has elapsed; and this claim and lien and the Government's right to repayment shall survive any termination of the contract, whether by completion of the exploration project or otherwise. This article is not to be construed as imposing any obligation on the Operator or his successor in interest to produce ore from any such discovery or development.

16. *No assignment of contract.* Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder.

17. *Termination and completion.* The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worthwhile discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; shall dispose of any unused materials, supplies, and equipment for the joint account of the Operator and the Government in the proportion of their respective interests; and shall pay to the Government its pro-rata share of any money remaining.

Executed in sextuplicate the day and year first above written.

THE UNITED STATES OF AMERICA

The Utah Construction Company and Associates
(Operator)

By ----------

By ----------
Acting Administrator
Defense Minerals Administration

U. S. GOVERNMENT PRINTING OFFICE 16—64066-2

EXHIBIT "A"

Performance of Work

Work will consist of:

(a) Diamond-drilling and churn-drilling, to prove the extent of the ore body. This will require 40 holes approximately 300 feet deep; approximately one-third of the drilling to be done by diamond-drills. Location of the first 8 drill holes is shown on the attached map. The other 32 holes are to be located after the results of the first 8 have been obtained. The location of these 32 holes is to have prior approval of the Government.

(b) An exploratory shaft of minimum dimensions to be sunk approximately 200 feet deep at the location shown on the attached map. From the foot of this shaft a small drift is to be driven in both directions at right angles to the apparent axis of the structure. Approximately 100 feet of drifting will be required. This work is to be done to gain further information on the character of the ore in place and to afford testing and sampling in order that the recovery attainable and the general feasibility of handling the ore may be evaluated.

All of the above work is to be contracted. Total cost of the project is not to exceed $250,000.00.

Estimated Cost of the Project

a. Exploration drilling

8,000 feet of churn-drilling at $7.00 per foot $56,000.00

4,000 feet of diamond-drilling at $8.00 per foot 32,000.00

b. Exploration Shaft and Drifting

Shaft sinking (through overburden 150 feet)	$120,000.00
Shaft sinking 50 feet and Drifting 100'	63,000.00
Access Roads	6,000.00
Total cost of Project	$250,000.00

Fixtures and Improvements (Estimated)

Access roads $6,000.00

Operating Equipment

Operating equipment will be supplied by the Contractors.

Labor and Supervision

Labor and supervision will be supplied by the Contractors.

Rehabilitation and Repairs

Does not apply to this Contract

July 17, 1951

Mr. Allen D. Christensen
Vice President
Utah Construction Company
One Montgomery Street
San Francisco, California

Subject: DMA-1829X
Re: Exploration Loan

My dear Mr. Christensen:

Receipt is acknowledged of your application and attachments for an exploration loan under the Defense Production Act of 1950.

The application was assigned Docket Number DMA-1829X and referred to Mr. George Helderer, Chief, Manganese Branch on July 11, 1951.

In any future correspondence relating to your application, kindly refer to DMA-1829X.

Sincerely yours,

LANDON F. STROBEL

Landon F. Strobel
Executive Secretary

L. F. Strobel:jc
cc: ✓ Strobel
File
Helderer
Lyon

MF-200
(April 1951)

Docket No. DMA 18294

Commodity _____

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT[1]

It is agreed this _____ day of _____, 195__, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and[2] The Utah Construction Company and Associates

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Minnesota, County of Aitkin described as follows:[3] all of section 23 T48N R27W

with respect to which the Operator represents and undertakes:[4]

(*a*) That he is the sole owner, in possession and entitled to possession, and that the property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached: _____

(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within THIRTY days from the date of this contract shall commence work on a project of exploration for[5] MANGANESE; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of[6] twelve months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Attached hereto, marked "Exhibit 'B'," is a detailed list of additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute its agreed pro-rata share of the cost. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

6. *Operating equipment.* Attached hereto, marked "Exhibit 'C'," is a detailed list of operating equipment divided into categories of items to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or rental value, as the case may be, annexed to each. As to equipment purchased for the project, the Government will contribute its agreed pro-rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of property.* All facilities, buildings, fixtures, equipment, and other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* Attached hereto, marked "Exhibit 'D'," is an itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project.

9. *Rehabilitation and repairs.* Attached hereto, marked "Exhibit 'E'," is a detailed schedule of existing facilities, buildings, installations, and fixtures, with a statement of the cost of any necessary rehabilitation or repairs to put into useful and operable condition, which cost shall be allowed as a cost of the project.

10. *Allowable costs of the project.* The allowable costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in the contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, or any other indirect costs not expressly allowed by these regulations, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

11. *Participation by the Government.* At the end of the first full calendar month after the Operator has commenced work under the project, and at the end of each succeeding calendar month, the Operator shall submit to the Government a voucher for payment with a detailed statement of work done and allowable costs (as defined in Article 10 of this agreement) incurred, in a form and with supporting data acceptable to the Government. After approving the voucher, the Government shall pay to the Operator 75 percent of the sum of such costs incurred; *Provided,* That the aggregate total of all sums paid by the Government under this agreement shall not exceed $375,000.00, which is 75 percent of the agreed estimated total cost of this project, $500,000.00.

12. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

13. *Progress reports.* The Operator shall provide the Government with monthly reports of progress in form and content satisfactory to the Government, and upon the completion of the project or termination of the contract shall provide the Government with a comprehensive geologic and engineering report, including an estimate of ore reserves, to the best of his ability. Four copies of all reports shall be furnished to the Government.

14. *Repayment by Operator.* If, upon the completion of the exploration project or termination of the contract, the Government considers that a discovery or development has resulted from the work from which commercial production of ore may be made, the Government, within 6 months thereafter shall so certify to the Operator, particularly describing and delimiting its estimate of the discovery or the development. Thereafter, if and as ore is produced as a result of such discovery or development, the Operator and his successor in interest shall be and become obligated to pay to the Government a percentage royalty on the net smelter returns or other net proceeds realized from such ore, concentrates, or metal produced within ten (10) years from the date of this contract, until the total amount contributed by the Government, without interest, is fully repaid or said 10 years have elapsed, whichever occurs first, as follows:

Of net smelter returns or other net proceeds not in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent.

Of net smelter returns or other net proceeds in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent, plus one-half (½) percent additional for each full fifty cents ($0.50) in excess of eight dollars ($8.00) per ton of ore, but not in excess of a maximum of five (5) percent.

This obligation to repay from net returns or proceeds shall be and remain a claim and lien upon the property which is the subject of the exploration project and upon any production resulting from such discovery or development, in favor of the Government, until fully paid, or until said 10-year period has elapsed; and this claim and lien and the Government's right to repayment shall survive any termination of the contract, whether by completion of the exploration project or otherwise. This article is not to be construed as imposing any obligation on the Operator or his successor in interest to produce ore from any such discovery or development.

15. *No assignment of contract.* Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder.

16. *Termination and completion.* The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worthwhile discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; shall dispose of any unused materials, supplies, and equipment for the joint account of the Operator and the Government in the proportion of their respective interests; and shall pay to the Government its pro-rata share of any money remaining.

Executed in triplicate the day and year first above written.

The Utah Construction Company and Associates
(Operator)

By
R. S. Palmer, Agent

THE UNITED STATES OF AMERICA

By

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1

EXHIBIT "A"

EXPLORATION PROJECT CONTRACT

A very large body of ore assaying 3 to 7% manganese has been partially outlined by drilling. A considerable reserve is well established, but further drilling to permit the planning of spoil banks and tailings ponds is essential before mining can commence. It is further indicated that much greater reserves may be proven by a systematic plan of drilling on areas of assumed ore.

The entire area is uniformly covered with alluvial material to a depth of 150 feet, and metallurgical work has been done only on churn-drill sludge and diamond-drill cores. While the three independent researches on concentration by M. A. Hanna Coal and Ore Company, U. S. Bureau of Mines, and Battelle Memorial Institute are in complete agreement on the practicality of gravity concentration, insufficient information is available for the design of an economical large scale mill. For this purpose, run-of-mine should be tested in a pilot type mill such as is maintained by the Mines Experiment Station of the University of Minnesota, American Cyanamid Company, Battelle Memorial Institute, and others.

Following on the pattern commenced by the Bureau of Mines, churn-and/or diamond core-drill holes will be developed on a regular pattern to explore the whole of the presently indicated ore-body, and to show barren areas for the establishment of dumps. The first holes will follow out sections now partially completed, but most of the holes will be planned as drilling proceeds.

Drilling will be done by well established contracting firms well established area, using cost data compiled by the U. S. Bureau of Mines for comparison.

Sampling of the ore will be done through one or more large diameter bore holes or drop shafts of the type often used for industrial water wells. Considerable experience in this type of work has beend had by firms in this area.

Metallurgical work will be contracted with one or more laboratories such as those maintained by American Cyanamid, Battelle Institute, etc. Data on rates will be compiled for the design of the mill, and the design will be studied by the operators own engineering facilities.

Exhibit "C"

Because of the type of the exploration work and metallurgical research required by this project, drilling and shaft sinking, as well as laboratory facilities, will be contracted for.

MF-200
(April 1951)

Docket No. DMA 1829X

Commodity _____

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT [1]

It is agreed this _____ day of _____, 195__, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and [2] The Utah Construction Company and Associates

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Minnesota, County of Aitkin described as follows: [3] all of section 23 T48N R27W

with respect to which the Operator represents and undertakes: [4]

(*a*) That he is the sole owner, in possession and entitled to possession, and that the property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached: _____

(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within thirty days from the date of this contract shall commence work on a project of exploration for [5] MANGANESE; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of [6] twelve months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Attached hereto, marked "Exhibit 'B'," is a detailed list of additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute its agreed pro-rata share of the cost. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

6. *Operating equipment.* Attached hereto, marked "Exhibit 'C'," is a detailed list of operating equipment divided into categories of items to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or rental value, as the case may be, annexed to each. As to equipment purchased for the project, the Government will contribute its agreed pro-rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of property.* All facilities, buildings, fixtures, equipment, and other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* Attached hereto, marked "Exhibit 'D'," is an itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project.

9. *Rehabilitation and repairs.* Attached hereto, marked "Exhibit 'E'," is a detailed schedule of existing facilities, buildings, installations, and fixtures, with a statement of the cost of any necessary rehabilitation or repairs to put into useful and operable condition, which cost shall be allowed as a cost of the project.

10. *Allowable costs of the project.* The allowable costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in the contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, or any other indirect costs not expressly allowed by these regulations, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

11. *Participation by the Government.* At the end of the first full calendar month after the Operator has commenced work under the project, and at the end of each succeeding calendar month, the Operator shall submit to the Government a voucher for payment with a detailed statement of work done and allowable costs (as defined in Article 10 of this agreement) incurred, in a form and with supporting data acceptable to the Government. After approving the voucher, the Government shall pay to the Operator 75 percent of the sum of such costs incurred; *Provided,* That the aggregate total of all sums paid by the Government under this agreement shall not exceed $375,000.00, which is 75 percent of the agreed estimated total cost of this project, $500,000.00.

12. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

13. *Progress reports.* The Operator shall provide the Government with monthly reports of progress in form and content satisfactory to the Government, and upon the completion of the project or termination of the contract shall provide the Government with a comprehensive geologic and engineering report, including an estimate of ore reserves, to the best of his ability. Four copies of all reports shall be furnished to the Government.

14. *Repayment by Operator.* If, upon the completion of the exploration project or termination of the contract, the Government considers that a discovery or development has resulted from the work from which commercial production of ore may be made, the Government, within 6 months thereafter shall so certify to the Operator, particularly describing and delimiting its estimate of the discovery or the development. Thereafter, if and as ore is produced as a result of such discovery or development, the Operator and his successor in interest shall be and become obligated to pay to the Government a percentage royalty on the net smelter returns or other net proceeds realized from such ore, concentrates, or metal produced within ten (10) years from the date of this contract, until the total amount contributed by the Government, without interest, is fully repaid or said 10 years have elapsed, whichever occurs first, as follows:

Of net smelter returns or other net proceeds not in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent.

Of net smelter returns or other net proceeds in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent, plus one-half (½) percent additional for each full fifty cents ($0.50) in excess of eight dollars ($8.00) per ton of ore, but not in excess of a maximum of five (5) percent.

This obligation to repay from net returns or proceeds shall be and remain a claim and lien upon the property which is the subject of the exploration project and upon any production resulting from such discovery or development, in favor of the Government, until fully paid, or until said 10-year period has elapsed; and this claim and lien and the Government's right to repayment shall survive any termination of the contract, whether by completion of the exploration project or otherwise. This article is not to be construed as imposing any obligation on the Operator or his successor in interest to produce ore from any such discovery or development.

15. *No assignment of contract.* Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder.

16. *Termination and completion.* The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worthwhile discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; shall dispose of any unused materials, supplies, and equipment for the joint account of the Operator and the Government in the proportion of their respective interests; and shall pay to the Government its pro-rata share of any money remaining.

Executed in triplicate the day and year first above written.

The Utah Construction Company and Associates
(Operator)

By
R. S. Palmer, Agent

THE UNITED STATES OF AMERICA

By

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1

EXHIBIT "A"

EXPLORATION PROJECT CONTRACT

A very large body of ore assaying 3 to 7% manganese has been partially outlined by drilling. A considerable reserve is well established, but further drilling to permit the planning of spoil banks and tailings ponds is essential before mining can commence. It is further indicated that much greater reserves may be proven by a systematic plan of drilling on areas of assumed ore.

The entire area is uniformly covered with alluvial material to a depth of 150 feet, and metallurgical work has been done only on churn-drill sludge and diamond-drill cores. While the three independent researches on concentration by M. A. Hanna Coal and Ore Company, U. S. Bureau of Mines, and Battelle Memorial Institute are in complete agreement on the practicality of gravity concentration, insufficient information is available for the design of an economical large scale mill. For this purpose, run-of-mine should be tested in a pilot type mill such as is maintained by the Mines Experiment Station of the University of Minnesota, American Cyanamid Company, Battelle Memorial Institute, and others.

Following on the pattern commenced by the Bureau of Mines, churn-and/or diamond core-drill holes will be developed on a regular pattern to explore the whole of the presently indicated ore-body, and to show barren areas for the establishment of dumps. The first holes will follow out sections now partially completed, but most of the holes will be planned as drilling proceeds.

Drilling will be done by well established contracting firms well established area, using cost data compiled by the U. S. Bureau of Mines for comparison.

Sampling of the ore will be done through one or more large diameter bore holes or drop shafts of the type often used for industrial water wells. Considerable experience in this type of work has beend had by firms in this area.

Metallurgical work will be contracted with one or more laboratories such as those maintained by American Cyanamid, Battelle Institute, etc. Data on rates will be compiled for the design of the mill, and the design will be studied by the operators own engineering facilities.

Exhibit "C"

Because of the type of the exploration work and metallurgical research required by this project, drilling and shaft sinking, as well as laboratory facilities, will be contracted for.

MF-200
(April 1951)

Docket No. DMA 1829H

Commodity _____

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT [1]

It is agreed this _____ day of _____, 195__, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and [2] The Utah Construction Company and Associates

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Minnesota, County of Aitkin described as follows: [3] All of section 23 T48N R27W

with respect to which the Operator represents and undertakes: [4]

(*a*) ~~That he is the sole owner, in possession and entitled to possession, and that the~~ property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached: _____

(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within thirty days from the date of this contract shall commence work on a project of exploration for [5] MANGANESE; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of [6] twelve months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Attached hereto, marked "Exhibit 'B'," is a detailed list of additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute its agreed pro-rata share of the cost. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

6. *Operating equipment.* Attached hereto, marked "Exhibit 'C'," is a detailed list of operating equipment divided into categories of items to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or rental value, as the case may be, annexed to each. As to equipment purchased for the project, the Government will contribute its agreed pro-rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of prope*[illegible] All facilities, buildings, fixtures, equipmen[illegible] other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* Attached hereto, marked "Exhibit 'D'," is an itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project.

9. *Rehabilitation and repairs.* Attached hereto, marked "Exhibit 'E'," is a detailed schedule of existing facilities, buildings, installations, and fixtures, with a statement of the cost of any necessary rehabilitation or repairs to put into useful and operable condition, which cost shall be allowed as a cost of the project.

10. *Allowable costs of the project.* The allowable costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in the contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, or any other indirect costs not expressly allowed by these regulations, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

11. *Participation by the Government.* At the end of the first full calendar month after the Operator has commenced work under the project, and at the end of each succeeding calendar month, the Operator shall submit to the Government a voucher for payment with a detailed statement of work done and allowable costs (as defined in Article 10 of this agreement) incurred, in a form and with supporting data acceptable to the Government. After approving the voucher, the Government shall pay to the Operator 75 percent of the sum of such costs incurred; *Provided,* That the aggregate total of all sums paid by the Government under this agreement shall not exceed $375,000.00, which is 75 percent of the agreed estimated total cost of this project, $500,000.00.

12. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

13. *Progress reports.* The Operator shall provide the Government with monthly reports of progress in form and content satisfactory to the Government, and upon the completion of the project or termination of the contract shall provide the Government with a comprehensive geologic and engineering report, including an estimate of ore reserves, to the best of his ability. Four copies of all reports shall be furnished to the Government.

14. *Repayment by Operator.* If, upon the completion of the exploration project or termination of the contract, the Government considers that a discovery or development has resulted from the work from which commercial production of ore may be made, the Government, within 6 months thereafter shall so certify to the Operator, particularly describing and delimiting its estimate of the discovery or the development. Thereafter, if and as ore is produced as a result of such discovery or development, the Operator and his successor in interest shall be and become obligated to pay to the Government a percentage royalty on the net smelter returns or other net proceeds realized from such ore, concentrates, or metal produced within ten (10) years from the date of this contract, until the total amount contributed by the Government, without interest, is fully repaid or said 10 years have elapsed, whichever occurs first, as follows:

Of net smelter returns or other net proceeds not in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent.

Of net smelter returns or other net proceeds in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent, plus one-half (½) percent additional for each full fifty cents ($0.50) in excess of eight dollars ($8.00) per ton of ore, but not in excess of a maximum of five (5) percent.

This obligation to repay from net returns or proceeds shall be and remain a claim and lien upon the property which is the subject of the exploration project and upon any production resulting from such discovery or development, in favor of the Government, until fully paid, or until said 10-year period has elapsed; and this claim and lien and the Government's right to repayment shall survive any termination of the contract, whether by completion of the exploration project or otherwise. This article is not to be construed as imposing any obligation on the Operator or his successor in interest to produce ore from any such discovery or development.

15. *No assignment of contract.* Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder.

16. *Termination and completion.* The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worthwhile discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; shall dispose of any unused materials, supplies, and equipment for the joint account of the Operator and the Government in the proportion of their respective interests; and shall pay to the Government its pro-rata share of any money remaining.

Executed in triplicate the day and year first above written.

The Utah Construction Company and Associates
(Operator)

By R. S. Palmer, Agent

THE UNITED STATES OF AMERICA

By

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1

EXHIBIT "A"

EXPLORATION PROJECT CONTRACT

A very large body of ore assaying 3 to 7% manganese has been partially outlined by drilling. A considerable reserve is well established, but further drilling to permit the planning of spoil banks and tailings ponds is essential before mining can commence. It is further indicated that much greater reserves may be proven by a systematic plan of drilling on areas of assumed ore.

The entire area is uniformly covered with alluvial material to a depth of 150 feet, and metallurgical work has been done only on churn-drill sludge and diamond-drill cores. While the three independent researches on concentration by M. A. Hanna Coal and Ore Company, U. S. Bureau of Mines, and Battelle Memorial Institute are in complete agreement on the practicality of gravity concentration, insufficient information is available for the design of an economical large scale mill. For this purpose, run-of-mine should be tested in a pilot type mill such as is maintained by the Mines Experiment Station of the University of Minnesota, American Cyanamid Company, Battelle Memorial Institute, and others.

Following on the pattern commenced by the Bureau of Mines, churn-and/or diamond core-drill holes will be developed on a regular pattern to explore the whole of the presently indicated ore-body, and to show barren areas for the establishment of dumps. The first holes will follow out sections now partially completed, but most of the holes will be planned as drilling proceeds.

Drilling will be done by well established contracting firms well established area, using cost data compiled by the U. S. Bureau of Mines for comparison.

Sampling of the ore will be done through one or more large diameter bore holes or drop shafts of the type often used for industrial water wells. Considerable experience in this type of work has beend had by firms in this area.

Metallurgical work will be contracted with one or more laboratories such as those maintained by American Cyanamid, Battelle Institute, etc. Data on rates will be compiled for the design of the mill, and the design will be studied by the operators own engineering facilities.

Exhibit "G"

Because of the type of the exploration work and metallurgical research required by this project, drilling and shaft sinking, as well as laboratory facilities, will be contracted for.

MF-200
(April 1951)

Docket No. DMA 1294

Commodity _____

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT [1]

It is agreed this _____ day of _____, 195__, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and [2] The Utah Construction Company and Associates

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Minnesota, County of Aitkin described as follows: [3] all of section 23 T48N R27W

with respect to which the Operator represents and undertakes: [4]

(*a*) That he is the sole owner, in possession and entitled to possession, and that the property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached: _____

(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within thirty days from the date of this contract shall commence work on a project of exploration for [5] MANGANESE; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of [6] twelve months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Attached hereto, marked "Exhibit 'B'," is a detailed list of additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute its agreed pro-rata share of the cost. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

6. *Operating equipment.* Attached hereto, marked "Exhibit 'C'," is a detailed list of operating equipment divided into categories of items to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or rental value, as the case may be, annexed to each. As to equipment purchased for the project, the Government will contribute its agreed pro-rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of proper* All facilities, buildings, fixtures, equipment other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* Attached hereto, marked "Exhibit 'D'," is an itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project.

9. *Rehabilitation and repairs.* Attached hereto, marked "Exhibit 'E'," is a detailed schedule of existing facilities, buildings, installations, and fixtures, with a statement of the cost of any necessary rehabilitation or repairs to put into useful and operable condition, which cost shall be allowed as a cost of the project.

10. *Allowable costs of the project.* The allowable costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in the contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, or any other indirect costs not expressly allowed by these regulations, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

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12. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

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Executed in triplicate the day and year first above written.

The Utah Construction Company and Associates
(Operator)

By
R. S. Palmer, Agent

THE UNITED STATES OF AMERICA

By

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1

EXHIBIT "A"

EXPLORATION PROJECT CONTRACT

A very large body of ore assaying 3 to 7% manganese has been partially outlined by drilling. A considerable reserve is well established, but further drilling to permit the planning of spoil banks and tailings ponds is essential before mining can commence. It is further indicated that much greater reserves may be proven by a systematic plan of drilling on areas of assumed ore.

The entire area is uniformly covered with alluvial material to a depth of 150 feet, and metallurgical work has been done only on churn-drill sludge and diamond-drill cores. While the three independent researches on concentration by M. A. Hanna Coal and Ore Company, U. S. Bureau of Mines, and Battelle Memorial Institute are in complete agreement on the practicality of gravity concentration, insufficient information is available for the design of an economical large scale mill. For this purpose, run-of-mine should be tested in a pilot type mill such as is maintained by the Mines Experiment Station of the University of Minnesota, American Cyanamid Company, Battelle Memorial Institute, and others.

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Drilling will be done by well established contracting firms well established area, using cost data compiled by the U. S. Bureau of Mines for comparison.

Sampling of the ore will be done through one or more large diameter bore holes or drop shafts of the type often used for industrial water wells. Considerable experience in this type of work has beend had by firms in this area.

Metallurgical work will be contracted with one or more laboratories such as those maintained by American Cyanamid, Battelle Institute, etc. Data on rates will be compiled for the design of the mill, and the design will be studied by the operators own engineering facilities.

Exhibit "G"

Because of the type of the exploration work and metallurgical research required by this project, drilling and shaft sinking, as well as laboratory facilities, will be contracted for.

MF-200
(April 1951)

Docket No. DMA 1829X

Commodity _____

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT [1]

It is agreed this _____ day of _____, 195___, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and [2] The Utah Construction Company and Associates

hereinafter called the "Operator," as follows:

1. *Authority for contract.* This agreement is entered into under the authority of the Defense Production Act of 1950, pursuant to Mineral Order 5, entitled "Regulations Governing Government Aid in Defense Exploration Projects."

2. *Operator's property rights.* The exploration project shall be conducted on that certain property situated in the State of Minnesota, County of Aitkin described as follows: [3] all of section 23 T48N R27W

with respect to which the Operator represents and undertakes: [4]

(*a*) That he is the sole owner, in possession and entitled to possession, and that the property is subject only to the following claims, liens, or encumbrances as to each of which the subordination agreement of the holder is attached: _____

(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within Thirty days from the date of this contract shall commence work on a project of exploration for [5] MANGANESE; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of [6] twelve months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

4. *Performance of the work.* The work shall be performed by the Operator, under his sole direction and control: *Provided,* That with the consent of the Government and its written approval of the contract or contracts, all or any part of the work may be performed by the Operator through contract or contracts with independent contractors. The Government shall have the right to enter and observe and inspect the work at all reasonable times, and the Operator shall provide the Government with all available means for doing so. The Government may consult with and advise the Operator on all phases of the work.

5. *Fixtures and improvements.* The Operator shall devote the land and all existing improvements, facilities, buildings, installations, and appurtenances to the purposes of the exploration project without any allowance for the use, rental value, depreciation, depletion, or other cost of acquiring, owning, or holding possession thereof. Attached hereto, marked "Exhibit 'B'," is a detailed list of additional facilities, buildings, and fixtures, to be purchased, installed, or erected by the Operator, with the estimated cost of each, to which the Government will contribute its agreed pro-rata share of the cost. The difference between the cost of such additional facilities, buildings, or fixtures, and the salvage value thereof at the conclusion of the work, shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

6. *Operating equipment.* Attached hereto, marked "Exhibit 'C'," is a detailed list of operating equipment divided into categories of items to be rented, purchased, or furnished by the Operator, with the allowable rental, purchase price, or rental value, as the case may be, annexed to each. As to equipment purchased for the project, the Government will contribute its agreed pro-rata share of the cost thereof, and the difference between the cost and the salvage value at the conclusion of the work shall be charged as a cost of the project to which the Government has contributed its pro-rata share.

[1] If sufficient space is not provided in any blank, use an extra sheet of paper and refer to it in the blank.
[2] State name, address, and nature of organization if any.
[3] Give legal description or enough to identify the property.
[4] Strike out the provision not applicable.
[5] Name of mineral.
[6] Not in excess of 2 years.

7. *Title to and disposition of property.* All facilities, buildings, fixtures, equipment, and other items costing more than $50 each, paid for or purchased with funds contributed jointly by the Operator and the Government, shall belong to the Operator and the Government jointly, in proportion to their respective contributions, and upon the termination of the contract, if they have any salvage value, shall be disposed of for their joint account unless the Government, in writing, waives its interest in any such items. The Government may require the dismantling, severance from land, and removal of any such items in order to realize its interest in the salvage value thereof, and the cost of any such removal and of the disposal of the items shall be for the joint account of the parties in proportion to their respective interests.

8. *Labor and supervision.* Attached hereto, marked "Exhibit 'D'," is an itemized schedule of labor, by numbers and classes (miners, muckers, millmen, etc.), and of supervisors, by numbers and positions, with the maximum wages or salaries that may be paid to each as an allowable cost of the project.

9. *Rehabilitation and repairs.* Attached hereto, marked "Exhibit 'E'," is a detailed schedule of existing facilities, buildings, installations, and fixtures, with a statement of the cost of any necessary rehabilitation or repairs to put into useful and operable condition, which cost shall be allowed as a cost of the project.

10. *Allowable costs of the project.* The allowable costs of the project in which the Government will participate are limited to the necessary, reasonable, direct costs of performing the exploration work, including the costs of materials, supplies, engineering, power, water, and utilities, including items of equipment costing less than $50 each; and the costs referred to in Articles 5, 6, 8, and 9, and the exhibits annexed to and referred to in the contract. Although the Government may pay part of the cost of new or additional facilities, structures, buildings, and equipment, only the depreciation on such items, computed as indicated in Articles 5 and 6, will be charged as a cost of the project. No items of general overhead, corporate management, interest, or any other indirect costs not expressly allowed by these regulations, or work performed or costs incurred before the date of this contract, shall be allowed as costs of the project in which the Government will participate.

11. *Participation by the Government.* At the end of the first full calendar month after the Operator has commenced work under the project, and at the end of each succeeding calendar month, the Operator shall submit to the Government a voucher for payment with a detailed statement of work done and allowable costs (as defined in Article 10 of this agreement) incurred, in a form and with supporting data acceptable to the Government. After approving the voucher, the Government shall pay to the Operator 75 percent of the sum of such costs incurred; *Provided,* That the aggregate total of all sums paid by the Government under this agreement shall not exceed $375,000.00, which is 75 percent of the agreed estimated total cost of this project, $500,000.00.

12. *Accounts and audits.* The Operator shall keep suitable records and accounts of operations, which the Government may inspect and audit at any time. The Government may at any time require an audit of the Operator's records and accounts by a certified public accountant, the cost thereof to be treated as a cost of the project. The Operator shall keep and preserve said records and accounts for at least 3 years after the completion of the project or the termination of this contract.

13. *Progress reports.* The Operator shall provide the Government with monthly reports of progress in form and content satisfactory to the Government, and upon the completion of the project or termination of the contract shall provide the Government with a comprehensive geologic and engineering report, including an estimate of ore reserves, to the best of his ability. Four copies of all reports shall be furnished to the Government.

14. *Repayment by Operator.* If, upon the completion of the exploration project or termination of the contract, the Government considers that a discovery or development has resulted from the work from which commercial production of ore may be made, the Government, within 6 months thereafter shall so certify to the Operator, particularly describing and delimiting its estimate of the discovery or the development. Thereafter, if and as ore is produced as a result of such discovery or development, the Operator and his successor in interest shall be and become obligated to pay to the Government a percentage royalty on the net smelter returns or other net proceeds realized from such ore, concentrates, or metal produced within ten (10) years from the date of this contract, until the total amount contributed by the Government, without interest, is fully repaid or said 10 years have elapsed, whichever occurs first, as follows:

Of net smelter returns or other net proceeds not in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent.

Of net smelter returns or other net proceeds in excess of eight dollars ($8.00) per ton of ore: One and one-half (1½) percent, plus one-half (½) percent additional for each full fifty cents ($0.50) in excess of eight dollars ($8.00) per ton of ore, but not in excess of a maximum of five (5) percent.

This obligation to repay from net returns or proceeds shall be and remain a claim and lien upon the property which is the subject of the exploration project and upon any production resulting from such discovery or development, in favor of the Government, until fully paid, or until said 10-year period has elapsed; and this claim and lien and the Government's right to repayment shall survive any termination of the contract, whether by completion of the exploration project or otherwise. This article is not to be construed as imposing any obligation on the Operator or his successor in interest to produce ore from any such discovery or development.

15. *No assignment of contract.* Without the written consent of the Government, the Operator shall not assign or otherwise transfer or hypothecate this contract or any rights thereunder.

16. *Termination and completion.* The Government may, at any time, by written notice to the Operator, terminate this contract: (*a*) If the Operator fails to provide his share of the money necessary to prosecute operations pursuant to the terms of the contract; (*b*) if the Operator, in the opinion of the Government, fails to prosecute operations pursuant to the terms of the contract; or (*c*) if in the opinion of the Government, operations up to the time of the notice have not indicated the probability of making any worthwhile discovery and in the opinion of the Government further operations are not justified. Upon the completion of the project or any termination of the contract the Operator shall render to the Government a full and final accounting of his operations under the contract and his expenditures of money; shall dispose of any unused materials, supplies, and equipment for the joint account of the Operator and the Government in the proportion of their respective interests; and shall pay to the Government its pro-rata share of any money remaining.

Executed in triplicate the day and year first above written.

The Utah Construction Company and Associates
(Operator)

By
R. S. Palmer, Agent

THE UNITED STATES OF AMERICA

By

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1

EXHIBIT "A"

EXPLORATION PROJECT CONTRACT

A very large body of ore assaying 3 to 7% manganese has been partially outlined by drilling. A considerable reserve is well established, but further drilling to permit the planning of spoil banks and tailings ponds is essential before mining can commence. It is further indicated that much greater reserves may be proven by a systematic plan of drilling on areas of assumed ore.

The entire area is uniformly covered with alluvial material to a depth of 150 feet, and metallurgical work has been done only on churn-drill sludge and diamond-drill cores. While the three independent researches on concentration by M. A. Hanna Coal and Ore Company, U. S. Bureau of Mines, and Battelle Memorial Institute are in complete agreement on the practicality of gravity concentration, insufficient information is available for the design of an economical large scale mill. For this purpose, run-of-mine should be tested in a pilot type mill such as is maintained by the Mines Experiment Station of the University of Minnesota, American Cyanamid Company, Battelle Memorial Institute, and others.

Following on the pattern commenced by the Bureau of Mines, churn-and/or diamond core-drill holes will be developed on a regular pattern to explore the whole of the presently indicated ore-body, and to show barren areas for the establishment of dumps. The first holes will follow out sections now partially completed, but most of the holes will be planned as drilling proceeds.

Drilling will be done by well established contracting firms well established area, using cost data compiled by the U. S. Bureau of Mines for comparison.

Sampling of the ore will be done through one or more large diameter bore holes or drop shafts of the type often used for industrial water wells. Considerable experience in this type of work has beend had by firms in this area.

Metallurgical work will be contracted with one or more laboratories such as those maintained by American Cyanamid, Battelle Institute, etc. Data on rates will be compiled for the design of the mill, and the design will be studied by the operators own engineering facilities.

Exhibit "G"

Because of the type of the exploration work and metallurgical research required by this project, drilling and shaft sinking, as well as laboratory facilities, will be contracted for.

MF-200
(April 1951)

Docket No. DMA 1829

Commodity _____

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

EXPLORATION PROJECT CONTRACT [1]

It is agreed this _____ day of _____, 195___, between the United States of America, acting through the Department of the Interior, Defense Minerals Administration, hereinafter called the "Government," and [2] The Utah Construction Company and Associates

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with respect to which the Operator represents and undertakes: [4]

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(*b*) That he is a lessee, in possession and entitled to possession, and the subordination agreement of the lessor is attached.

3. *Exploration project.* The Operator, within thirty days from the date of this contract shall commence work on a project of exploration for [5] MANGANESE; shall prosecute the work efficiently, expertly, in a workmanlike manner, in accordance with good mining standards, with suitable and adequate equipment, materials, and labor, all properly designed to bring the project to completion within a period of [6] twelve months from the date of this contract. The exploration project and the work to be performed are more fully described on Exhibit "A" attached hereto, which, with any maps or drawings thereto attached, is made a part of this contract.

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Executed in triplicate the day and year first above written.

The Utah Construction Company and Associates
(Operator)

By
R. S. Palmer, Agent

THE UNITED STATES OF AMERICA

By

U. S. GOVERNMENT PRINTING OFFICE 16—64066-1

EXHIBIT "A"

EXPLORATION PROJECT CONTRACT

A very large body of ore assaying 3 to 7% manganese has been partially outlined by drilling. A considerable reserve is well established, but further drilling to permit the planning of spoil banks and tailings ponds is essential before mining can commence. It is further indicated that much greater reserves may be proven by a systematic plan of drilling on areas of assumed ore.

The entire area is uniformly covered with alluvial material to a depth of 150 feet, and metallurgical work has been done only on churn-drill sludge and diamond-drill cores. While the three independent researches on concentration by M. A. Hanna Coal and Ore Company, U. S. Bureau of Mines, and Battelle Memorial Institute are in complete agreement on the practicality of gravity concentration, insufficient information is available for the design of an economical large scale mill. For this purpose, run-of-mine should be tested in a pilot type mill such as is maintained by the Mines Experiment Station of the University of Minnesota, American Cyanamid Company, Battelle Memorial Institute, and others.

Following on the pattern commenced by the Bureau of Mines, churn-and/or diamond core-drill holes will be developed on a regular pattern to explore the whole of the presently indicated ore-body, and to show barren areas for the establishment of dumps. The first holes will follow out sections now partially completed, but most of the holes will be planned as drilling proceeds.

Drilling will be done by well established contracting firms well established area, using cost data compiled by the U. S. Bureau of Mines for comparison.

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Metallurgical work will be contracted with one or more laboratories such as those maintained by American Cyanamid, Battelle Institute, etc. Data on rates will be compiled for the design of the mill, and the design will be studied by the operators own engineering facilities.

Exhibit "G"

Because of the type of the exploration work and metallurgical research required by this project, drilling and shaft sinking, as well as laboratory facilities, will be contracted for.

GENERAL OFFICES
FIRST SECURITY BANK BUILDING
OGDEN, UTAH

SAN FRANCISCO OFFICE
ONE MONTGOMERY STREET
TEL. GARFIELD 1-6743

SALT LAKE CITY OFFICE
57 EAST 4TH SOUTH STREET
TEL. 3-7676

THE UTAH CONSTRUCTION COMPANY

ENGINEERS AND CONTRACTORS
SAN FRANCISCO 4, CALIFORNIA

CABLE ADDRESS
UTAHCONCO

July 2, 1951

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 11 1951
LANDON E. STROBEL
Executive Secretary

Defense Minerals Administration
New Interior Building
Washington 25, D. C.

Gentlemen:

We are sending herewith for your consideration a proposal for supplying a high grade sintered manganese oxide product on a large scale from a domestic source.

The proposal embraces a well studied program including:

1. A large deposit of low grade manganese ore in the Cuyuna Range which has been partially drilled and proven.

2. A process for recovery of manganese developed by American Cyanamid Company (through its wholly owned subsidiary, Chemical Construction Company) and which process was recently tested by Batelle Institute and approved by them as being definitely successful in laboratory tests on ore from the above deposit.

3. An operating group with an impressive background of experience in mining and in construction and operation of metallurgical plant facilities.

The program we propose calls for three stages in the development and operating procedure, which are as follows:

A. An initial exploratory stage aided by the Defense Minerals Act, including more detailed drilling and shaft work to completely prove the deposit and test the actual ore from the deposit through commercial size equipment. This stage will require eight to twelve months time and will cost approximately $500,000.

B. Development of the mine and design and construction of a full scale beneficiation and sintering plant under terms of a purchase contract for 50,000,000 long ton units under appropriate procurement regulations with suitable guarantees against loss from cancellation by the government. This development is estimated to require twelve months time and will cost approximately $25,000,000.

C. Delivery of sintered manganese for a five year period beginning late in 1953 or early in 1954.

This program offers a sound and practical approach to the manganese supply problem, a solution of which is so essential to our steel industry. The program utilizes domestic sources which are not subject to interruption by war or external political influences, and the supply can be expanded if necessary during times of national emergency. The proven character and the broad experience of the group of participants gives the maximum assurance to the government that the contract will be fulfilled.

Respectfully submitted by,

THE UTAH CONSTRUCTION COMPANY

By Allen D. Christensen
Allen D. Christensen,
Vice President and
General Manager

ADC/jka

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. DMA 1829X

Date received 7-11-51

Participation

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

FILL IN THIS BLOCK

Date of application July 2, 1951

Estimated cost $500,000.00

Mineral or metal Manganese

Percentage of Government participation 75%

Location of mine Sec. 23, T48N, R27W,
Aitkin County, Minn.

Date of filing MF-100 July 2, 1951

DMA Docket Number, if available 1829X

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.
    (*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

    NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area.

*11. State the present and former names of the property, if any.
*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.
*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.
*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.
15. State in detail how the ore could be shipped and how and where milled.
*16. History:
    (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.
    (*b*) State briefly the known history and production of adjoining and neighboring properties.
    (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.
*17. Production:
    (*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)
    (*a*) Describe the ore or mineral deposits briefly.
    (*b*) Submit available maps and assay data.
    (*c*) Give estimated tonnage and grade of each class of ore reserves.
19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?
21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

    NOTE.—The Government will not participate in a project that will require more than 2 years to complete.
22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows:
    (*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.
    (*b*) Supervisors, by numbers and positions, with salaries of each.
    (*c*) Cost of necessary repairs to existing facilities, structures, and buildings.
    (*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.
    (*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.
    (*f*) Cost of rental for equipment which the operator proposes to rent.
    (*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.
    (*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.
    (*i*) Cost of power, water, utilities, and any other items not provided for above.
24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates

July 2, 1961

Allen B. Christensen
Vice President and General Manager
for The Utah Construction Company

By _____
(Signature of authorized official)

_____
(Name of company)

_____
(Date)

_____
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

Form MF-103

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1 to 5, inclusive, are answered in form MF-100, which is attached.

6. Applicant is lessee.

7. Lease is in good standing. A copy of the agreement is attached.

8. A financial statement is attached to form MF-100, which accompanies this application.

9. Applicant is prepared to invest $150,000 in the project. This sum exceeds our share of the cost as detailed in question 23, and according to the provisions of Section 9 of Mineral Order 5.

The Property

10. (a) The ore body lies in section 23, Township 48 N, range 27 west, Aitkin County, Minnesota.
    (b) Explorations are to be conducted over a considerable portion of the entire section. For the purposes of this contract the property will be subdivided into 40 acre tracts, and exploration is to proceed as discoveries indicate.

11 to 14, inclusive, are answered in form MF-100.

15. Mining will be done from an open pit, using power shovel loading and truck haulage. A gravity concentrating plant is to be erected on the property, and the 20% concentrate produced will be leached by a modified sulphur dioxide process, facilities for which will probably be erected on the property. The leaching process turns out a 62% manganese content sintered oxide, which is suitable for production of ferromanganese.

16 to 18, inclusive, are answered in form MF-100.

19. The foregoing answers are believed to cover the pertinent facts.

The Exploration

20. Explorations are to be conducted for manganese, indications of which have already been established by the drilling described previously. The deposit is believed to be a folded, bedded deposit, and is known to be of considerable thickness and extent. The ore contains manganese and iron as oxides, together with silica and alumina which constitute the gangue.

21. It is estimated that about 40 holes should be drilled to substantiate further the reserve of mineral, and to gain other information necessary to plan a mine. It is expected that this work can be completed within four months of commencement. In addition to the drill holes, it is felt that an exploratory shaft, or several large core holes, should be put down on the property to gain further knowledge of the character and formation of the mineral, and to obtain samples for further work on beneficiation. Tentative drilling sections and the shaft site are indicated in red on plan E-2, which is attached, but it is expected that early findings will dictate the final plan of development.

22. This property was originally drilled as a prospect for iron ore, owing to its position relative to the Cuyuna Range. Later exploration was made with the hope of developing a body of manganiferous iron ore. In the light of recent development of a process for leaching manganese, together with the susceptability of the ore to gravity concentration, the present program has been

undertaken. Considerable ore is now known to exist, but the current exploration is necessary to plan the mine and to obtain samples for final metallurgical work.

The substantiation of this request lies in the drilling logs and metallurgical reports of work done on the ore. Photostatic copies of such reports as are available are attached to this application.

The Requirements and Costs

23. It is anticipated that drilling and shaft sinking will be done under contract by firms engaged in doing this type of work in the iron ranges. Estimates of costs are based on recent experience of the U.S.B.M. and the mining companies operating in the area.

24.

Type and extent of work	Completion Time Estimate (from date of approval)	Cost Estimate
Exploratory drilling	4 months	$120,000
Exploratory shaft	6 "	60,000
Mining for sample purposes	9 "	25,000
Beneficiation research	12 " (concurrent with mining)	275,000
Contingencies (control of water which may be encountered during shaft sinking)		20,000
		$500,000

Form MF-100
(March 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Form approved.
Budget Bureau No. 42-R1026.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950

NOT TO BE FILLED IN BY APPLICANT

Docket No. DMA 1829X

Date received 7-11-51

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

INSTRUCTIONS

This form is to be filed with Defense Minerals Administration, Department of the Interior, Washington 25, D. C. It should be accompanied by appropriate application form when a specific type of Government assistance is requested, in the form of (1) loan, (2) purchase contract, (3) Government guarantee of a private loan, ~~(4) Necessity Certificate pursuant to the provisions of Sec. 124 A (Amortization Deduction) of Internal Revenue Code, 1950,~~ (4) priorities or allocation of mining equipment, and maintenance, repair and operating supplies, and (5) other forms of Government assistance that might arise under the Act. Submit four (4) signed copies of the form and accompanying papers. Name and address should be stamped or typed on each sheet of this form and all accompanying papers. *When a question is inapplicable it should be so stated on the form.* Additional sheets may be attached in answering any questions or in supplying additional information. (IF YOU CANNOT ANSWER A QUESTION, SO STATE.) If a question is answered elsewhere indicate where answered. It is not necessary to answer it again.

GENERAL TECHNICAL DATA

Supply the following information on separate sheets, arranged, numbered, and lettered as indicated.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 11 1951
Executive Secretary

1. Materials produced:
   (*a*) What are the chief mine, mill, or smelter products?
   (*b*) What are the byproducts, if any?
2. Name(s) and type(s) of mine(s), mill(s), smelter(s), refinery(ies), pit(s), quarry (ies), drilling operation(s). Include old names of property, if any. Show extent of workings, including the following:
   (*a*) Linear feet of shafts.
   (*b*) Linear feet of drifts and crosscuts.
   (*c*) Linear feet of tunnels or adits.
   (*d*) Linear feet of other mine openings (explain briefly).

   Indicate whether mine is flooded or not. Describe any pumping problems. Give size or productive capacity.
3. For each operation listed above supply the following:
   (*a*) Distance and direction from nearest town and shipping point.
   (*b*) Mining district.
   (*c*) Township, Section, Range.
   (*d*) County, State.
4. (*a*) State whether or not property is now in operation, and if in operation, by whom operated.
   (*b*) Are you operating this property as:
   - ☐ Owner.
   - ☐ Lessee.
   - ☐ Contractor.
5. Number of years in production .....

   If not in production or operation, estimated date when production will begin .....
6. Experience of operators:
   Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who manage the project.
7. History:
   (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for suspension of operation.
   (*b*) State briefly the known history and production of adjoining and neighboring properties.
   (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

8. Names and addresses of Officers, Directors, or Partners, and in addition thereto, the five largest stockholders if applicant is a corporation.

Name and Address (a)	Official Title (If officer is also director indicate by "D") (b)	Total of Annual Salary, Commissions, Bonuses, Etc., Received From Applicant and Affiliates During Last Fiscal Year (c)	Estimated Net Worth Outside of Interest in Applicant (d)	Number of Shares Held in Applicant Corporation		Life Insurance Carried for Benefit of Applicant	
				Common (e)	Preferred (f)	Amount (g)	Net Cash Surrender Value After Loans (h)
	Total		x x x x x			x x x x x	x x x x x

If more lines are needed continue on separate sheet.

9. Capital Stock Issues:

For Corporate Applicants

Item	Authorized (a)	Outstanding (b)	Par Value (c)	Number of Shares Outstanding (d)	Dividend Rate Last Paid* (e)
Common stock	$	$	$		
Preferred stock	$	$	$		

*Indicate period covered.

10. Production:

Item	Kind of Product (a)	1948 Total (b)	1949 Total (c)	1950 Total (d)	Present Average Monthly (e)
1. Quantity of product mined or quarried (Short, long, metric tons; barrels; pounds; etc.)					
2. Quantity of product processed (specify unit of measure and type of process)					
3. Quantity and grade of product sold or shipped (specify units of measure)					

11. Do you contemplate a change in the present average monthly rate of production? If so, state estimated maximum monthly production and basis of change.

12. Ore or Mineral Reserves:

(*a*) Describe the ore or mineral deposit briefly. Accompany the application by any available report on the geology and ore reserves.

(*b*) If deposit is other than placer:

(1) Submit assay plans and/or sections showing location and size of proved (measured) and probable (indicated) ore or mineral reserve.

(2) State the tonnage (indicate type of ton) and grade of each class of ore reserve, as above, and show how computed. Tabulated total ore reserve as follows:

TOTAL ORE OR MINERAL RESERVES

Ore or Mineral Reserve	Estimated Tons (a)	Metal or Mineral Content Per Ton (Grade) (b)	Gross Value Per Ton (c)	Recoverable Unit Value Per Ton (d)	Estimated Cost of Production Per Ton (e)
Measured (proved)					
Indicated (probable)					

(*c*) If placer:

(1) Give estimated total yardage and average marketable mineral content of each deposit.

(2) Submit map showing location of placer deposit and surrounding area, with all test holes or pits. Submit logs of each hole and test pit with depth and average value of each.

(3) Describe gravel, stating whether fine, medium or coarse; loose, tight, cemented, or frozen, and whether it contains stumps or boulders more than 1 foot in diameter; if so, how large, and in what proportion.

(4) Describe bedrock, giving type (granite, sandstone, shale, etc.) and state whether it is hard or soft, smooth, uneven or rough.

(5) Describe overburden, stating whether loose, tight, or cemented; fine or coarse textured; furnish estimate of average thickness and total amount.

(6) Tabulate the reserves using the form outlined above for ore or mineral reserves.

13. Access Roads:

Give road distances to shipping, supply and residence points, stating kind and condition of roads.

14. Water Supply:

State source and quantity of water available for operations and whether sufficient for all seasons of year.

15. Power:

State amount of power used, rate per hour, and source thereof.

16. Labor:

State number and classes (miners, muckers, millmen, etc.) of men employed during a recent representative payroll period.

17. Equipment and Facilities:

Describe present equipment on the property, including buildings. (State condition.) List major pieces of equipment now owned or controlled and in serviceable condition available for this operation.

18. Are there any particular conditions or circumstances affecting your operations that are not described above? If so, explain.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates
(Name of company)

By Allen D. Christensen
(Signature of authorized official)

Vice President and General Manager for The Utah Construction Company
(Title)

July 2, 1951
(Date)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—63792-1

Form MF-100

U.S.DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1. (a) The property will produce manganese oxide ore, which will be gravity concentrated on the property. This concentrate will, in turn, be leached to provide a high grade, high purity product suitable for ferro-manganese production.

   (b) The ore is high in iron, and effort will be made to recover this as an iron ore.

2. The property is known only by its description, section 23, township 48N, range 27W. Operations to date have consisted of sampling by churn - and diamond core - drilling, and metallurgical testing, as described below. The total amount of churn drilling is 14,360 feet and the total amount of diamond core drilling is 2,583 feet.

3. (a) The property is about eight miles north of Aitkin, Minnesota. The town, which is the county seat, is served by the Northern Pacific Railroad.

   (b) The property is north-east of the Cuyuna Range iron mining district.

   (c)(d) The ore body lies in section 23, township 48N, range 27W, Aitkin County, Minnesota.

4. (a) Applicant is engaged in an engineering program leading to the production of a 30% gravity concentrate from which a 62% sintered manganese oxide will be prepared by a modified sulphur dioxide leaching process. Continued explorations will furnish additional technical data to be utilized in completing plant designs.

   (b) Applicant is the lessee.

5. Production is not yet under way, but is expected to commence within twenty months.

6. Experience of the operators:

The Utah Construction Company was organized in 1900, and since that time has engaged in heavy construction of all kinds, including hydroelectric power projects, railroads, industrial plants, tunnels, shafts, and military installations of all kinds including a complicated plant and installations for the Chemical Warfare Department.

For a long time the company has been associated with important mining companies in the performance of mining and stripping work for Kennecott Copper Corporation, Pittsburg Coal Company, and later the Pittsburg Consolidated Coal Company, Colorado Fuel and Iron Corporation, Columbia Iron Mining Company (Geneva Steel Company), and others.

Important achievements of the company have been the construction of plant facilities for Kennecott Copper Corporation which included smelting works, electrolytic refining plant, power house, and a concentration plant. The company successfully performed the general contract for construction of the major part of the Geneva Steel Plant for the Defense Plant Corporation. Other plant facilities built by the company are the design and construction of a zinc fuming plant for American Smelting and Refining Company, a chemical plant for Darco Corporation, a cobalt refinery for Howe Sound Company, and similar projects for other mining companies.

Continuous maintenance contracts are currently being performed for Geneva Steel Company and the Salt Lake Refinery.

Production of iron ore from our own iron mining property near Cedar City, Utah is 150,000 to 200,000 tons per month, and we are shipping ore to Kaiser Steel Company at Fontana, California, to Geneva Steel Company at Geneva and Ironton, Utah, to Carnegie Illinois Steel Company at Chicago and Pittsburg, to Inland Steel Company at Chicago, and to others.

In British Columbia we are opening a new open pit mine which will be processed through a magnetic separator plant with a capacity of 75,000 tons per month.

Associated with us are Foley Grothers, Inc. of St. Paul, Minn., a firm about seventy five years old with long experience in mining and construction work. Located in St. Paul Minn., it has had a wide knowledge and experience in Minnesota Conditions and activities and on the iron range, and has performed construction work throughout the U. S., Canada and Alaska. During the past 27 years it has operated the world's largest open pit coal mine at Colstrip, Montana, currently producing about two million tons of coal annually, has acted as consultant and operator for the government of India in connection with open pit mines northwest of Calcutta and other similar projects.

MF 100

8. See financial statement attached for officers and directors. The five largest stockholders are:

Allen D. Christensen &
Carmen Christensen
1 Montgomery Street
San Francisco, California

Thomas D. Dee
Ogden, Utah

Eccles Hotel Company
Ogden, Utah

E. O. Wattis Estate
% Shepard Mitchell
815 No. Bedford Drive
Beverly Hills, California

P. L. & Phyllis Wattis
220 Bush Street
San Francisco, California

7. (a) This property has been drilled, first for possible iron ore, and later for manganese ore, by three independent organizations. The first explorations were made by M.P.Botsford of Crosby, Minn. in 1913 and by the Crosby Exploration Company in 1917. Later, in 1947, the M.A.Hanna Coal and Ore Company put down a number of churn drill holes, and as recently as the fall of 1950, the U.S.Bureau of Mines made a series of diamond drill holes. The logs of all of these holes are available, and the split cores may be seen at Region V headquarters, U.S.B.M., Minneapolis, Minn. The manganiferous material on this property appears to be extensive, and has been shown to be susceptible to beneficiation by simple procedures.

(b) While this property may be considered contiguous to the Cuyuna Range iron formation, it is distinct and separate from the existing mines and is removed from the nearest mine by more than twenty miles.

(c) The private reports which have been made on this property are confidential and not immediately available. All of the reports, however, are substantiated in all respects by those of the U.S.B.M., Region V.

10. Operations have not reached the production stage.

11. Proposed production is at the rate of 16,500 L.T. per 24 hrs. for 200 days per year. This will produce some 10,000,000 long ton units of manganese per year.

12. (a) The mineral body consists of bedded sedimentary deposits, considerably metamorphosed and lying in the form of an eroded anticline covered by alluvium some 150 feet thick. The mineral bed appears to vary from 150 to 250 feet in thickness. Assays have run from less than 1% to over 20% Mn. Average minable material is believed to run 3 3/4% Mn. The mineral consists of grains of manganiferous material of varying sizes embedded in fine, dense clayey material.

(b) U.S.B.M. drilling log of 5/13/50, Aitkin County, Minn. Sec. Ref.1072 is referred to as substantiation, and a plan of the drilling is attached.

Mineral reserve	Estimated tons	% Mn.	Total Mn. content	Total recoverable long tons	Est.cost of prod.
Measured	37,800,000 L.T.	3 3/4%	1,400,000	1,100,000	$6 / L.T. of 20% concentrate
Indicated	23,700,000 "	"	880,000	710,000	"

13. It will be necessary to build about two miles of access road from a good county highway. A railroad spur about ten miles long is required. The entire area is perfectly flat, and the cost of these access facilities would be at the minimum for such works.

14. Blind Lake, about 500 acres in extent, is about half a mile due north of the northwest corner of the section, and could supply all the water needed for beneficiation. There would be no seasonal shortage.

15. Power is available from the Minnesota Power and Light Co's. grid, which is less than six miles distant. The rate for the estimated 2,500 kw required is under 1½¢ per kw hr.

16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

MANGANESE PRODUCTION FROM LOW GRADE CUYUNA ORES

It is proposed to utilize a supply of low grade manganiferous material occurring on section 23-T48N R27W, in Aitkin County, Minnesota. The mineral apparently occurs in a syncline. Churn and diamond core drilling indicate a probable ore body roughly rectangular, about 1000' wide, and from 5000' to 6000' long. The thickness of mineralization varies from 150' to 250', but the thicker portions contain leaner streaks, which brings the average more nearly to 150'. This indicates a probable tonnage of 62,000,000. With an average content of recoverable manganese of 3%, this shows the possibility of recovering some 190,000,000 long ton units of manganese.

Preliminary ore dressing work by three independent laboratories demonstrates that greater than 80% manganese recovery is possible when concentrating 4.5% ore to 20%. There should be no difficulty in achieving a similar result even with the grade of the ore falling to nearly 3%. This is due to the unusual characteristic of the formation, wherein the gangue exists chiefly as a veryfine clayey material which may be washed away. Further refinement is then effected by gravity separation, such as sink-float.

The area is perfectly flat, and the overburden consists of sandy loam, clay, gravel and boulders to a depth of 150' over the entire ore body. Because of this thickness of overburden, open pit mining operations must be carried out on a large scale to be economical.

With a proposed leaching plant designed for a yearly production of 10,000,000 long ton units of manganese as a 61% manganese sinter, and assuming 350 working days per year in the leaching plant and 300 working days in the mine, ore production would be 11,000 long tons per 24 hours.

Owing to the depth of overburden, the only means of sampling the ore has been through some 40 churn-drill holes and 7 diamond core-drill holes. These show the undoubted existence of an enormous quantity of potential ore; a great deal is left to be desired. But additional information on ore dressing and on the actual quality of ore which could be mined are desired.

In order to prove further the extent of the ore body, and to define barren areas for the spoil banks, tailings ponds and plant facilities, it will be necessary to drill more holes. It is estimated that about 40 more holes should be drilled. Because equipment procurement entails a long delay, and because the large capital outlay magnifies the consequence of errors in calculations, it is considered desirable that run of mine samples, rather than drill cores or sludge, be obtained for ore dressing work. When it is mentioned that the ore dressing will probably entail the expenditure of about $1,000,000, it can readily be seen that the sinking of an exploratory shaft for sample mining is amply justified.

MANGANESE PRODUCTION FROM LOW GRADE CUYUNA ORES (Cont'd)

With drilling expected to cost about $60,000, the shaft $100,000 mining of ore for pilot ore dressing and pilot leaching operations $25,000, and ore dressing research and piloting $275,000, it will be seen that exploration capital of $500,000 should be made available.

Using the most nearly equivalent operations as guides and basing stripping costs on large scale contracts in the locality, a mining and concentrating cost of $5.47 per ton of 20% concentrate is obtained. For purposes of estimate it is desirable to reduce all costs to the basis of long ton units of manganese content (22.4 lb.). On this basis, mining and concentrating would cost $0.278 /long ton unit.

It should be noted that an increase in the rate of mining tends to reduce the cost of producing concentrates, and it is indicated that production of 100,000 units of manganese per day would reduce the cost of concentrates to about $0.2415 /long ton unit.

Because of the low grade of the ore, a small change in the assay has a large effect on the cost of the concentrate. On the 200 ton per day operation, a change in assay of ½% changes the cost of concentrates by 14%. This serves to stress the importance of thorough exploration of the ore body.

May 23, 1951

MANGANESE

Ore samples have assayed	2.5 - 7.5%	Mn
Average is expected to be	3.75%	Mn
Recovery is expected to be	3%	Mn

All on the basis of per ton mined

Concentration to 20% is expected

Concentration ratio is 6.67:1

All figures following are based on reaching full production the first year, and the mining cost is lower by reason of distributing the entire stripping cost over five years' ore production.

No taxes have been included.

200 x 5 x 6.67 = 6670 T/day

6670 x 365 = 2,435,000 T/yr.

2,500,000 T/yr.

Figure 200 working days in the mine.

$\frac{2,500,000}{200}$ = 12,500 T/24 hrs.

$\frac{12,500}{24}$ = 521 T/hr.

PRODUCTION OF CONCENTRATE

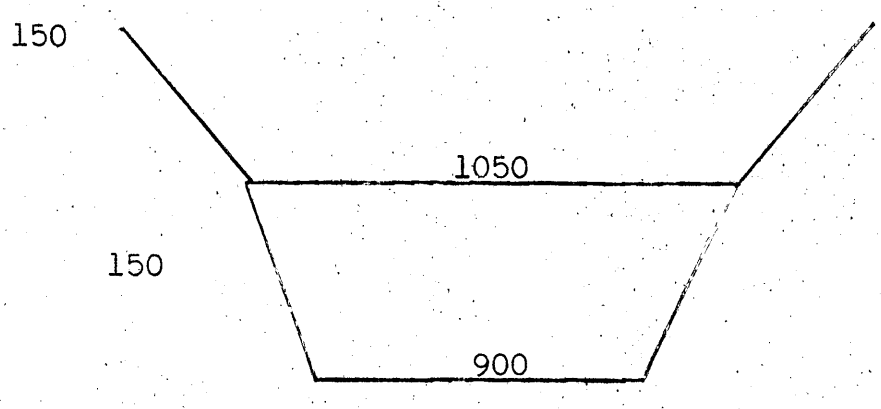
	5 yr. basis
Mining cost, including stripping	0.622
Concentrating	0.211
Per ton ore mined	0.833
Per ton concentrate shipped	5.58

On the basis of 3% Mn recoverable in the concentrate, the cost of concentrate per ton of contained Mn is:

$$\frac{0.82}{0.03} = \$27.80$$

Exclusive of royalties, depletion, taxes, etc.

MINING COST



Volume overburden $= \frac{150}{3}$ (1500 + 1050 + 1500 x 1050) = 50 (2250000 + 1102500 + 1575000)

= 4927500 x 50 = 245380000 cf. or 8780000 cy.

Volume ore = $\frac{150}{3}$ (1050 + 900 + 1050 x 900) = (1102500 + 810000 + 945000) 50

= (2857500) 50 = 142,780,00 cf, or5,285,000 cy.

with sp. gr. 2.7 = 10,650,000 gross tons.

Cost:

Stripping	8,780,000 Cy. @ 40¢	=	3,512,000
Mining	5,285,000 Cy. @ 60¢	=	3,170,000
			6,682,000

Cost per ton = $\frac{6682000}{10650000}$ = \$0.622/Ton mined

Stripping ratio = 0.816 Cy./Ton gross

COST OF CONCENTRATION

	Per ton ore mined
Plant amortization, 5 year write-off	0.08
Labor, including maintenance	0.0476
Maintenance & Repair materials	0.016
Utilities	0.0438
	0.1874
Administration & Overhead 50% of labor	0.0238
Per ton ore mined	0.2112
Cost of concentration	
Use	0.21
Or	1.40 per ton concentrates shipped.

ORE DRESSING PLANT

Buildings	$ 200,000
Crushers	68,000
Screens	20,000
Washing trommell	20,000
Log wahsers	40,000
Rod mill	35,000
Conveyors	30,000
Wilfley tables	35,000
Screw classifiers	60,000
Sink-float	100,000
Bins	50,000
Water supply	50,000
Tails disposal	50,000
	$ 758,000
Contingencies	76,000
Engineering	76,000
	$ 910,000
Use	$1,000,000.00

Cost per ton mined $= \frac{1,000,000}{12,500,000} = 0.08$

CONCENTRATING PLANT LABOUR

Foreman	3 @ 25.00 per diem	$ 75.00
Chemist		20.00
Operators	24 @ 15.00	360.00
Maintenance	(2 elect, 2 pipe fitters, 2 mech.)	140.00
		$595.00 per diem

$$\frac{595}{12,500} = \$0.0476/T \text{ mined}$$

UTILITIES FOR ORE DRESSING PLANT

	HP	
Crushers @	400	
Screens @	40	
Washing trommell	200	
Rod mill	200	
Log washers	100	
Conveyors	150	
Wilfley tables	50	
Screw classifiers	50	
Water supply	125	
Tails disposal pumps	200	
	1515 HP	
		1780
		50 kw
Lighting, etc.		1830

Or 1850 kw

Use figure of 0.01¼ per kw hr or 22.80 per hr

Cost per ton of ore mined $= \frac{22.80}{521} = 0.0438$ per ton ore mined.

CONCENTRATING PLANT MAINTENANCE AND REPAIRS

Crusher replacements	$10,000.00 per an.
Screen replacements	4,000.00
Log washer "	2,000.00
Trommell "	2,500.00
Conveyor	2,500.00
Wilfley table "	3,500.00
Classifiers "	1,000.00
Pump "	10,000.00
Building repairs	1,000.00
Piping replacements	2,500.00
Miscellaneous supplies	1,000.00
	$40,000.00 per an.

Or $0.016 per ton mined

MANGANESE RECOVERY PLANT

Capacity 200 Short Tons Mn/24 Hrs. as Sintered Oxide from -48 Mesh Cuyuna Concentrates (20% Mn)

ESTIMATED OPERATING COST/TON Mn

Operating Labor	$7.75	
Supervision & O.H.	2.65	10.40
0.15 T. Sulfur @ $30	4.50	
0.55 T. Coal or Coke Breeze @ $10	5.50	
20 Million BTU Gas or Oil @ 33¢	6.60	
650 K.W. Hrs. @ 1½¢	9.75	
16 Thousand Gals. Water @ 1½¢	0.24	
Repairs and Maintenance	7.00	33.59
Total/Short Ton Mn		$43.99

ADJUSTMENT TO 100,000 LONG TONS/ YEAR

Operating Labor	$7.75 x $\frac{16,000,000}{10,310,000}$ x $\frac{66,000}{100,000}$ =	$7.95	
Overhead	$2.65 x $\frac{66,000}{100,000}$ =	1.75	$9.70
Material, Services, Utilities and Maintenance	$33.59 x 1.12 =		37.62
Total/L Ton			$47.32
Total/ L Ton Unit			$0.473

Form MF-100

U.S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1. (a) The property will produce manganese oxide ore, which will be gravity concentrated on the property. This concentrate will, in turn, be leached to provide a high grade, high purity product suitable for ferro-manganese production.

   (b) The ore is high in iron, and effort will be made to recover this as an iron ore.

2. The property is known only by its description, section 23, Township 48N, range 27W. Operations to date have consisted of sampling by churn - and diamond core - drilling, and metallurgical testing, as described below. The total amount of churn-drilling is 14,360 feet and the total amount of diamond core drilling is 2,583 feet.

3. (a) The property is about eight miles north of Aitkin, Minnesota. The town, which is the county seat, is served by the Northern Pacific Railroad.

   (b) The property is north-east of the Cuyuna Range iron mining district.

   (c) (d) The ore body lies in section 23, township 48N, range 27W, Aitkin County, Minnesota.

4. (a) Applicant is engaged in an engineering program leading to the production of a 20% gravity concentrate from which a 62% sintered manganese oxide will be prepared by a modified sulphur dioxide leaching process. Continued explorations will furnish additional technical data to be utilized in completing plant designs.

   (b) Applicant is the lessee.

5. Production is not yet under way, but is expected to commence within twenty months.

6. Experience of the operators:

   The Utah Construction Company was organized in 1900, and since that time has engaged in heavy construction of all kinds, including hydroelectric power projects, railroads, industrial plants, tunnels, shafts, and military installations of all kinds including a complicated plant and installations for the Chemical Warfare Department.

6. Cont. For a long time the company has been associated with important mining companies in the performance of mining and stripping work for Kennecott Copper Corporation, Pittsburg Coal Company, and later the Pittsburg Consolidated Coal Company, Colorado Fuel and Iron Corporation, Columbia Iron Mining Company (Geneva Steel Company), and others.

Important achievements of the company have been the construction of plant facilities for Kennecott Copper Corporation which included smelting works, electrolytic refining plant, power house, and a concentration plant. The company successfully performed the general contract for construction of the major part of the Geneva Steel Plant for the Defense Plant Corporation. Other plant facilities built by the company are the design and construction of a zinc fuming plant for American Smelting and Refining Company, a chemical plant for Darco Corporation, a cobalt refinery for Howe Sound Company, and similar projects for other mining companies.

Continuous maintenance contracts are currently being performed for Geneva Steel Company and the Salt Lake Refinery.

Production of iron ore from our own iron mining property near Cedar City, Utah is 150,000 to 200,000 tons per month, and we are shipping ore to Kaiser Steel Company at Fontana, California, to Geneva Steel Company at Geneva and Ironton, Utah, to Carnegie Illinois Steel Company at Chicago and Pittsburg, to Inland Steel Company at Chicago, and to others.

In British Columbia we are opening a new open pit mine which will be processed through a magnetic separator plant with a capacity of 75,000 tons per month.

Associated with us are Foley Brothers, Inc. of St. Paul, Minn., a firm about seventy five years old with long experience in mining and construction work. Located in St. Paul, Minn., it has a wide knowledge and experience in Minnesota conditions and activities and on the iron range, and has performed construction work throughout the U. S., Canada and Alaska. During the past 27 years it has operated the world's largest open pit coal mine at Colstrip, Montana, currently producing about two million tons of coal annually, has acted as consultant and operator for the government of India in connection with open pit mines northwest of Calcutta and other similar projects.

7. (a) This property has been drilled, first for possible iron ore, and later for manganese ore, by three independent organizations. The first explorations were made by M. P. Botsford of Crosby, Minn. in 1913 and by the Crosby Exploration Company in 1917. Later, in 1947, the M.A. Hanna Coal and Ore Company put down a number of churn drill holes, and as recently as the fall of 1950, the U. S. Bureau of Mines made a series of diamond drill holes. The logs of all of these holes are available, and the split cores may be seen at Region V headquarters, U.S.B.M., Minneapolis, Minn.

7. (a) Cont. The manganiferous material on this property appears to be extensive, and has been shown to be susceptible to beneficiation by simple procedures.

(b) While this property may be considered contiguous to the Cuyuna Range iron formation, it is distinct and separate from the existing mines and is removed from the nearest mine by more than twenty miles.

(c) The private reports which have been made on this property are confidential and not immediately available. All of the reports, however, are substantiated in all respects by those of the U.S.B.M., Region V.

8. See financial statement attached for officers and directors. The five largest stockholders are:

Allen D. Christensen &
Carmen Christensen
1 Montgomery Street
San Francisco, California

Thomas D. Dee
Ogden, Utah

Eccles Hotel Company
Ogden, Utah

E. O. Wattis Estate
% Shepard Mitchell
815 No. Bedford Drive
Beverly Hills, California

P. L. & Phyllis Wattis
220 Bush Street
San Francisco, California

8. & 9. See financial statement of The Utah Construction Company.

10. Operations have not reached the production stage.

11. Proposed production is at the rate of 16,000 L. T. per 24 hrs. for 300 days per year. This will produce some 10,000,000 long ton units of manganese per year.

12. (a) The mineral body consists of bedded sedimentary deposits, considerably metamorphosed and lying in the form of an eroded anticline covered by alluviam some 150 feet thick. The mineral bed appears to vary from 150 to 250 feet in thickness. Assays have run from less than 1% to cover 20% Mn. Average minable material is believed to run 3 3/4% Mn. The mineral consists of grains of manganiferous material of varying sized embedded in fine, dense clayey material.

12. (b) Cont. U.S.B.M. drilling log of 5/13/50, Aitkin County, Minn. Sec. Ref. 1072 is referred to as substantiation, and a plan of the drilling is attached.

Mineral reserve	Estimated tons	% Mn.	Total Mn. content	Total recoverable long tons	Est.Cost of prod.
Measured	37,800,000 L.T.	3 3/4%	1,400,000	1,100,000	$6 / L.T. of 20% concentrate
Indicated	23,700,000 "	"	880,000	710,000	"

13. It will be necessary to build about two miles of access road from a good county highway. A railroad spur about ten miles long is required. The entire area is perfectly flat, and the cost of these access facilities would be at the minimum for such works.

14. Blind Lake, about 500 acres in extent, is about half a mile due north of the northwest corner of the section, and could supply all the water needed for beneficiation. There would be no seasonal shortage.

15. Power is available from the Minnesota Power and Light Co's. grid, which is less than six miles distant. The rate for the estimated 2,500 kw required is under 1½¢/kw hr.

16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

DEFENSE MINERALS ADMINISTRATION
Control Slip

MN

CONTROLLED DOCUMENT

DMA Docket No. 1829X

DO NOT DETACH THIS SLIP

Action on this document is recorded and controlled in Reports and Records Branch. Any movement of this document between divisions or offices of DMA or movement outside DMA must be reported to the Reports and Records Branch. Actions taken that affect status of the case must also be reported.

This document has been recorded as

Any action taken to change the type of request for assistance must be promptly reported to the Reports and Records Branch. Use DMA Form 2 for submitting these reports.

Routing Slip

To:	Director, Supply Div	Date	Sept 4, 1951
To:	REPORTS AND RECORDS	Date	~~SEP 4 1951~~ SEP 5 1951
To:		Date	
To:	Reports & Records	Date	11/28/51
To:	Iron & Ferro Alloys Br. Selfridge Bldg. 3538	Date	1/4/52
To:		Date	
To:	Open Conn	Date	5- -53
To:	Code-400	Date	9-29-53
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	

DO NOT DETACH

CONTROLLED DOCUMENT

November 16, 1953

MEMORANDUM

To: R. E. Adams, Chief, Oper. Control and Statistics Div., DMEA

From: Iron and Ferro-Alloys Division, DMEA

Subject: Removal of application from the active files
Docket No. DMEA 1889 - Manganese
Utah Construction Company & Associates
Section 23, T. 48 N., R. 27 W.
Aitkin County, Minnesota

The subject application, dated August 3, 1951, was approved by the Supply Division, DMA, on September 5, 1951, and received by the FED, DMA, on the same day. The recommendation of the FED was for the application to be put in the inactive file.

On January 30, 1952, Mr. Reynolds of the Utah Construction Company indicated his company intended to submit an amended application. These data were not received and by letter of July 3, 1952, the matter was called to the attention of the applicant.

On July 21, 1952, the applicant advised DMEA that the proposal was contingent upon acceptance by the Defense Materials Procurement Administration of a related proposal, and therefore requested DMEA to hold open the subject application until DMPA acted with respect to the other application.

On March 30, 1953, we again asked what the Applicant intended to do and were advised by letter of April 23, 1953, that the intention was to file an amended application. We were then requested to keep the subject file open.

When no further data were received, on June 8, 1953, we wrote two separate letters to ask the Applicant for the information previously promised. On August 26, 1953, when no answer had been received to either letter we notified the Applicant that if we had not heard from him by October 1, 1953, the docket would be transferred to the inactive files and the matter closed.

On September 22, 1953, the Applicant while not furnishing the data promised still requested DMEA to hold the application open.

In view of the long period of time the subject application has been held in abeyance and the reluctance of the Applicant to submit the amended application promised in January 30, 1952, we notified the Applicant on September 28, 1953, that if the necessary data were not received by November 15, 1953, the subject application would be closed.

The docket is transmitted herewith.

W. S. Martin, Chief
Iron and Ferro-Alloys Division

FAButledge:foc
11-16-53
cc: Docket
Code 400
Admr. Reading File

LScott
9/25/53

SEP 2 8 1953

Mr. Carl A. McClure III
Putney, Twombly, Hall & Hizdenore
165 Broadway
New York 6, New York

Re: Docket No. DMA 1829T - Manganese
Utah Construction Company
& Associates
Aitkin County, Minnesota

Dear Mr. McClure:

This acknowledges receipt of your letter of September 22, 1953, with reference to our two letters of June 8 and August 26, 1953, to Mr. William W. Hayden concerning the subject application. Our letter of August 26 advised Mr. Hayden that unless we had received a reply by October 1, 1953, to our several earlier requests of Utah Construction Company for certain specific information needed to process the application, we would withdrew the docket from our active files and consider the matter closed.

The Defense Minerals Exploration Administration has now held this application in abeyance for approximately two years in compliance with various requests by the applicant's representatives, with the understanding that the applicant would furnish an amended application containing the requisite data.

We wish to cooperate fully in the matter of allowing ample time but we are anxious to close the very few remaining old DMA dockets and if the needed data are not received by November 15, 1953, the subject docket will be withdrawn from our active files.

Should Utah Construction Company be unable to obtain and supply us with the required subordination agreement and other necessary data by November 15, a new application may, of course, be submitted to DMEA at such future time as these data are available.

Sincerely yours,

Frank E. Johnson

ACTING Administrator

Copy to: Mr. William W. Hayden
President, Chemetals Corp.
486 Madison Avenue
New York 22, New York

Copy to: Docket
Field Team, Reg. 5
Code 400
Adm. Read. File
Martha Carr, USGS
Gilbert DeBuff, USBM

400

AUG 2 6 1953

Mr. William M. Hayden, President
Chemetals Corporation
488 Madison Avenue
New York 22, New York

Re: Docket No. [illegible] - Manganese
Utah Construction Company and
Associates
Aitkin County, Minnesota

Dear Mr. Hayden:

Reference is made to our two letters of June 8, 1953, concerning the subject docket. To date we have not heard from you concerning the five items mentioned in the one letter or the revised costs requested in the other.

If you wish to continue with the referenced application or an amended application will you please advise us.

If we have not heard from you by October 1, 1953, we will withdraw the docket from our active files and consider the matter closed.

Sincerely yours,

C. O. Mittendorf

Administrator

cc: Utah Construction Company
and Associates
Aitkin County, Minnesota

cc: Docket
Code 400
FT. Reg. 8
Operating Comm.
Adm. Reading File
Mr. DeHuff, USBM
Mrs. Martha Carr, USGS

Mr. William [illegible] Hayden, President
Chemetals Corporation
488 Madison Avenue
New York 22, New York

JUN 3 1953

Re: Docket No. [illegible] - Manganese
Utah Construction Co. and Associates
Aitkin County, Minnesota

Dear Mr. Hayden:

Under separate cover we are mailing to you about certain details of property owners in and related subjects under the captioned application for exploration assistance.

It is understood also from previous conversations with Mr. C. L. L. Berresby that your estimate, dated "Second Draft - Exploration Expense - March 11, 1953," will be revised to exclude all items other than those which we could accept as "necessary, reasonable, direct cost" under Section 8(b) of DMA Order-3. For your convenience we enclose a copy of that order, as amended.

It will be appreciated if you can arrange to submit the revised cost promptly in order that we may be able to continue our consideration of your application, in the light of present conditions, at the same time that you are obtaining the data requested in our above-mentioned letter.

Sincerely yours,

C. O. Mittendorf

Administrator

Enclosure

CC: Docket
COMM 400
FIELD OPS, REGIONV
OPER. COMMITTEE
ADM. ASSO. FILE
N. B. MEAGHER, USBM
M. D. CHIETENDEN, USGS
Utah Construction Co., 1 Mont. St., San Francisco 4, Calif.

WSMartin/ls 6/5/53

140

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

400

JUN 8 1953

Mr. William M. Hayden, President
Chemetals Corporation
488 Madison Avenue
New York 22, New York

Re: Docket No. DMA-1329X - Manganese
Utah Construction Company and Associates
Aitkin County, Minnesota

Dear Mr. Hayden:

Reference is made to your conversation with our Iron and Ferro-Alloys Division on May 15, 1953, when you asked us to reactivate the subject application, which has been held in abeyance since January 30, 1952, at the request of the Utah Construction Company.

The above exploration project is now being reviewed to determine to what extent modification will be required to suit current conditions. We have already noted, however, five items which can be called to your attention at once, as follows:

1. There is no record of the assignment of the lease of January 1, 1950, from Tintic Standard Mining Company, Nellie B. Mining Company, Hubert E. Howard, Harold E. Raddatz, and William M. Hayden to the Utah Construction Company. Six copies of such assignment will be required.

2. In lieu of the Landlord's Subordination Agreement which we formerly used we shall need from the Andyck Corporation six copies of Owner's Consent to Lien, for which we enclose forms. This should refer to the lease dated January 1, 1950 to Kay Todd, Sinclair H. Todd, Edward P. Scallon, and Frances Scallon and the successive assignments.

3. The present "Landlord's Subordination Agreement" signed by Kay Todd and Edward P. Seallon is deficient in that it describes the signers thereof as owners of the property when they are actually only the lessees, and it should be signed not only by them, but also by their wives. Accordingly, we are attaching a new subordination agreement for their signatures.

4. This office should be informed of the exact name of the Operator, which should be inserted in the attached Subordination Agreement, if it is there stated incorrectly. The application states that the applicant is the assignee of the lease, and the "Dummy" assignment refers to "The Utah Construction Company and Associates, Inc." but the Landlord's Subordination Agreement dated August 6, 1951, refers only to "Utah Construction Company and Associates". If the Operator is not a corporation, we should be advised of its legal status--that is whether it is a partnership or not, and the names of all concerned. If the assignment to the Operator also creates a lien on production superior to the Government's, another subordination agreement from the Tintic Standard Mining Company et al., would be necessary.

5. The original lease and assignment thereof and option agreement indicate that the property is located in section 23, T. 48, R. 27 Aitkin County, Minn. They should be corrected to indicate that the property is located in section 23, T. 48 N., R. 27 W. Aitkin County, Minn. (as appears under the title of the map "Proposed Manganese Mine").

Sincerely yours,

C. O. Mittendorf

Administrator

Copy to: Utah Construction Company
and Associates
1 Montgomery Street
San Francisco 4, California

Rutledge/Martin/Kane/ema
5/25/53

cc: Mails & Files
Mr. Martin
FT. Reg. V - 2
Adm. R. File
C. O. Mittendorf
N. B. Melcher, USBM
M. D. Crittenden, USGS
J. L. Hofflund
A. E. Kane
Chron.
Pending

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

SUBORDINATION AGREEMENT

WHEREAS, the undersigned are the Assignors mentioned in the contract of assignment of lease dated _____, 1950, in which they assigned their right, title and interest in and to the lease from Andyck Corporation dated January 1, 1950, to Tintic Standard Mining Company et al., as assignees, and the latter agreed to pay the royalties specified therein on all iron, manganese and magniferous ores or concentrates mined and removed from the property which is also the subject of a proposed Exploration Project Contract between the United States of America, hereinafter called the "Government" and The Utah Construction Company and Associates, Inc.

NOW, THEREFORE, the undersigned, as such Assignors, do by these presents subordinate all of their right, title and interest under the provisions of the said lease and the said contract of assignment of lease to the right, title and interest of the Government under the provisions of the said Exploration Project Contract, and agree that the lien and claim of the Government shall be prior to the undersigned's rights under the terms of the said lease and contract of assignment thereof; and to commit no act nor assert any right, title, or interest that might contravene or conflict with the prior lien and claim of the Government under the provisions of said Exploration Project Contract; and

The undersigned further agree that if the said leasehold interest should be surrendered to them by the assignees above-mentioned, or any subsequent assignees thereof, or be terminated at any time prior to the expiration of the rights of the Government under the said Exploration Project Contract, the undersigned shall assume and do hereby assume all the obligations of the "Operator" under the said Exploration Project Contract to make repayment to the Government according to the terms of the said contract.

This undertaking and covenant shall be binding upon the heirs, successors and assigns of the undersigned.

Dated this _____ day of _____, 1953.

_____ _____

_____ _____

Bureau of Mines
Report of Investigations 4979

INVESTIGATION OF SCALLON-TODD LEASE AITKIN COUNTY, MINN.

BY WESLEY A. GROSH, JAMES W. PENNINGTON, AND PAUL A. WASSON

For release
June 1, 1953

United States Department of the Interior— May 1953

INVESTIGATION OF SCALLON-TODD LEASE AITKIN COUNTY, MINN.

BY WESLEY A. GROSH, JAMES W. PENNINGTON, AND PAUL A. WASSON

* * * * * * * * * **Report of Investigations 4979**

UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary
BUREAU OF MINES
J. J. Forbes, Director

Work on manuscript completed October 1952. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4979."

May 1953

INVESTIGATION OF SCALLON-TODD LEASE, AITKIN COUNTY, MINN.

by

Wesley A. Grosh,[1] James W. Pennington,[2] and Paul A. Wasson[2]

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1/ Mining engineer, Mining Division, Region V, Bureau of Mines.
2/ Metallurgist (mineral dressing), Metallurgical Division, Region V, Bureau of Mines.

Report of Investigations 4979

SUMMARY

The Cuyuna range in central Minnesota has been the source of substantial tonnages of manganiferous iron ores for almost four decades. To increase the Nation's self-sufficiency in manganese reserves, the Bureau of Mines initiated a comprehensive investigative program to determine and develop the potential manganese reserves in the region. In the course of compiling all available information on the Cuyuna range, the Scallon-Todd lease appeared to be an area having favorable possibilities for developing substantial reserves of manganese.

Early drilling on this lease indicated considerable tonnages of material relatively high in manganese. More recent drilling substantiated the size of the deposit but indicated lower manganese values. However, beneficiation tests of samples obtained from the recent drilling indicated that the material was amenable to concentration.

To obtain samples of the material for checking the analyses and for beneficiation tests, the Bureau of Mines drilled a test hole on the property in the early spring of 1950. Results of the drilling were favorable and justified a more extensive drilling program. Therefore, 6 NX-size diamond core-drill holes, totaling 2,251 feet, were drilled in the fall of 1950.

All core samples were split, and half has been reserved for permanent record in the Bureau of Mines core-storage warehouse in Minneapolis, Minn. The other half of the cores and the sludge samples were used for analyses and for mineral-dressing studies. The drill-core samples indicated that the manganese was distributed throughout the deposit and averaged approximately 3 percent.

Mineral-dressing studies included washing and desliming and sink-float and flotation tests. Ordinary washing and desliming of the crushed material removed about 50 percent of the original weight with a manganese loss of about 7 percent. Sink-float tests indicated that grinding of the material to at least minus-100-mesh size was necessary to produce a high-manganese, low-silica product.

Flotation of the deslimed material after crushing to minus-200-mesh size produced a concentrate assaying 19.09 percent iron, 23.23 percent manganese, and 16.64 percent silica. As the middlings were not re-treated, the calculated manganese recovery was 86.2 percent. A product such as this could be utilized as a manganese-leaching-plant feed or mixed with high-grade iron ore for production of basic pig iron.

The procedures used and the factual data on the results obtained from the Bureau of Mines drilling and beneficiation tests are presented in this report.

INTRODUCTION

During the last 40 years substantial tonnages of iron ore have been mined in the Cuyuna range, in central Minnesota. A large percentage of the ores shipped was manganiferous and demanded a premium for use in upgrading the manganese content of ores from other iron ranges in the Lake Superior region. Over half of the ore is beneficiated before shipment.

The Bureau of Mines began a detailed investigation of the Cuyuna range as part of a program to improve the Nation's self-sufficiency in manganese. One objective of the investigation was to review and compile all the geologic, exploration, development, and mining information into a comprehensive atlas as a ready reference of geology and ore reserves. This phase of the study is the subject of another report.

A second phase consisted of investigating and developing favorable-appearing deposits by core drilling to determine reserves and grade of ore, as well as metallurgical testing to determine character of the ore and amenability to concentration.

During the early history of the Cuyuna range it was intensively prospected for iron ore. Only the richer or higher grade deposits were considered at that time, and little attention was paid to the manganese content, except as a desirable adjunct to the iron. No effort was made to develop manganese reserves for their manganese content alone.

Beneficiation of the Cuyuna ores was begun soon after the first mining on the range and has steadily increased until more than half of the ores shipped are now concentrated to some extent. Over 90 percent of the concentrates are produced by washing, drying, or sintering. Jigging and high-density methods, which have been responsible for only minor tonnages of concentrates in the past, are being employed to a greater extent in the Cuyuna range as the ores mined become more complex. As mining and beneficiation methods improved, lower grade deposits have been exploited. Many lower grade deposits, formerly considered of little value, are now being considered for exploitation.

In the course of assembling information on the Cuyuna range, the Scallon-Todd lease appeared to be an area favorable for developing a large tonnage of low-grade manganese-iron ore that could be readily beneficiated. Records of 41 holes were available. Thirty-six were drilled by the Crosby Exploration Co. and 5 by The M. A. Hanna Co. There was a great discrepancy in the manganese values disclosed by the drilling of these two companies. Therefore, to evaluate properly the conflicting information available, the Bureau of Mines diamond-core-drilled one preliminary test hole in March and April 1950. This hole indicated lower manganese values than did the drilling by Crosby Exploration Co. and substantiated the results obtained by The M. A. Hanna Co.

Metallurgical tests of samples from this hole indicated that the manganese was amenable to concentration. It was found that a concentrate containing over 20 percent manganese with favorable recoveries could be produced by simple washing methods. As this confirmed some of the original information received, a more extensive drilling program was proposed. This program was designed to establish the limits of the deposit, increase the manganese reserves, and provide samples for beneficiation tests.

Further drilling was initiated September 14, 1950, and completed December 2, 1950. During this period, 6 holes totaling 2,251 feet were drilled. This drilling was only a part of the original proposal.

Half of the core and all of the sludge samples taken were used for mineral-dressing studies at the Bureau of Mines laboratory in Minneapolis, Minn. The object of these studies was to determine suitable procedures for concentrating the manganese minerals into a product that could be mixed with high-grade iron ore and used in producing basic pig iron or as a feed material for a manganese-leaching plant.

ACKNOWLEDGMENTS

The drilling program was conducted under the direct supervision of Wesley A. Grosh, mining engineer, Mining Division. Compilation of data and preparation of the Cuyuna range atlas is under the supervision of Walter E. Lewis, chief, Mineral Industry Survey Branch, Mining Division. The Cuyuna range development program is under the general supervision of A. B. Needham, chief, Mining Division.

All work was done under the general direction of Paul Zinner, then regional director, Region V, Bureau of Mines.

LOCATION AND ACCESSIBILITY

All drilling reported herein was confined to sec. 23, T. 48 N., R. 27 W., Aitkin County, Minn. The drill site is 6-1/2 miles north and 1 mile west of the town of Aitkin, Minn. A gravel road from Aitkin, maintained by the county, passes east-west 2 miles south of the southwest corner of the section. One mile farther west the road turns and continues north, passing 1 mile west of the same section corner. A graded ditch bank extends from the gravel road 2 miles north to the section corner. No roads exist within section 23, which is almost entirely swamp land incapable of supporting automotive equipment. A trail extends from the southwest corner of the section to approximately the center of the NE1/4 of the SE1/4 and is passable in dry weather or when the ground is frozen. The gravel roads in the area are good most of the year, except during the spring thaw, when travel by car may be impossible for a week or more. Load limits, which prohibit the use of heavy trucks, are usually imposed on most of the roads in the vicinity for a month or more in the spring.

Telephone, telegraph, and mail service is available in Aitkin, Minn., about 8 miles from the property. Rail facilities are provided in town by the Northern Pacific Railroad. The principal mining supply centers are Crosby and

Brainerd, Minn., 15 and 20 miles westward, respectively. Most ore shipments from the Cuyuna range are made by rail to the Duluth-Superior harbor and from there by boat to the lower lake ports.

Figure 1 shows the general location of the Bureau of Mines drilling with respect to roads and towns in the vicinity.

PHYSICAL FEATURES AND CLIMATE

The Cuyuna range lies in the central lake and swamp province of Minnesota. The entire region is covered with a thick mantle of glacial drift. Relief is low over most of the region, being imperceptible in the swamp areas. North of Aitkin, in the vicinity of the drill site, swamp land predominates. Numerous ditches in the vicinity have provided enough drainage to convert some of the swamp land to hay fields. Patches of scrub timber, consisting largely of tamarack, aspen, and other softwoods, may be found scattered throughout the area.

All drainage in the area is tributary to the Mississippi River. The Little Willow River passes 1 mile east of section 23. All other drainage in the vicinity is provided by ditches. Large portions of the area are subject to floods in the spring. Although floods do not occur every year, the more severe floods may extend several miles north of Aitkin and disrupt transportation over many of the county and some of the State roads. Problems arising from floods should be considered in any contemplated mining venture.

Typical climatic conditions are moderate summer temperatures and severe winters. Summer temperatures rarely exceed 100° F., but humidity is usually rather high. Winters are quite cold, temperatures of minus-30° F. are not unusual, and often temperatures of minus-40° F. are recorded. Humidity is low, so the cold is not too uncomfortable.

Normally, little snow falls before January; however, blizzards may be expected during the first 3 months of the year. Moderate rainfall is characteristic during the spring and summer months.

HISTORY AND PRODUCTION

The Cuyuna range was the last of the Lake Superior iron ranges to be discovered and the last to become productive. Although early explorers and fur traders traversed the area, they failed to find or report any indications of iron ore. The first intimation of iron ore was from abnormal variations of the surveyor's compass experienced during the land surveys in 1869.3/ The deep mantle of glacial drift and the lack of rock outcrops in the vicinity account for failure to discover the deposits by direct visual observation.

Exploration by drilling on the Cuyuna range was begun in 1892. However, it was not until 1911 that the first shipments of iron ore were made from the

3/ Zapffe, Carl, Lake Superior Iron Ores: Lake Superior Iron Ore Assoc., 1938, pp. 23-24.

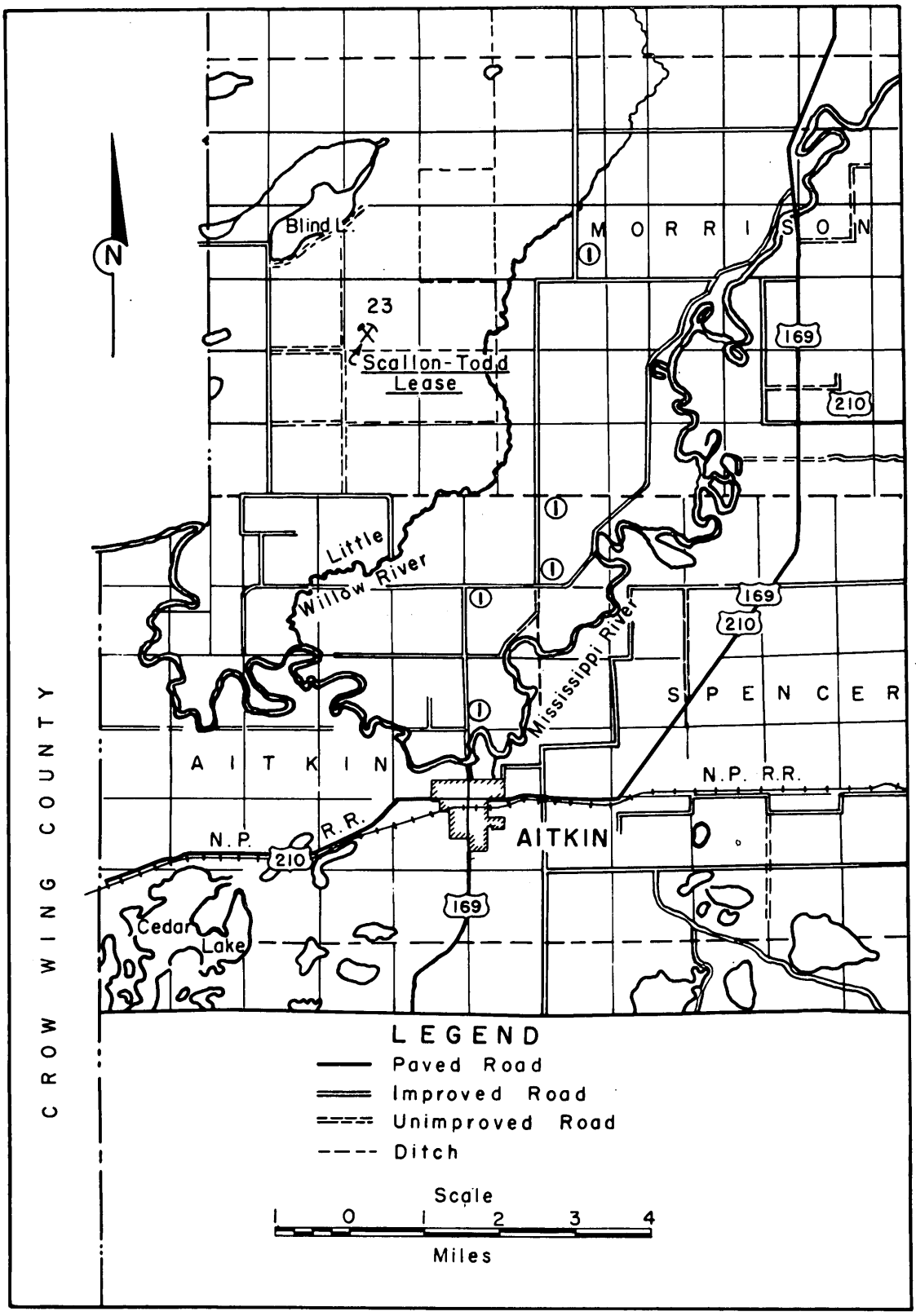

Figure 1. - General location of Scallon-Todd lease, Aitkin County, Minn.

range. Production of 1,000,000 tons a year was reached in 1915; since that time, the range has continued to supply large tonnages of iron ore. The ore from the Cuyuna range has long been noted for its relatively high manganese content and has been used principally for blending with other ores from the Lake Superior district to provide the manganese content needed in the blast furnace feed.

There are no iron mines in Aitkin County. However, scattered drilling and magnetic prospecting throughout the county have established the existence of several iron deposits, which have received little attention until recently. A prominent iron-mining company has recently conducted an extensive drilling program on a deposit in the county.

No mining has been done on the Scallon-Todd lease, where the Bureau of Mines drilled. This property was first drilled in 1913 and 1914 by the Crosby Exploration Co. There is no record of drilling in 1915, but the same company resumed drilling in 1916 and 1917. The Bureau of Mines has records of 36 of these early holes; some of them are incomplete and of doubtful accuracy. In 1949 The M. A. Hanna Co. became interested in the property and drilled five holes. There was no other activity on the property before the Bureau of Mines began to drill.

PROPERTY AND OWNERSHIP

At the time of the Bureau of Mines work, sec. 23, T. 48 N., R. 27 W., was controlled by E. P. Scallon and Kay Todd of St. Paul, Minn., through lease and/or option with the fee owners. Since completion of the work, it has been reliably reported that at least part of their interest has been conveyed to a New York concern. However, Scallon and Todd still control extensive mineral rights to the northeast and southwest of section 23.

DESCRIPTION OF DEPOSIT

The entire Cuyuna range is covered with glacial drift to depths ranging from 50 to over 200 feet. This cover and the absence of any outcrops in the vicinity have prevented detailed geologic studies of the range outside of the active mining areas. Consequently, most of the exploration on the Cuyuna range is controlled, at least in the preliminary stages, by magnetic observations or surveys.

Excessive folding is characteristic of the rock formations on the Cuyuna range. Leaching of the slates during formation of the iron ore has caused some distortion and slump of the beds. The absence of any well-defined marker beds, in conjunction with the folding and effects of leaching, make correlation of geologic structures extremely difficult, especially when studies must be based solely on samples obtained from drill holes.

Rocks of the Cuyuna range may be divided into three groups, according to age and character:4/ (1) Old metamorphosed sediments and interbedded igneous rocks; (2) igneous rocks intruded after metamorphism; and (3) younger rocks lying nearly horizontal on the eroded edges of the complexly folded older rocks. Much disagreement still exists as to the age and correlation of these rocks.

The iron-bearing rocks may be Animikie,5/ with older schists underlying them. The intrusives occur in and near the iron-bearing rocks. Overlying the iron-bearing rocks are some thin lavas, probably Keweenawan, and still higher in the series are small conglomerates and shales, which carry Cretaceous fossils.

The iron and manganese mineralization of economic interest is confined almost exclusively to the Animikee series.6/ Therefore exploration is usually discontinued upon encountering schists or quartzites, and consequently knowledge of the older formations is based on very limited information.

In the Animikie series, the lower cherty divisions are locally enriched to iron ore with little manganese.7/ The upper cherty beds and adjacent carbonate slates are commonly manganiferous. However, the manganese content varies throughout the slates. Toward the top of the upper slaty division are also some iron-bearing beds, with little manganese. In the belt known as the South range, far up from the productive North range, iron ore is found with very little manganese in a mixture of slate and cherty formation.

The oxidation and leaching of ferruginous slates and cherts are very erratic and extend to depths of 10 to 500 feet or more below the weathered surface.8/ The folded cherts are commonly more broken than the folded slates; consequently, leaching along the brecciated chert, as a rule, extends deeper than in the slates. However, the carbonate may weather locally and form ore down to depths of several hundred feet.

Most of the productive mines of the Cuyuna range are in T. 46 N., R. 29 W., and T. 47 N., R. 28 and 29 W.9/ In these townships, the glacial drift is the thinnest, open pit mines the most numerous, and manganese most abundant in the primary formation.

Section 23, T. 48 N., R. 27 W., with which this report is concerned, is about 12 miles east of the village of Cuyuna, the site of the nearest mine opening where direct observation of the rock formations has been possible. Because of the general erratic nature of the formations, geologic projections of this distance are not very reliable. Therefore, geologic interpretations in the area must be based largely on data obtained from drill holes.

4/ Grout, F. F., consulting geologist, Mining Division, Region V: Bureau of Mines unpublished rept.
5/ See footnote 4.
6/ See footnote 4.
7/ See footnote 4.
8/ See footnote 4.
9/ See footnote 4.

It has been generally assumed that rocks in the vicinity dip southeast. The dips of bedding planes in diamond-drill cores vary from vertical to almost horizontal, dips of about 70° predominating. The direction of the dip cannot be established from drill cores alone, as no distinctive bed has been encountered that could be used as a marker for correlation from one drill hole to another.

Whereas the character of the rocks encountered in the drilling on section 23 are not typical of the Cuyuna range iron formation, there is no basis for definitely concluding that they are not part of the iron formation.

Microscopic examination of samples obtained from one hole drilled by The M. A. Hanna Co. did not establish conclusively which beds of the iron formation series are represented. From the examination it was found that the samples were composed of an intimate mixture of fine-grained particles embracing all of the iron oxides and at least the two major manganese oxide minerals. In addition, it was found that some of the manganese was in carbonate form. The carbonate is probably one of the anhydrous carbonates of the calcite group, such as one of the isomorphs of siderite and rhodochrosite, with rhodochrosite predominating.

WORK BY BUREAU OF MINES

Drilling and Sampling

The first consideration of the Bureau was to evaluate properly the wide range in assay results from previous drilling. Therefore, to obtain samples for assay and to provide material for preliminary beneficiation tests, as well as to establish the feasibility of core drilling, one diamond core-drill hole was put down on section 23 in the early spring of 1950. This hole, USBM 1, was begun on March 15, 1950, and completed at a depth of 332 feet on May 13, 1950. A bottom-discharge NX-size diamond-coring bit was used, which gave a 2-1/16-inch-diameter core. The core obtained was split in half. Half of it was crushed and analyzed, and the rejects were used for beneficiation tests. The other half was retained for permanent reference and stored in the Bureau of Mines core-storage warehouse in Minneapolis.

As results from this work were favorable, particularly in the beneficiation tests, a more extensive drilling program was proposed. When funds became available, a contract was let to Atkins-Walker Co. of Duluth, Minn., for diamond-core drilling. Under this contract, 6 NX-size diamond-core-drill holes, totaling 2,251 feet, were drilled in the fall of 1950. Drilling under this contract was begun September 14, 1950, and completed December 12, 1950. Two drills were operated 2 shifts per day 6 days per week.

The surface material, ranging from 140 to 175 feet in depth, consisted of sand, gravel, clay, and boulders and was penetrated by chopping and washing. A 4-inch standpipe was set on bedrock to seal off the surface material. An NX coring bit was used to penetrate the formation. The maximum sample interval was 5 feet. It was found that, in some types of rock encountered, better core recovery could be obtained with shorter runs. When the core blocked the bit, the run was stopped and the footage recorded as a sample interval. Often the

sludge samples from two short intervals were combined before analyses when the rock in the samples was of similar character.

All holes except Nos. 1 and 3 were drilled through the completely altered, oxidized zone. Except for these two cases, at least one run was made in the partly altered zone at the bottom of each hole. Hole 1 was discontinued while still in the altered zone because of difficulties not directly associated with the drilling. Hole 3 had to be abandoned because of a broken casing in the hole, which could not be recovered or bypassed. In general, the bottom of the altered zone was fairly definite within each hole. The slates became harder and changed color from red to gray. However, the gray slates, even near the bottom of hole 2, showed bands of red oxidized slate far below what was considered the bottom of the altered zone.

Sludge samples were collected for each sample interval. The core obtained from each sample interval was measured and the percentage of core recovery calculated. Sludge samples for those drill intervals where the core recovery was 90 percent or greater were discarded. When the core recovery was less than 90 percent, the sludge samples were allowed to settle, the water was decanted, and the residue was dried and analyzed.

The core recovered was split in half. Half of the core was crushed and analyzed, and the rejects were saved for beneficiation tests; the other half of the core was retained for permanent record and stored in the Bureau of Mines core-storage warehouse in Minneapolis.

The collars of all holes were located, and their elevation was determined by transit and stadia. The relation between the Bureau of Mines holes, prominent physical features, and land subdivisions was established by the same means. Where old drill holes could be found, they were tied in. Figure 2 shows drill-hole locations of holes drilled by The M. A. Hanna Co. and the United States Bureau of Mines.

Analyses of the core and sludge samples, together with the respective assays for each sample, are shown with the accompanying logs for each hole. The first three columns indicate the interval sampled according to the depth of the hole. The fourth column shows the log of the hole. The last three columns show the combined analyses of the core and sludge, weighed according to Royce's formula.

Beneficiation

The entire core from drill hole 1 was sent to the Bureau of Mines laboratory in standard core boxes. Later, the crushed rejects of the cores from holes 2, 3, 4, 5, 6, and 7 were submitted to the laboratory in ordinary canvas sampling bags. Each sack represented approximately 5 feet of drill core. Sludges recovered from the drilling also were shipped in canvas bags.

Most of the manganese occurred in a hard, dark, heavy, impure psilomelane. In core 1 this mineral assayed 34.54 percent manganese, 18.10 percent iron, and 10.50 percent silica. Minor amounts of the softer pyrolusite mineral were present also.

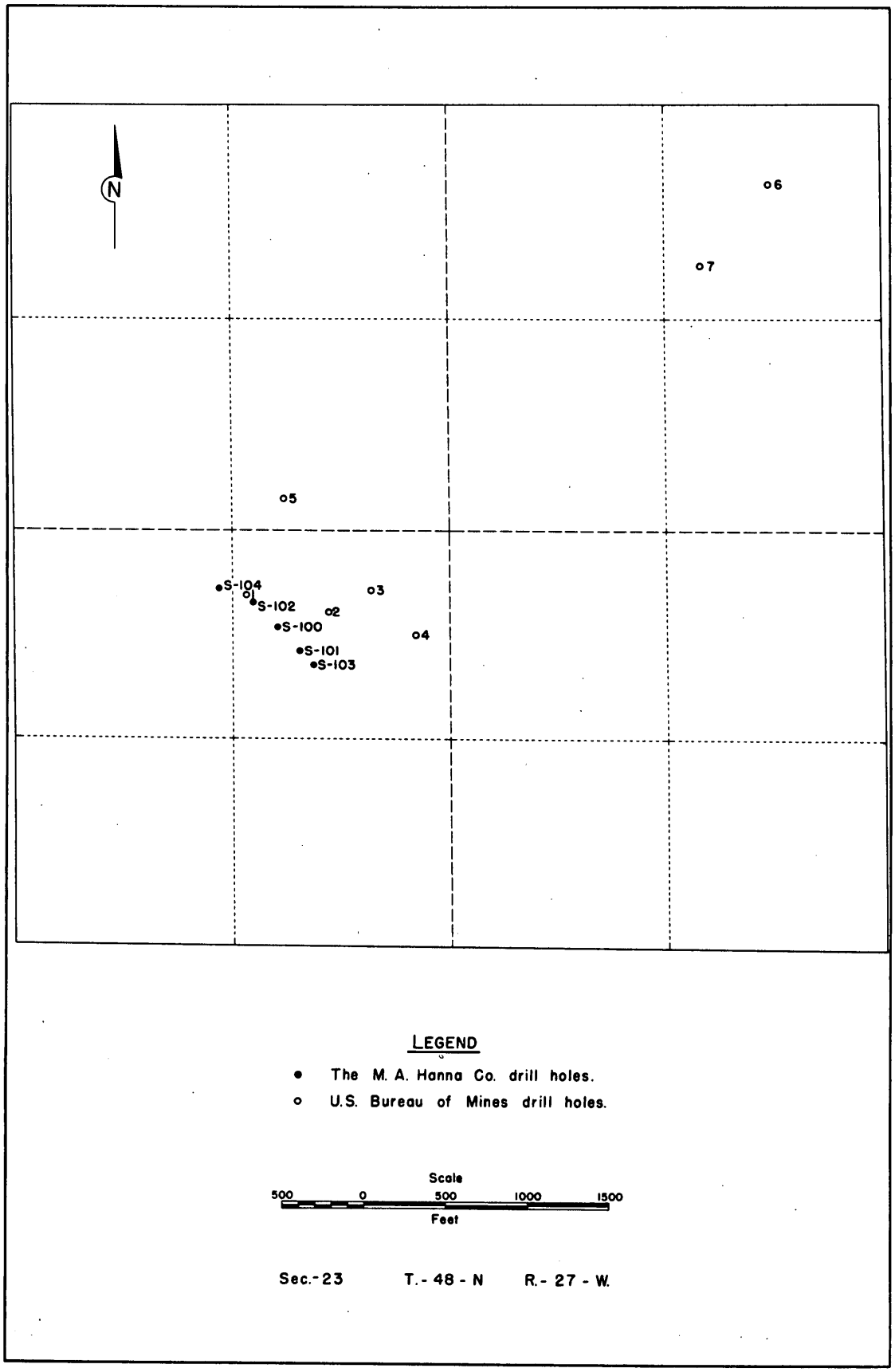

Figure 2. - Drill-hole locations, Scallon-Todd lease, Aitkin County, Minn.

HOLE 1

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R 27 W.
Collar Elevation:
Depth of Hole: 332 feet

Date completed: 5/13/50
Type of Drilling: Diamond-Drill Core

Log

From	To	Feet	Description	Analysis Iron	Analysis Mang.	Analysis Core
0	150	150	Sand, gravel, boulders.			
150	162	12	Green sand. Surface			
162	167	5	Soft iron formation.			
167	172	5	Red mud.			8.2
172	177	5	No core.			
177	182	5		18.92	1.88	36.8
182	187	5				31.6
187	192	5	Red mud and lump of red slate.	18.76	7.81	58.5
192	197	5		17.16	4.64	48.4
197	202	5		13.79	6.71	40.0
202	207	5				26.6
207	210	3		16.36	20.17	
210	213	3				33.3
213	218	5	Mud, red slate and black slate.			21.6
218	222	4		13.79	6.87	50.0
222	227	5		15.79	6.05	53.4
227	232	5				
232	237	5				50.0
237	242	5		12.67	2.27	20.0
242	247	5				3.4
247	250.5	3.5	No core.			
250.5	253	2.5				21.3
253	257	4	Red slatey.	7.86	.75	18.8
257	260	3				83.5
260	263	3		10.42	2.74	83.5
263	266	3				94.4
266	269.5	3.5		11.39	5.97	62.0
269.5	273	3.5				90.4
273	277	4		9.30	.32	85.6
277	281	4	Clayey light decomb. slate. Lump of black slate and manganese	11.47	1.49	100.0
281	283.5	2.5	at 260', 263'4", 269', 296'7", 300', 300'6" to 302'.			100.0
283.5	287	3.5		7.94	.95	95.4
287	291.5	4.5				50.0
291.5	295	3.5		8.58	3.06	105.1
295	298	3				116.5
298	300.5	2.5		11.45	7.69	90.0
300.5	302	1.5				44.6
302	304	2		8.90	7.50	100.0
304	307	3				86.0
307	309	2	Similar but red.	11.79	3.02	87.5
309	312.5	3.5				90.8
312.5	314	1.5		15.31	2.82	66.7
314	318	4	Similar to above but red. Few small black manganese nodules.			66.5
318	320	2	Large at 319'.	7.70	4.33	54.0
320	324.7	4.7		10.42	1.38	94.0
324.7	327.7	3		8.18	1.42	100.0
327	332	5		14.51	.13	93.0
116	332	216	Average for hole.	11.79	3.60	

No unaltered formation. Bands show dips 45°±.

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HOLE 2

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R. 27 W.
Collar Elevation: 1213.5'
Depth of Hole: 467 feet

Date completed: 10/9/50
Type of Drilling: Diamond-Drill Core

Log

From	To	Feet	Description	Analyses: Core Iron	Core Mang.	Core Silica	Sludge Iron	Sludge Mang.	Sludge Silica	Adjusted Average Iron	Adjusted Average Mang.	Adjusted Average Silica
0	144	144	Surface material.									
144	150	6	No core.				19.37	.93	44.99	19.37	.93	44.99
150	155	5	Dark-red clay.	20.86	1.41	54.39	26.70	1.97	37.56	25.70	1.87	40.44
155	160	5	No core.				21.65	.85	43.92	21.65	.85	43.92
160	164	4	Dark-red clay; a few soft pieces of Mn oxide.	23.77	2.29	48.15	22.30	.67	43.11	22.97	1.41	45.40
164	169	5	Dark-red clay; a few streaks of wad ore.	19.73	.86	56.17	24.26	2.50	39.24	20.59	1.17	52.95
Average										21.91	1.23	45.52
169	174	5	Dark-red clay and broken, soft slate.	19.56	3.74	51.84	21.82	1.54	45.37	21.26	2.08	46.96
174	179	5	No core.				20.68	2.96	43.10	20.68	2.96	43.10
179	184	5	Soft, red slate and clay; a few black Mn -bearing bands in slate; bedding 45°	23.61	6.74	38.16	20.19	4.63	39.93	21.87	5.66	39.06
184	187	3	No core.				15.63	3.41	50.27	15.63	3.41	50.27
187	191	4	Red clay and soft slate; a few pieces of slate with black bands.	14.55	2.09	62.45				14.55	2.09	62.45
Average										19.28	3.28	47.55
191	196	5	Soft, red slate.	13.58	1.61	64.96				13.58	1.61	64.96
196	201	5	Soft, red slate or narrow band, hard black slate.	11.16	.63	70.33				11.16	.63	70.33
201	206	5	Soft, red slate.	7.44	2.44	73.94	8.79	1.89	68.05	8.20	2.13	70.62
206	211	5	Soft, red slate; bedding 68°.	8.25	.59	76.04				8.25	.59	76.04
211	216	5	Soft, red slate.	10.35	.51	73.59				10.35	.51	73.59
216	220	4	Soft, red slate; rather hard band of black slate.	10.51	.70	73.23				10.51	.70	73.23
220	225	5	Soft, red slate and clay; bedding 45° ; cleavage 31° about right angles to bedding.	7.60	1.22	75.79				7.60	1.22	75.79
Average										9.93	1.07	72.05
225	230	5	Soft, red slate.	7.11	4.73	78.90				7.11	4.73	78.90
230	235	5	Soft, red slate; a few bands of black slate.	8.08	3.23	74.01				8.08	3.23	74.01
235	238.5	3.5	Black slate with some pale-red slate.	13.42	7.60	59.43	10.74	4.71	65.71	11.72	5.76	63.41
Average										9.36	4.44	73.07
238.5	243.5	5	Soft, pale-red slate.	8.08	1.45	68.32				8.08	1.45	68.32
243.5	248.5	5	Soft, pale-red slate with bands of harder red slate.	7.92	.39	68.19	6.51	.89	76.76	7.25	.63	72.25
248.5	254	5.5	Pale-red slate; cleavage 52° at 248.5'; vertical fracture plane at 249'.	7.27	1.49	69.22	11.56	3.88	65.03	9.92	2.97	66.63
254	259	5	Soft, red and light-gray slate; vertical banding at 255'; cleavage 15°.	6.47	.47	71.71				6.47	.47	71.71
259	264	5	Soft, red slate to 261'; harder red slate 261' to 264'; cleavage 28° to 33°; Mn filling along cleavage planes.	5.17	.66	75.34				5.17	.66	75.34
264	269	5	Red slate band of chert and Mn (?) at 269'; bedding 53°.	13.42	.59	64.27	16.38	1.44	62.93	15.44	1.17	63.36
Average										8.74	1.25	69.55
269	274	5	Red to dark-red clay with highly fractured slate; a few bands of harder slate.	13.90	.66	60.17				13.90	.66	60.17
274	279	5	Black slate 274' to 275'; red slate 275' to 279'.	7.60	.51	69.87				7.60	.51	69.87
279	284	5	Red slate (soft) to 282'; soft gray slate 282' to 284'.	6.79	.28	71.30				6.79	.28	71.30
284	289	5	Soft, red and light-gray slate.	10.99	.78	64.73	11.72	.59	67.04	11.42	.67	66.09
289	294	5	Soft, red slate; Mn filling in fractures and/or bedding planes.	9.94	.98	65.91	11.88	1.89	65.20	10.70	1.34	65.63
294	299	5	Soft, red slate.	8.73	.36	66.56				8.73	.36	66.56
299	303.5	4.5	Soft, light-gray slate; cleavage 25° at 299' to 300'; soft red slate at 300' to 302'; hard black slate at 302' to 303.5' (manganiferous?).	10.51	2.44	63.30				10.51	2.44	63.30
303.5	308	4.5	Soft, red clay and slate to 306'; light-red slate to 306' to 308', soft bedding 35° ; hard black slate at 308'.	8.81	.32	67.91				8.81	.32	67.91
308	313	5	Red slate; cleavage 35°; Mn band at 309'; fractured pieces of Mn 312' to 313'.	7.68	1.65	67.18				7.68	1.65	67.18
Average										9.57	.90	66.46
313	318	5	Band of hard Mn ± 2' or more; dark slate at 318'.	12.69	14.58	44.96	15.30	16.29	39.84	14.81	15.97	40.81
318	323	5	Red slate and hard bands of Mn to 320'; softer red slate 320' to 323'; rumpled bedding at 322'.	9.40	1.73	65.64				9.40	1.73	65.64
323	327.5	4.5	Soft, red slate.	11.03	5.00	59.74				11.03	5.00	59.74
327.5	333	5.5	Soft, red slate with ± 1' of hard Mn.	22.54	10.64	40.33	14.98	5.91	57.17	16.74	7.01	53.25
Average										13.14	7.48	54.70
333	338	5	Soft, red slate and clay.	8.60	.23	69.22				8.60	.23	69.22
338	343	5	Soft, red slate; bedding 30°; cleavage 55°; angle of cleavage and bedding ± 90°.	6.81	.27	70.27				6.81	.27	70.27
343	347	4	Light-red slate; cleavage and bedding vertical.	10.70	.86	65.60				10.70	.86	65.60
347	351.5	4.5	Red clay and slate; bedding 27°; some wad.	9.73	.19	68.21				9.73	.19	68.21
351.5	356.5	5	Red slate; dark-gray slate only slightly altered at 354'; bedding 35°; cleavage 20°.	11.35	.15	67.60				11.35	.15	67.60
Average										9.38	.31	68.29
356.5	360.5	4	Soft, dark-gray slate.	9.57	.55	69.07	11.07	2.21	65.21	10.33	1.40	67.10
360.5	366	5.5	Hard-banded slate, dark-gray to light-red; bedding 37°; cleavage 70°	7.30	.82	69.97				7.30	.82	69.97
366	371	5	Hard, dark-gray slate with streaks of iron stain; cleavage 27°.	8.11	1.68	64.31				8.11	1.68	64.31
Average										8.42	1.28	67.23
371	373	2	Hard, dark-gray slate; rumpled bedding.	5.35	4.98	53.95				5.35	4.98	53.95
373	378	5	Hard, reddish iron-stained slate.	7.19	2.29	47.57				7.19	2.29	47.57
378	383	5	Hard, dark-gray slate; some iron stain; cleavage 30°.	8.92	.04	69.45				8.92	.04	69.45
383	388	5	Bedding 15°; tends to cleave on bedding planes; dark-gray slate; 2' light-gray slate with thin iron seams.	9.40	.63	68.53				9.40	.63	68.53
388	392	4	Dark-gray to moderately light-gray slate; some iron stain.	7.95	1.97	64.55				7.95	1.97	64.55
392	397	5	Light-gray slate.	9.40	1.61	65.16	11.23	1.95	63.70	10.24	1.77	64.49
397	402	5	Light-gray slate.	12.16	2.13	63.04				12.16	2.13	63.04
402	407	5	Gray slate; some iron stain.	9.57	2.48	65.03				9.57	2.48	65.03
407	412	5	Dark-gray slate; some iron stain; uneven fracture; rumpled bedding.	8.11	1.53	67.17				8.11	1.53	67.17
412	417	5	Moderate gray slate; some iron-stained bands.	7.60	2.76	65.73				7.60	2.76	65.73
417	422	5	Gray slate; some iron stain; bedding 35°.	7.27	1.06	69.08				7.27	1.06	69.08
422	427	5	Gray slate; some iron stain; bedding 35°.	6.63	1.81	69.98				6.63	1.81	69.98
Average										8.53	1.89	64.58
427	432	5	Gray slate; ± 1' badly fractured iron-stained slate.	8.57	.20	69.64				8.57	.20	69.64
432	437	5	Gray slate and red iron-stained slate.	7.92	.12	71.43				7.92	.12	71.43
437	442	5	Dark-gray slate; bedding 40°.	7.03	.12	72.82				7.03	.12	72.82
442	447	5	Dark to light-gray slates; some iron stain.	8.08	.12	68.76				8.08	.12	68.76
447	452	5	Medium-gray slate; several iron-stained bands.	8.65	.12	68.97				8.65	.12	68.97
Average										8.05	.14	70.32
452	457	5	Light-gray slate; iron-stained bands.	6.95	1.18	66.44				6.95	1.18	66.44
457	462	5	Light-gray slate; iron-stained bands.	8.08	2.72	62.07				8.08	2.72	62.07
462	467	5	Light-gray slate; iron-stained bands.	6.47	1.57	65.27				6.47	1.57	65.27
Average										7.17	1.82	64.59
144	467	323	Average for hole.							10.88	1.82	64.03

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HOLE 3

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R. 27 W.
Collar Elevation: 1213.1'
Depth of Hole: 340'

Date completed: 10/6/50
Type of Drilling: Diamond-Drill Core

Log

From	To	Feet	Description	Analyses: Core Iron	Core Mang.	Core Silica	Sludge Iron	Sludge Mang.	Sludge Silica	Adjusted Average Iron	Adjusted Average Mang.	Adjusted Average Silica
0	175	175	Surface.									
175	181	6	No core.				13.05	2.25	62.54	13.05	2.25	62.54
181	185	4	Light-gray clay and soft slate.	12.13	3.90	57.80				12.13	3.90	57.80
185	188	3	Red, light-red soft slate; bedding vertical.	10.91	1.08	63.54				10.91	1.08	63.54
188	191	3	Soft, red slate; bedding vertical.	10.99	2.32	63.84				10.99	2.32	63.84
191	194	3	Soft, red slate; bedding at 45°; rock breaks along bedding easily at 198'.	12.21	2.60	56.90				12.21	2.60	56.90
Average										12.06	2.48	61.01
194	197	3	Light-gray, closely folded slate; cleavage 15° (axis of folds) at 194' to 195'. Red slate; bedding vertical; cleavage 70° at 196'.	10.02	1.85	64.30				10.02	1.85	64.30
197	200	3	Red slate; bedding 43°.	8.89	.59	65.78				8.89	.59	65.78
200	205	5	Soft, red slate and clay; bedding 15°.	10.99	.95	62.22				10.99	.95	62.22
205	210	5	Light-red slate; bedding 50°; cleavage vertical (?).	11.24	1.28	62.77	14.34	1.77	61.95	13.67	1.66	62.13
Average										11.25	1.27	63.25
210	215	5	Light-red, soft slate; some manganese.	11.32	6.23	58.07	14.18	1.57	61.23	13.82	2.16	60.83
215	218.5	3.5	Dark-red clay; pale-red slate; some manganese.	12.94	3.31	61.50	14.50	1.68	59.92	13.85	2.36	60.58
218.5	221	2.5	Pale-red slate; ± 3' manganese.									
221	224	3	Red and pale-red slate; cleavage 20°.	11.16	1.69	63.04	11.28	1.93	66.25	11.25	1.87	65.41
224	230	6	Some good manganese at 224'; pale-red slate; bedding 45°.	14.15	3.27	55.70	14.34	4.18	62.01	13.20	2.94	60.96
							11.03	1.18	64.03			
230	233	3	Some manganese at 230'; red slate; bedding 22°; cleavage 50°.	14.96	3.84	58.16	10.87	1.33	65.34	12.34	2.23	62.76
Average										12.86	2.33	62.17
233	235	2	Soft, pale-red slate.									
235	237	2	No core.	19.40	4.49	51.74	14.42	4.43	58.84	14.74	4.43	58.39
237	240	3	Pale-red slate; cleavage 52°.	10.19	2.96	63.84				10.19	2.96	63.84
240	242.7	2.7	Pale-red slate; little core; mostly manganese.									
242.7	244	1.3	Clay, most of core good manganese; bedding 30°.	16.49	9.00	46.80	12.24	3.43	64.01	13.59	5.20	58.55
244	247	3	Soft clay.	15.20	5.14	55.87				15.20	5.14	55.87
247	250	3	Pale-red slate; some manganese.									
250	253	3	Red slate; cleavage 47°; bedding ± horizontal; some manganese.	11.24	3.43	61.53	11.84	3.11	63.31	11.65	3.21	62.76
253	256	3	Little core; all manganese.	11.48	20.23	42.10	9.70	2.64	74.42	9.87	4.29	71.38
Average										12.57	4.13	61.63
256	258	2	Soft, red slate or clay.									
258	262	4	Dark-red clay; some manganese.	13.10	3.51	62.35	12.08	1.77	65.60	12.34	2.21	64.78
262	265	3	Soft-red slate; bedding 10°; cleavage 10° in opposite directions.									
265	268	3	No core.	9.65	2.34	66.15	12.81	2.17	64.15	12.14	2.21	64.58
268	271	3	Red clay.	13.42	1.71	63.15				13.42	1.71	63.15
Average										12.48	2.11	64.37
271	274	3	Soft, pale-red to red slate.	12.29	.95	67.69						
274	277	3	Red clay.	10.51	.95	65.54	9.99	.63	67.56	10.87	.87	66.58
277	280	3	Soft, pale-red slate.	9.54	.89	68.06						
280	283	3	Red slate.	9.54	1.77	62.98	10.51	1.10	67.02	9.84	1.34	65.51
283	286	3	Soft, pale-red slate.	9.86	.79	67.33						
286	289	3	Red slate, rather hard; bedding 30°; cleavage 30°.	12.61	.24	62.44	12.13	1.32	67.00	12.10	.82	65.18
Average										10.94	1.01	65.76
289	295	6	Red slate; 2 good bands of manganese.	10.51	4.83	63.10	10.91	2.82	69.11	10.80	3.36	67.49
295	298	3	Red slate; 1 good band of manganese.									
298	301	3	Red slate; some manganese.	10.19	1.40	68.67	11.96	2.44	69.36	11.49	2.16	69.17
301	304	3	Red slate; bedding 70°.									
304	307	3	Pale-red slate.	10.35	.77	64.63	11.88	1.64	65.55	11.25	1.28	65.17
307	310	3	Red slate; 2 bands manganese; cleavage vertical (?).									
310	313	3	Pale-red slate; some manganese.	12.29	7.46	54.32	13.42	2.44	62.91	12.99	4.35	59.65
313	316	3	Pale-red slate; some manganese.									
316	319	3	Red slate; some manganese.	13.10	5.48	58.23	64.88	3.55	61.20	14.39	4.09	60.37
319	322	3	Pale-red slate; some ochre; bedding 70°; cleavage 15°									
322	325	3	Red slate.	10.02	1.30	65.33	11.16	3.51	66.02	10.65	2.53	65.71
325	328	3	Darker-red slate.									
328	331	3	Some manganese; red slate; bedding 30°; cleavage vertical (?).	12.29	1.41	62.33	13.98	2.25	64.25	13.52	2.02	63.72
331	333	2	Dark-red slate.									
333	337	4	Dark-red slate; bedding 35°.	6.30	4.45	62.97	14.71	3.80	60.00	12.39	3.98	60.82
337	340	3	Gray slate; some good manganese.	11.48	1.50	62.24	14.63	3.64	60.30	13.81	3.08	60.80
340			Bottom of hole.							12.28	2.98	63.82
Average										12.15	2.53	63.17
175	340	165	Average for hole.									

5354

HOLE 4

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R. 27 W.
Collar Elevation: 1213.3'
Depth of Hole: 370'

Date completed: 10/26/50
Type of Drilling: Diamond Drill Core

Log

From	To	Feet	Description	Analyses: Core Iron	Core Mang.	Core Silica	Sludge Iron	Sludge Mang.	Sludge Silica	Adjusted Average Iron	Adjusted Average Mang.	Adjusted Average Silica
0	143	143	Surface material									
143	148	5	Iron formation; drilled with chopping bit				8.94	0.39	48.30	8.94	0.39	48.30
148	151	3	Reddish brown clay and slate									
151	154	3	Reddish brown clay and slate; bedding 35°	13.23	0.20	52.56	16.21	.32	52.20	14.46	.25	52.41
154	157	3	Soft red slate	12.58	.24	53.66				12.58	.24	53.66
Average										12.09	.30	51.21
157	160	3	Soft red-gray slate	15.40	1.45	47.72				15.40	1.45	47.72
160	163	3	Red and dark gray to black slate (some manganese?) bedding 45°	22.90	2.21	36.24				22.90	2.21	36.24
163	166	3	Dark red slate; bedding 40°	22.26	3.62	36.48				22.26	3.62	36.48
166	169	3	Soft red slate									
169	172	3	Dark red slate	15.65	3.11	43.90				15.65	3.11	43.90
172	175	3	Dark red slate	17.34	2.09	46.18	16.05	2.29	50.82	16.98	2.15	47.27
Average										18.14	2.61	42.62
175	178	3	Red slate; bedding 50°; some manganese	15.16	1.89	45.92				15.16	1.89	45.92
178	182	4	Red slate; bedding 45° at 180'; 35° at 181'									
182	187	5	Red slate with dark streaks; manganese ?; rolling bedding at 183'; 18° at 184'	14.03	1.77	45.40				14.03	1.77	45.40
187	192	5	Red slate; bedding vertical; cleavage 33°	10.32	1.02	54.82				10.32	1.02	54.82
192	197	5	Red slate; bedding vertical at 199'; wavey at 201',	15.81	1.65	45.76				15.81	1.65	45.76
197	202	5	approximately 70°	16.61	2.29	42.04				16.61	2.29	42.04
202	207	5	Red slate	8.22	.59	56.26				8.22	.59	56.26
Average										13.33	1.54	48.15
207	212	5	Red slate	14.03	4.96	47.56	12.84	2.52	51.08	13.42	3.72	49.36
212	217	5	Red slate; some manganese; rolling bedding	12.34	2.76	49.84				12.34	2.76	49.84
217	222	5	Red slate; bedding 15°; some manganese	11.94	1.49	54.10				11.94	1.49	54.10
222	227	5	Red slate	12.42	2.44	50.40				12.42	2.44	50.40
227	232	5	Red slate; quartz and manganese	9.68	2.29	68.60	9.63	2.29	66.46	9.64	2.29	66.93
Average										11.95	2.54	54.13
232	235	3	Red slate; some manganese	22.26	7.96	31.48	14.12	2.84	55.70	18.51	5.60	42.65
235	238	3	Broken red slate with thin bands of manganese (?)	21.57	6.38	34.80	20.70	6.07	36.34	21.23	6.26	35.39
238	241	3	Dark red slate; some manganese									
241	244	3	Red slate; some manganese	29.14	6.70	28.48				29.14	6.70	28.48
244	247	3	Light red slate, 4" good manganese									
247	250	3	Light red slate, some good manganese	22.14	6.78	37.68	24.88	6.15	35.42	23.61	6.44	36.47
Average										24.21	6.36	34.66
250	253	3	Pink to light gray slate	9.12	2.44	56.24				9.12	2.44	56.24
253	257	4	Pink to light gray slate; some manganese	9.93	2.80	55.00				9.93	2.80	55.00
257	261	4	Same, changing to red at 260'	12.37	1.30	53.88	12.20	1.53	55.80	12.30	1.40	54.72
261	265	4	Light red slate, vertical bedding	7.33	1.06	59.34				7.33	1.06	59.34
265	270	5	Light red and gray slates; folded bedding; axis of folds 10°	12.05	.55	58.88				12.05	.55	58.88
Average										10.29	1.56	56.97
270	275	5	Light red slate, some manganese	14.65	8.98	46.74				14.65	8.98	46.74
275	280	5	Red slate	11.56	2.13	52.48				11.56	2.13	52.48
280	285	5	Red slate	9.12	.90	54.40				9.12	.90	54.40
285	290	5	Red slate; some manganese in fissures	12.37	2.17	55.32				12.37	2.17	55.32
290	295	5	Red slate; some manganese				14.44	3.15	55.90	14.44	3.15	55.90
295	300	5	Gray slate; some good manganese	14.81	4.47	52.44	14.19	5.59	51.42	14.45	5.13	51.84
300	303	3	Gray slate; some good manganese									
303	306	3	Red slate; folded bedding; manganese between bedding planes	12.99	5.32	52.96	14.12	2.01	60.10	13.74	3.14	57.67
306	309	3	Red slate	9.91	.39	54.48				9.91	.39	54.48
Average										12.70	3.39	53.66
309	312	3	Red slate; some good manganese	15.51	10.44	39.90	11.55	4.89	55.92	13.98	8.30	46.08
312	315	3	Mostly broken-up manganese	13.80	21.12	33.50	15.25	9.65	50.10	14.95	12.00	46.70
315	318	3	Mostly broken-up manganese									
318	321	3	Red slate; bedding 30°	12.10	2.32	54.28	14.76	9.73	48.22	13.86	7.21	50.28
321	325	4	Light red slate	12.34	11.78	47.34				12.34	11.78	47.34
325	328	3	Red slate; cleavage vertical (?)	9.91	.12	52.50	10.11	1.26	63.14	9.91	.12	52.50
328	332	4	Red slate; 6" solid manganese and gray slate	12.34	10.24	47.40	12.04	6.90	53.70	12.17	8.31	51.04
Average										12.94	8.04	49.18
332	335	3	Red slate									
335	338	3	Light red slate; some good manganese	9.09	2.32	63.88				9.09	2.32	63.88
338	342	4	Red slate; good manganese	13.23	1.73	53.94				13.23	1.73	53.94
342	345	3	Mostly broken manganese	11.21	11.47	49.12	9.23	4.41	60.50	9.67	5.98	57.97
345	348	3	Red slate; some manganese	10.39	9.81	45.44				10.39	9.81	45.44
348	352	4	Red slate; some manganese; irregular bedding	9.42	5.20	51.40				9.42	5.20	51.40
352	356	4	Gray and red slate; some manganese	9.58	2.64	55.38				9.58	2.64	55.38
Average										10.15	4.15	55.68
356	360	4	Gray and black banded slate; vertical bedding 35°	16.08	1.22	51.82				16.08	1.22	51.82
360	365	5	Gray slate banded with red slate; bedding 10°	17.21	.82	48.60				17.21	.82	48.60
365	370	5	Gray slate, wavy bedding at 65°	6.09	.24	62.00				6.09	.24	62.00
Average										12.92	.73	54.31
143	370	227	Average for hole							13.57	3.24	50.49

5354

HOLE 5

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R. 27 W.
Collar Elevation: 1214.0'
Depth of Hole: 348'

Date completed: 11/4/50
Type of Drilling: Diamond-Drill Core

Log

From	To	Feet	Description	Analyses: Core Iron	Core Mang.	Core Silica	Sludge Iron	Sludge Mang.	Sludge Silica	Adjusted Average Iron	Adjusted Average Mang.	Adjusted Average Silica
0	146	146	Surface.									
146	150	4					13.92	4.73	49.28	13.92	4.73	49.28
150	155	5	Carb. slate.									
155	157	2	Carb. slate.	15.14	5.83	29.34				15.14	5.83	29.34
157	160	3	Carb. slate.	14.98	4.89	31.10	14.65	4.02	31.60	14.70	4.15	31.52
160	170	10	Carb. slate.	18.56	7.21	24.50	12.54	1.33	36.28	13.26	2.04	34.87
170	175	5	Altered red slate and some carb. slate.									
175	178	3	Red slate and light-gray clay.	11.74	6.30	30.54	10.58	3.66	33.80	10.88	4.33	32.97
178	181	3	Red to dark-red slate; bedding 35°.	18.07	5.04	28.58				18.07	5.04	28.58
181	182	1	Gray slate.									
182	185	3	Gray slate to 183', red slate 183' to 185'.	20.19	2.60	31.84	22.06	3.47	42.22	21.23	3.08	37.61
Average										14.44	3.55	33.40
185	189	4	Dark-red slate; bedding 18°; cleavage 70° to 90°(?).	16.20	.70	44.22	18.88	2.84	46.80	17.06	1.38	45.05
189	193	4	Dark-red slate; bedding 15°; cleavage vertical (?).	17.58	1.45	46.50				17.58	1.45	46.50
193	198	5	Dark-red slate; bedding 55°; cleavage vertical.	18.72	1.81	44.04				18.72	1.81	44.04
198	203	5	Dark-red slate and clay.	16.44	3.94	42.54	17.26	3.62	45.00	16.90	3.76	43.91
Average										17.59	2.18	44.77
203	206	3	Red slate; bedding 50°.									
206	209	3	Red and light-red slates; bedding 35°; cleavage vertical.	13.70	.63	48.10				13.70	.63	48.10
209	213	4	Red slate and clay; a little manganese.	15.49	3.70	42.60				15.49	3.70	42.60
213	218	5	Red slate; bedding 30°; cleavage vertical.	14.19	3.35	44.62				14.19	3.35	44.62
218	221	3	Red slate; bedding 30°.	9.87	4.49	49.30				9.87	4.49	49.30
221	226	5	Light-red slate.	13.86	2.36	44.88	19.37	3.31	48.40	15.54	2.65	45.95
Average										14.02	2.70	46.08
226	231	5	Red slate; bedding 25°.	12.39	1.53	52.02				12.39	1.53	52.02
231	236	5	Red slate.	8.72	.90	57.48				8.72	.90	57.48
236	241	5	Red to light-red slate; bedding 25°.	9.95	1.10	54.92				9.95	1.10	54.92
Average										10.35	1.18	54.81
241	246	5	Light-red slate; bedding 33°.	5.71	.59	59.90	15.71	5.08	47.62	9.47	2.28	55.28
246	250	4	Light-red slate.	9.13	3.15	54.44				9.13	3.15	54.44
250	253	3	Light-red slate; some chert.	15.49	6.34	45.20	15.47	6.07	49.40	15.47	6.13	48.42
253	256	3	Red slate; cleavage 35°.									
256	259	3	Red slate; some manganese.	8.81	.55	58.66	15.95	1.65	53.00	12.34	1.09	55.86
259	262	3	Red and light-red bands of slate; some manganese.	10.44	5.36	56.16				10.44	5.36	56.16
262	265	3	Red slate; some manganese; rumpled bedding.	11.50	2.68	53.32	15.55	3.47	37.80	13.37	3.04	46.15
265	268	3	Light-red to red slates; little manganese.	12.07	2.29	54.64				12.07	2.29	54.64
268	273	5	Red slates; bedding 40°.	7.34	.12	60.46	15.38	4.06	52.70	13.68	3.23	54.34
273	279	6	Red slates; some manganese; bedding 38°.	8.97	3.74	54.42	15.63	5.83	51.56	13.14	5.05	52.63
279	282	3	Red and light-red slates; some manganese.									
282	285	3	Red slate.	6.85	4.73	52.10	11.31	5.67	55.52	8.81	5.14	53.60
285	289	4	Red slate; some manganese.	11.42	4.45	50.26	10.58	4.69	56.44	11.34	4.47	50.86
289	293	4	Red slate.	10.44	2.29	57.00				18.92	2.29	57.00
293	298	5	Red slate.	18.92	8.27	41.50	11.88	3.55	54.86	12.70	4.10	53.31
298	304	6	Red slate.	15.49	6.38	42.06	12.78	2.56	56.46	14.85	5.47	45.49
304	308	4	Red to light-red slate; bedding; cleavage at 90° to bedding(?).	10.19	4.02	51.06				10.19	4.02	51.06
Average										12.34	3.80	52.68
308	313	5	Red slate.	10.52	1.18	51.70				10.52	1.18	51.70
313	317	4	Banded red and gray slates; bedding 30°.	10.44	.98	53.70				10.44	.98	53.70
317	322	5	Red slate.	6.36	.78	61.66	10.91	1.26	56.48	10.00	1.16	57.52
322	325	3	Banded red and gray slates; bedding 35°.	8.81	1.10	53.90				8.81	1.10	53.90
325	330	5	Banded red and gray slates; bedding 50°; cleavage 15°(?).	11.58	1.18	50.40				11.58	1.18	50.40
330	335	5	Light-red slate.	9.79	6.38	47.24	17.58	8.39	40.92	15.98	7.98	42.22
335	338	3	Gray slate with red and black bands.	13.86	1.45	48.70				13.86	1.45	48.70
Average										11.67	2.30	51.06
338	343	5	Gray slate with red and black bands; bedding 30°.	9.62	.66	53.62				9.62	.66	53.62
343	348	5	Same, bedding 30°; cleavage 55°.	10.44	.66	53.26				10.44	.66	53.26
Average										10.03	.66	53.44
155	348	193	Average for hole.							12.98	2.88	47.96

5354

HOLE 6

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R. 27 W.
Collar Elevation: 1213.8'
Depth of Hole: 334'

Date completed: 11/16/50
Type of Drilling: Diamond-Drill Core

Log

From	To	Feet	Description	Analyses: Core Iron	Core Mang.	Core Silica	Sludge Iron	Sludge Mang.	Sludge Silica	Adjusted Average Iron	Adjusted Average Mang.	Adjusted Average Silica
0	138	138	Surface.									
138	143	5	Iron formation (chopped sample).				15.93	2.92	53.48	15.93	2.92	53.48
143	148	5	Dark-red clay and soft slate; a few manganese nodules in clay.	12.55	2.36	52.52	11.02	3.03	58.78	11.23	2.94	57.92
148	155	7	Soft, dark-red clay and slate.	14.80	2.13	48.84				14.80	2.13	48.84
155	160	5	Red slate; bedding 52° to 55°; cleavage 25° (?).	13.52	2.92	47.66				13.52	2.92	47.66
160	165	5	Dark-red slate.	14.72	1.77	49.20				14.72	1.77	49.20
165	170	5	Dark-red slate.	11.26	1.57	52.30				11.26	1.57	52.30
170	175	5	Dard-red slate.	17.70	2.52	48.62				17.70	2.52	48.62
175	180	5	Dark-red slate and clay; bedding 60°.	18.18	1.81	44.80	14.48	2.09	55.78	16.21	1.96	50.64
180	185	5	Dark-red slate; bands of chert 184' to 185'.	13.60	2.52	52.20				13.60	2.52	52.20
185	190	5	Dark-red slate; chert band at 185.5'; chert slate contact 75°; bedding 65°; cleavage(?)50°, approximately right angles to bedding; bedding 60° at 188'.	16.89	2.68	50.22				16.89	2.68	50.22
Average										14.59	2.38	51.02
190	195	5	Dark-red slate chert (± 1') 194' to 195'.	18.18	17.81	30.00	12.55	8.98	55.20	14.07	11.36	48.40
195	200	5	Some red slate; considerable chert; some manganese.	15.77	28.37	19.40	15.77	12.61	46.06	15.77	14.86	42.25
200	203	3	Some red slate; considerable chert.	12.71	7.88	60.80	7.56	3.55	67.64	8.44	4.29	66.47
203	206	3	Red slate; some manganese; cleavage 20°(?).									
206	210	4	Red slate; some manganese.	14.28	7.92	47.20				14.28	7.92	47.20
210	215	5	Red slate; some manganese.	14.20	7.80	43.00	13.84	5.08	54.20	13.97	6.03	50.30
215	218	3	Red slate; bedding 25°.	10.43	2.36	54.60				10.43	2.36	54.60
218	222	4	Red slate; some manganese and chert.	18.46	13.67	34.80				18.46	13.67	34.80
222	227	5	Red slate; some manganese and chert.	24.71	8.71	39.22	16.89	1.73	54.08	17.69	2.44	52.56
Average										14.54	8.20	48.66
227	230	3	Red clay.									
230	234	4	Red to dark-red slate; bedding 36°.	19.58	.96	47.06				19.58	.96	47.06
234	239	5	Red slate and clay; cleavage 25°(?).	17.91	2.48	53.60	20.11	1.93	51.80	19.16	2.16	52.55
239	242	3	Red slate; considerable chert; some manganese (?).	12.76	6.86	63.46	17.22	6.70	55.40	16.13	6.74	57.37
242	249	7	Red slate; some chert.	11.31	3.03	58.00				11.31	3.03	58.00
Average										16.38	2.68	53.19
249	254	5	Red slate; irregular bedding.	11.23	.76	53.34				11.23	.76	53.34
254	259	5	Red slate.	18.37	.53	65.32	11.58	.39	58.38	13.41	.43	60.75
259	263	4	Red slate.	11.39	.21	64.24				11.39	.21	64.24
263	268	5	Red slate; cleavage 43° (?).	12.32	.15	64.24				12.32	.15	64.24
Average										12.12	.40	60.45
268	273	5	Red slate and clay; a little gray slate.	14.32	3.70	53.18				14.32	3.70	53.18
273	278	5	Red and gray slates; bedding 50°; cleavage 30° approximately right angles to bedding.	8.00	.96	58.84	11.26	1.77	58.40	9.95	1.45	58.58
278	281	3	Red and gray slate; irregular bedding; some red clay.									
281	285	4	Red and gray slate; folded bedding; axis of folds 38°.	9.36	2.17	60.64				9.36	2.17	60.64
285	290	5	Red and gray slates.	6.88	5.99	53.36	8.53	5.16	55.92	8.30	5.28	55.56
290	294	4	Gray slate with iron bands; bedding 28° at 290'.	8.24	2.13	53.36				8.24	2.13	53.36
294	299	5	Dark-gray slate; bedding 65°; cleavage 22°; some soft manganese (?).	6.64	4.14	61.50				6.64	4.14	61.50
Average										9.50	3.11	57.48
299	304	5	Banded red and gray slates; bedding 35°.	6.40	.24	61.84				6.40	.24	61.84
304	309	5	Dark-gray slate; cleavage (?) 45°; few iron stains.	7.36	.37	59.50				7.36	.37	59.50
309	314	5	Gray slate, some red slate; gray slate highly fractured at 309'; quartz filling in fractures; bedding 35° at 311'; cleavage (?) 46°.	7.37	.56	61.22				7.37	.56	61.22
314	319	5	Gray slate; bedding 50°.	8.00	.15	59.56				8.00	.15	59.56
319	324	5	Gray slate; some iron bands; bedding 45°; vertical band of iron 1/2-inch wide 320' to 322'.	10.08	.12	57.64				10.08	.12	57.64
324	329	5	Gray slate; some iron bands; bedding 15°.	6.40	.09	62.10				6.40	.09	62.10
329	334	5	Gray slate; few iron bands; cleavage (?) 30°.	7.36	.18	61.32				7.36	.18	61.32
334			Bottom of hole.									
Average										7.57	.24	60.45
138	334	196	Average for hole.							12.48	3.05	54.44

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HOLE 7

Location: Aitkin County, Minn., Sec. 23, T. 48 N., R. 27 W.
Collar Elevation: 1214.3'
Depth of Hole: 392'

Date completed: 12/2/50
Type of Drilling: Diamond Drill-Core

Log

From	To	Feet	Description	Core Iron	Core Mang.	Core Silica	Sludge Iron	Sludge Mang.	Sludge Silica	Adjusted Average Iron	Adjusted Average Mang.	Adjusted Average Silica
0	140	140	Surface.									
140	145	5					12.36	1.41	55.02	12.36	1.41	55.02
145	151	6		11.84	0.33		10.83	1.14	60.00	11.02	.98	
151	154	3	Red slate.	12.48	.45		13.80	1.53	54.40	13.30	1.12	
154	157	3	Red-light red slate.	13.92	.76					13.92	.76	
Average										12.33	1.09	
157	160	3	Red-light red slate. Bedding 50°.	25.28	2.36					25.28	2.36	
160	163	3	Red slate. Bedding 55°, cleavage 35°, same direction.	14.24	1.12		18.13	2.25	50.20	14.63	1.03	
163	166	3	Red slate. Cleavage (?) 40°.									
166	169	3	Light-red slate, folded bedding. Axis of folds 35°.	10.80	1.52					10.80	1.52	
169	173	4	Light-red slate.	14.72	.15		17.92	.49	51.00	17.14	.41	
173	176	3	Pink slate.	4.72	.06		14.88	.51	56.28	12.91	.42	
176	179	3	Pink, light-red slate. Bedding 40°.	11.76	.68		11.20	1.22	60.60	11.55	.88	
179	182	3	Light-red slate. Bedding 52°.	13.36	1.04		13.44	2.13	58.70	13.40	1.53	
182	185	3	Light-red slate. Bedding 25° at 153'. Bedding 70° at 154'. Cleavage along bedding.	16.61	3.15					16.61	3.15	
185	190	5	Red slate. Bedding 45° at 186'. Bedding 25° at 188'. Cleavage(?) 60°.	9.60	.37					9.60	.37	
190	195	5	Red slate.	20.56	1.77					20.56	1.77	
195	200	5	Red slate. Bedding 30°.	8.56	.68		15.60	1.10	58.40	13.66	.98	
200	205	5	Red slate.	13.76	.80		13.44	.76	62.20	13.51	.77	
205	208	3	Red slate. Bedding 20°. Cleavage 50°.	14.72	.84					14.72	.84	
Average										14.63	1.19	
208	213	5	Light-red slate. Bedding 60°.	17.84	.30		13.60	5.79	55.90	14.60	4.50	
213	216	3	Red slate. Bedding 50°.	9.12	4.57					9.12	4.57	
216	221	5	Light-red slate.	9.92	4.61		14.32	6.03	51.90	13.36	5.72	
221	224	3	Red slate. Some good manganese.	9.52	5.16		14.24	4.89	53.30	13.01	4.96	
224	227	3	Red slate.	10.08	6.19		8.48	4.41	61.30	8.91	4.89	
227	230	3	Red slate. Bedding 48°.									
230	235	5	Red slate. Bedding 50°.	10.40	.53					10.40	.53	
235	240	5	Red slate. One small piece of manganese oxide. Bedding 45°.	10.48	.37		11.68	3.07	61.20	11.11	1.78	
240	245	5	Red slate. A little chert, some manganese oxide. Bedding 35°.	14.64	3.31		20.96	4.53	51.28	19.18	4.19	
Average										16.64	3.47	
245	250	5	Red slate. Bedding 50°.	9.92	.06					9.92	.06	
250	255	5	Red slate. 6" of solid chert or quartz.	10.24	.80		16.96	.90	63.80	15.88	.88	
255	258	3	Red slate. Bedding 48°.	13.36	6.62					13.36	6.62	
258	263	5	Red slate. Bedding 48°.	21.28	1.30		17.12	1.41	59.26	18.38	1.38	
263	268	5	Red slate. Bedding 48°.	16.96	.18					16.96	.18	
268	273	5	Red slate. Bedding 53°, cleavage 27°.	8.72	.12					8.72	.12	
Average										13.91	1.18	
273	278	5	Red slate. Some chert and manganese oxide. Bedding 50°, cleavage(?) 25°.	12.00	2.92					12.00	2.92	
278	283	5	Red and gray slate.	15.76	.68		21.28	3.03	53.26	20.15	2.55	
283	285	2	Chert.	6.72	4.26					6.72	4.26	
285	290	5	Red slate. Some chert, little manganese oxide. Chert slate contact 10° (almost vertical).	22.24	10.32		21.60	3.07	54.04	21.76	4.93	
290	295	5	Red slate.	23.52	12.61		22.40	3.66	48.22	22.48	4.30	
295	298	3	Red slate.	20.40	2.72		21.12	2.52	51.08	20.73	2.63	
298	301	3	Red slate. Bedding 48°.	15.66	2.13		18.72	2.29	58.64	17.08	2.20	
Average										18.17	3.45	
301	304	3	Red slate. Irregular bedding.	24.40	1.49					24.40	1.49	
304	307	3	Red slate. Bedding 50°, cleavage 30°.	16.24	2.01					16.24	2.01	
307	312	5	Red slate. 6" chert at 312'.	14.40	1.65		20.08	1.89	55.60	18.04	1.80	
312	317	5	Red and gray slates.	10.40	2.36		16.96	1.53	59.72	15.86	1.67	
317	320	3	Red slate, some chert. Bedding 40°.	24.16	1.06					24.16	1.06	
320	325	5	Gray slate. Bedding 45°.	10.40	2.13		15.04	1.14	67.28	14.40	1.28	
Average										18.16	1.56	
325	330	5	Red slate. Bedding 65°.	22.40	.68					22.40	.68	
330	335	5	Red slate. Bedding 45°.	19.84	1.33		15.84	.70	64.28	17.80	1.01	
335	340	5	Red slate. Bedding 45°.	23.28	1.41					23.28	1.41	
340	345	5	Red slate. Bedding 20°.	19.92	.45		26.24	.45	47.46	24.78	.45	
345	350	5	Red slate. Some chert at 350'. Bedding 45°.	19.20	1.06					19.20	1.06	
350	355	5	Red slate. Bedding 35°.	16.64	1.02		16.32	.30	60.86	16.46	.61	
355	358	3	Red slate. Bedding 35°.									
358	360	2	Gray slate, some red slate chert. Bedding 35°.	14.72	1.18					14.72	1.18	
360	362	2	Red slate. Bedding 40°.	20.32	.45		16.00	.53	60.42	17.12	.51	
362	366	4	Red slate, some gray slate at 365'. Bedding red slate 35°. Grey slate 25°.	14.48	.60					14.48	.60	
Average										19.15	.86	
366	367	1	Dark red slate and chert.									
367	372	5	Red slate. Bedding 45°.	14.64	1.37					14.64	1.37	
372	377	5	Red slate, some chert.	22.24	.76		17.92	1.06	60.80	19.06	.98	
377	382	5	Red slate. Folded bedding, axis of folds 5°.	25.92	2.13		18.72	1.61	57.02	21.14	1.78	
382	387	5	Red slate, some chert. Gray slate at 385'. Bedding 50°.	18.56	1.45					18.56	1.45	
387	392	5	Red and gray slates, some chert. Bedding 45°, cleavage 20°.	16.48	1.30					16.48	1.30	
Average										17.85	1.38	
140	392	252	Average for hole.							16.55	1.77	

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Associated with the manganese minerals was a reddish-brown gangue. It was moderately hard when dry but became soft and sliny when wetted. This gangue consisted of extremely small quartz particles in a mixture of iron oxides, clay, and other silicates. Also present in some of the cores was a dark, hard, slaty material.

Core 1 was divided into 5-foot sections, later split longitudinally into two equal and representative fractions. One part was stored in the core library at Fort Snelling for reference purposes, and the other was crushed dry to minus-10-mesh. Each section was sampled for assay, and the rejects were used to prepare a composite sample of the entire core.

The crushed rejects of each of the other cores were combined to form composite samples for the individual cores. This was done by splitting out a representative fraction of each section of core. In sections where the core recovery was less than 90 percent, the core was supplemented by a fraction of the sludge recovered from that section.

One sample was prepared by combining the crushed rejects of holes 2 to 7, inclusive, and omitting the drilling sludge.

The material used to make the various samples is shown in table 1. Also included are the iron, manganese, and silica assays of the composite samples.

Iron assays ranged from a low of 11.56 percent in core 2 to a high of 14.96 percent in core 7. The manganese varied from a minimum of 1.98 percent in core 2 to a maximum of 3.60 percent in core 1. Drill core 2 contained the smallest amount of silica, 42.10 percent, and core 7 contained the greatest amount, 52.64 percent.

TABLE 1. - Composite drill-core and sludge samples

Core number	Footage Interval From-	Footage Interval To-	Length	Assay, percent Iron	Assay, percent Manganese	Assay, percent Silica
1	166	332	166	11.79	3.60	46.40
2	150	427	277	11.56	1.98	42.10
3	175	340	165	11.96	3.08	52.50
4	160	356	196	13.34	3.34	48.87
5	155	335	180	13.18	3.46	45.77
6	138	299	161	12.21	3.30	52.13
7	157	325	168	14.96	2.62	52.64

Table 1 contains valuable and interesting information. For instance, the waste overburden is fairly uniform in thickness and averaged about 160 feet. The depth of the manganese-bearing formation is fairly constant, with an average value of 170 feet. Distribution of the manganese in the deposit is consistent and low. Excluding drill hole 2, the average manganese content of the formation is 3.2 percent.

The drill core of hole 1 was crushed to minus-10-mesh size to assist in accurate sampling of the material for chemical analysis. As the rejects of the other cores were crushed to minus-8-mesh size when received, they were kept at this size in an effort to prevent production of an excessive amount of fine-sized manganese, which would be lost during the washing and desliming process.

All samples were screened dry in a Ro-tap machine for 15 minutes. Each screen fraction was weighed and assayed for iron and manganese.

The data obtained for the screen analyses of the crushed drill cores are shown in table 2.

TABLE 2. - Screen analyses of crushed drill cores

Core No.	Product	Weight-percent	Assay, percent		Percent of total	
			Iron	Manganese	Iron	Manganese
1	-10 +35M	54.2	12.19	4.38	55.8	67.8
	-35 +100	16.2	12.35	4.03	16.8	18.5
	-100 +200	6.0	12.51	3.70	6.4	6.3
	-200	23.6	10.60	1.10	21.0	7.4
	Composite	100.0	11.82	3.51	100.0	100.0
2	-8 +28	45.7	10.52	1.80	41.5	44.3
	-28 +100	21.7	11.21	2.41	21.0	28.2
	-100 +200	7.5	13.26	2.64	8.6	10.7
	-200	25.1	13.34	1.24	28.9	16.8
	Composite	100.0	11.58	1.86	100.0	100.0
3	-8 +28	33.2	11.56	3.92	32.5	44.1
	-28 +100	21.9	12.33	3.38	22.9	25.1
	-100 +200	9.4	14.47	3.88	11.5	12.5
	-200	35.5	10.99	1.52	33.1	18.3
	Composite	100.0	11.80	2.95	100.0	100.0
4	-8 +28	43.5	12.39	3.36	41.9	43.3
	-28 +100	22.5	13.64	3.91	23.8	26.1
	-100 +200	7.5	14.88	5.44	8.7	12.2
	-200	26.5	12.55	2.34	25.6	18.4
	Composite	100.0	12.88	3.37	100.0	100.0
5	-8 +28	42.1	12.35	3.47	39.5	44.1
	-28 +100	22.0	14.64	3.27	24.5	21.8
	-100 +200	10.1	16.25	5.10	12.5	15.7
	-200	25.8	11.96	2.38	23.5	18.4
	Composite	100.0	13.15	3.31	100.0	100.0
6	-8 +28	40.8	11.05	2.89	37.5	37.8
	-28 +100	19.3	12.80	4.09	20.5	25.3
	-100 +200	9.0	15.04	5.46	11.2	15.7
	-200	30.9	11.96	2.14	30.8	21.2
	Composite	100.0	12.03	3.12	100.0	100.0
7	-8 +28	26.9	14.05	2.38	24.9	24.2
	-28 +100	16.2	15.86	3.09	16.9	18.9
	-100 +200	14.6	18.03	4.12	17.3	22.6
	-200	42.3	14.71	2.14	40.9	34.3
	Composite	100.0	15.20	2.65	100.0	100.0

The results of the screen analyses show that the plus-200-mesh fractions of each sample assayed higher in manganese and contained a larger amount of the manganese than the minus-200-mesh fractions, yet the minus-200-mesh material contained too much manganese to be discarded. The excessive amount of fine material of high manganese content probably was due to the presence of the drilling sludge.

Many methods of washing and desliming were tried, but the best results were obtained by agitating the material at a high pulp density, diluting the pulp, allowing the solids to settle, and removing the slimes by siphoning. All slimes removed were finer than 200-mesh.

The weights of the slimes varied from 36.7 percent for core 1 to 52.8 percent for core 3. In the other cores, the slime losses were almost equal and averaged 42.2 percent.

Manganese losses in the slimes were high for all cores except No. 1, which indicated that the fine manganese present in the drilling sludge was removed during the desliming process.

It is evident from the results in table 3 that a large amount of gangue material can be discarded by washing and desliming procedures. Such a method however should be used only on coarse material that contains a relatively small amount of minus-200-mesh manganese minerals.

TABLE 3. - Results of desliming crushed drill cores

Core No.	Product	Weight-percent	Assay, percent		Percent of total	
			Iron	Manganese	Iron	Manganese
1	Sands.	63.3	12.48	5.48	68.2	95.1
	Slimes.	36.7	10.02	.49	31.8	4.9
	Composite.	100.0	11.58	3.65	100.0	100.0
2	Sands.	58.7	12.44	2.76	63.1	81.8
	Slimes.	41.3	10.31	.87	36.9	18.2
	Composite.	100.0	11.56	1.98	100.0	100.0
3	Sands.	47.2	13.65	4.96	53.8	76.0
	Slimes.	52.8	10.45	1.40	46.2	24.0
	Composite.	100.0	11.96	3.08	100.0	100.0
4	Sands.	57.8	14.37	4.80	62.3	82.9
	Slimes.	42.2	11.92	1.35	37.7	17.1
	Composite.	100.0	13.34	3.34	100.0	100.0
5	Sands.	58.5	15.42	5.20	68.4	87.9
	Slimes.	41.5	10.02	1.01	31.6	12.1
	Composite.	100.0	13.18	3.46	100.0	100.0

TABLE 3. - Results of desliming crushed drill cores (Cont.)

Core No.	Product	Weight-percent	Assay, percent		Percent of total	
			Iron	Manganese	Iron	Manganese
6	Sands.	58.2	13.08	5.16	62.3	90.9
	Slimes.	41.8	11.00	.72	37.7	9.1
	Composite.	100.0	12.21	3.30	100.0	100.0
7	Sands.	55.6	16.15	3.88	60.0	82.4
	Slimes.	44.4	13.47	1.04	40.0	17.6
	Composite.	100.0	14.96	2.62	100.0	100.0

When drill-core 1 sample was received, the only gravity concentration equipment available was a laboratory concentrating table.

For these tests, the deslimed minus-10-mesh material was crushed to minus-35-mesh size, deslimed, and classified.

Results of the table concentration and the data from the desliming operations are given in table 4.

TABLE 4. - Table-concentration test on core from hole 1

Product	Weight-percent	Assay, percent			Percent of total	
		Iron	Manganese	Silica	Iron	Manganese
Concentrate	8.8	22.40	24.55	13.98	16.9	65.2
Middling	6.2	16.50	6.81		8.7	12.7
Tailing	24.0	10.67	1.25		21.9	9.1
Slimes	61.0	10.07	.70		52.5	13.0
Composite	100.0	11.69	3.31		100.0	100.0

A table concentrate representing 8.8 percent of the original feed weight and assaying 22.40 percent iron, 24.55 percent manganese, and 13.98 percent silica was obtained. Manganese recovery in the concentrate was 65.2 percent.

The middling product, which was given no additional treatment, assayed 6.81 percent manganese, contained 12.7 percent of the total manganese, and represented 6.2 percent of the weight.

A tailing with a weight recovery of 24.0 percent and assaying 1.25 percent manganese was discarded.

The largest amount of material, 61.0 percent, was removed as slimes and assayed 0.70 percent manganese. Only 13.0 percent of the manganese was lost in the slimes.

Results of the table-concentration tests indicate that a good washing and desliming procedure followed by table concentration of the material would produce a concentrate assaying about 25 percent manganese, 15 percent silica, and containing about 80 percent of the total manganese.

For sink-float tests on holes 2, 3, 4, 5, 6, and 7, the plus-100-mesh deslimed core samples were sized into four screen fractions - minus-8- plus 14-mesh, minus-14- plus 28-mesh, minus-28- plus-48-mesh, and minus-48- plus-100-mesh. Each fraction was treated separately in acetylene tetrabromide with a density of 2.95.

A definite separation of the manganese from the gangue minerals was obtained for each screen fraction. The sink portion of each fraction, however, contained an excessive amount of silica. At the same time, the corresponding float portions contained too much manganese to be discarded.

It is apparent from the results of these tests given in table 5 that the manganese minerals are not completely liberated in the plus-100-mesh particles. To obtain an acceptable concentrate, the material must be ground to at least 100-mesh.

As it was believed that flotation would be the most efficient method of concentrating the minus-100-mesh minerals, no other gravity methods of concentration were studied.

Flotation tests made on the deslimed drill cores produced concentrates that assayed 20 percent and higher in manganese. Unfortunately, the manganese recoveries were too low to be acceptable.

It was thought that the low manganese recoveries were caused by the failure of the extremely fine manganese particles in the sludge to float.

To overcome this obstacle, it was decided to prepare a sample from the remainder of the drill cores and omit the drilling sludge.

This sample was then washed in a 325-mesh screen. The minus-325-mesh fraction assayed only 0.35 percent manganese. Discarding this portion removed 47.8 percent of the weight and only 6.8 percent of the total manganese.

TABLE 5. - Sink-float tests on deslimed and sized crushed drill cores

Core No.	Screen fraction	Product	Weight-percent	Assay, percent			Percent of total	
				Iron	Manganese	Silica	Iron	Manganese
2	-8 +14M	2.95 sink	21.3	26.40	13.76	21.68	44.8	78.8
		2.95 float	78.7	8.80	1.00		55.2	21.2
		Composite	100.0	12.55	3.75		100.0	100.0
	-14 +28	2.95 sink	18.5	27.37	12.68	21.39	43.0	75.1
		2.95 float	81.5	8.23	.96		57.0	24.9
		Composite	100.0	11.77	3.13		100.0	100.0
	-28 +48	2.95 sink	25.0	27.94	14.40	18.59	52.9	82.8
		2.95 float	75.0	8.31	1.00		47.1	17.2
		Composite	100.0	13.22	4.35		100.0	100.0
	-48 +100	2.95 sink	36.6	26.97	15.16	17.54	66.3	92.0
		2.95 float	63.4	7.91	.76		33.7	8.0
		Composite	100.0	14.88	6.03		100.0	100.0

TABLE 5. - Sink-float tests on deslimed and sized crushed drill cores (Cont.)

Core No.	Screen fraction	Product	Weight-percent	Assay, percent			Percent of total	
				Iron	Manganese	Silica	Iron	Manganese
3	-8 +14	2.95 sink	43.8	20.51	23.52	19.44	60.1	95.6
		2.95 float	56.2	10.58	.84		39.9	4.4
		Composite	100.0	14.93	10.77		100.0	100.0
	-14 +28	2.95 sink	32.5	21.16	20.96	19.10	51.5	92.0
		2.95 float	67.5	9.61	.88		48.5	8.0
		Composite	100.0	13.36	7.41		100.0	100.0
	-28 +48	2.95 sink	31.8	24.31	17.24	20.18	60.9	93.0
		2.95 float	68.2	7.27	.60		39.1	7.0
		Composite	100.0	12.69	5.89		100.0	100.0
	-48 +100	2.95 sink	46.9	24.23	15.80	22.11	72.6	94.9
		2.95 float	53.1	8.08	.76		27.4	5.1
		Composite	100.0	15.65	7.81		100.0	100.0
4	-8 +14M	2.95 sink	43.2	23.74	9.04	19.18	61.9	89.1
		2.95 float	56.8	11.14	.84		38.1	10.9
		Composite	100.0	16.58	4.39		100.0	100.0
	-14 +28M	2.95 sink	33.6	24.71	17.68	19.00	54.0	93.4
		2.95 float	66.4	10.66	.64		46.0	6.6
		Composite	100.0	15.38	6.36		100.0	100.0
	-28 +48	2.95 sink	38.7	25.19	18.20	19.03	63.3	94.1
		2.95 float	61.3	9.21	.72		36.7	5.9
		Composite	100.0	15.40	7.48		100.0	100.0
	-48 +100	2.95 sink	33.7	25.19	17.36	19.10	61.8	92.1
		2.95 float	66.3	7.91	.76		38.2	7.9
		Composite	100.0	13.73	6.35		100.0	100.0
5	-8 +14M	2.95 sink	39.4	24.55	16.28	19.90	59.3	90.8
		2.95 float	60.6	10.98	1.08		40.7	9.2
		Composite	100.0	16.32	7.06		100.0	100.0
	-14 +28	2.95 sink	34.5	24.79	15.88	19.96	55.1	88.2
		2.95 float	65.5	10.66	1.12		44.9	11.8
		Composite	100.0	15.53	6.21		100.0	100.0
	-28 +48	2.95 sink	36.3	25.92	13.56	20.94	50.1	76.0
		2.95 float	63.7	14.70	2.44		49.9	24.0
		Composite	100.0	18.77	6.47		100.0	100.0
	-48 +100	2.95 sink	54.7	25.03	11.72	23.78	67.9	87.6
		2.95 float	45.3	14.29	2.00		32.1	12.4
		Composite	100.0	20.16	7.32		100.0	100.0

5354

TABLE 5. - Sink-float tests on deslimed and sized crushed drill cores (Cont.)

Core No.	Screen fraction	Product	Weight-percent	Assay, percent			Percent of total	
				Iron	Manganese	Silica	Iron	Manganese
6	-8 +14M	2.95 sink	32.4	21.80	21.88	22.53	57.9	95.7
		2.95 float	67.6	7.59	.48		42.1	4.3
		Composite	100.0	12.19	7.41		100.0	100.0
	-14 +28	2.95 sink	25.4	23.58	20.12	18.60	49.8	91.9
		2.95 float	74.6	8.08	.60		50.2	8.1
		Composite	100.0	12.02	5.56		100.0	100.0
	-28 +48	2.95 sink	35.8	24.47	19.04	19.07	62.1	92.7
		2.95 float	64.2	8.31	.84		37.9	7.3
		Composite	100.0	14.10	7.36		100.0	100.0
	-48 +100	2.95 sink	50.2	24.87	19.80	18.14	76.0	94.1
		2.95 float	49.8	7.91	1.24		24.0	5.9
		Composite	100.0	16.42	10.56		100.0	100.0
7	-8 +14M	2.95 sink	34.6	21.21	17.08	20.24	60.6	92.2
		2.95 float	65.4	9.37	.76		39.4	7.8
		Composite	100.0	15.54	6.41		100.0	100.0
	-14 +28	2.95 sink	28.9	27.94	14.84	21.63	51.4	88.8
		2.95 float	71.1	10.74	.76		48.6	11.2
		Composite	100.0	15.71	4.83		100.0	100.0
	-28 +48	2.95 sink	31.4	28.18	13.60	23.36	49.7	78.8
		2.95 float	68.6	13.08	1.68		50.3	21.2
		Composite	100.0	17.82	5.42		100.0	100.0
	-48 +100	2.95 sink	49.0	26.73	11.92	26.60	71.2	91.7
		2.95 float	51.0	10.42	1.04		28.8	8.3
		Composite	100.0	18.41	6.37		100.0	100.0

In table 6, the results of the washing treatment are given. Manganese content was increased from 2.48 percent to 4.42 percent.

TABLE 6. - Results of washing composite drill cores on 325-mesh

Product	Weight-percent	Assay, percent			Percent of total		
		Iron	Manganese	Silica	Iron	Manganese	Silica
-10 +325	52.2	14.50	4.42	49.08	55.9	93.2	50.9
-325	47.8	12.50	.35	51.66	44.1	6.8	49.1
Composite	100.0	13.54	2.48	50.31	100.0	100.0	100.0
Heads	100.0	13.53	2.54	49.72			

A series of flotation tests was made on the washed sands. Conditions and reagents were varied until acceptable results were obtained.

The best manganese recovery and selectivity were obtained with an emulsion of reagent D-142, a product of the Armour Co. and reagent RC-1336, a product of General Mills. Stage grinding to minus-200-mesh and floating at a pulp density of about 18 percent solids also improved the flotation results.

Manganese recoveries in the rougher concentrate varied from a low of 81.6 percent to a high of 95.6 percent. Under the same conditions, after cleaning the rougher concentrate twice the cleaner concentrate ranged from a maximum assay of 23.87 percent manganese to a minimum assay 17.77 percent manganese.

The conditions and results of one of these tests are given in tables 7 and 8.

TABLE 7. - Flotation of manganese minerals

Sample number	Product	Weight-percent	Assay, percent			Percent of total		
			Iron	Manganese	Silica	Iron	Manganese	Silica
52-01-81	Cleaner conc.	11.8	19.09	23.23	16.64	15.8	61.5	4.0
52-01-82	Middling No. 2	4.4	24.17	11.59	-	7.4	11.4	-
52-01-83	Middling No. 1	15.1	20.91	4.64	-	22.1	15.7	-
52-01-84	Rougher tailing	68.7	11.37	.74	-	54.7	11.4	-
	Composite	100.0	14.28	4.46	-	100.0	100.0	-
	Heads	100.0	14.50	4.42	49.08	-	-	-

TABLE 8. - Reagents and conditions used in flotation of manganese minerals

	Reagents, pounds per ton				
	Soda ash	Metso	Calgon	RC-1336	D-142
Rougher float..	2.0	1.0	-	0.75	1.50
Cleaner No. 1..	-	-	1.0	-	-
Cleaner No. 2..	-	1.0	-	-	-

Data in table 7 show that 68.7 percent of the weight was eliminated in a rougher tailing that assayed 0.74 percent manganese. Only 11.4 percent of the total manganese was lost in this product.

After the rougher concentrate was cleaned twice, the cleaner concentrate assayed 19.09 percent iron, 23.23 percent manganese, and 16.64 percent silica. The middlings were not given any additional treatment. Also, it was impossible to conduct any locked flotation tests because of lack of material.

CONCLUSIONS

Investigations to date indicate a substantial tonnage of low-grade manganese-iron formation in the area covered by this report. Beneficiation studies to date by the Bureau of Mines, private mining interests, and by commercial testing laboratories have shown that a partial concentrate can be made by simple washing methods. The results of testing to date indicate that it would be feasible for a commercial plant to make a product containing over 20 percent manganese, about 20 percent iron, and about 16 percent silica; however, grinding, desliming, and flotation would be required to attain these results.

A product as described above is not suitable for making ferromanganese direct. It could, however, be used in several chemical-leaching processes that have been considered for producing manganese metal. The product would also be useful for upgrading the manganese in iron ores deficient in manganese or for smelting to spiegeleisen.

Further drilling northeast and southwest of section 23 could indicate additional reserves of a similar type. Additional work in outlying portions of the area might indicate blocks of ore of similar-grade manganese.

Int. - Bu. of Mines, Pgh., Pa.

FILE COPY
SURNAME:

400

Butledge
Martin
Schmitz

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.

Mr. William M. Hayden, President
Chemetals Corporation
488 Madison Avenue
New York 22, New York

Re: Docket No. DMA 1829X - Manganese
Utah Construction Company and
Associates
Section 23, T. 48 N., R. 27 W.
Aitkin County, Minnesota

Dear Mr. Hayden:

Reference is made to your conversation with our Iron and Ferro-Alloys Division on May 15, 1953, when you asked us to reactivate the subject application, which has been held in abeyance since January 30, 1952, at the request of the Utah Construction Company.

The above exploration project is now being reviewed to determine to what extent modification will be required to suit current conditions. We have already noted, however, three items which can be called to your attention at once, as follows:

1. There is no record of the assignment of the lease of January 1, 1950, from Tintic Standard Mining Company, Nellie B. Mining Company, Hubert E. Howard, Harold E. Raddatz, and William M. Hayden to the Utah Construction Company. Six copies of such assignment will be required.

2. In lieu of the Landlord's Subordination Agreement which we formerly used we shall need from the Andyck Corporation six copies of Owner's Consent to Lien, for which we enclose forms. This should refer to the lease dated January 1, 1950 to Kay Todd, Sinclair H. Todd, Edward P. Scallon, and Frances Scallon and the successive assignments.

3. The original lease and assignment thereof and option agreement indicate that the property is located in section 23, T. 48, R. 27 Aitkin County, Minn. They should be corrected to indicate that the property is located in section 23, T. 48 N., R. 27 W. Aitkin County, Minn. (as appears under the title of the map "Proposed Manganese Lease).

Sincerely yours,

Administrator

Copy to: Utah Construction Company
and Associates
1 Montgomery Street
San Francisco 4, California

Rutledge/Martin/Kane/foc
5-18-53

cc: Docket
Code 400
FT. Reg. V
Adm. Reading File
N. B. Melcher, USBM
M. D. Crittenden, USGS

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

not mailed

Utah Construction Company
and Associates
1 Montgomery Street
San Francisco 4, California

Re: Docket No. 1829 - Manganese
Section 23, T. 48 N., R. 27 W.
Aitkin County, Minnesota

Gentlemen:

This will acknowledge your letter of April 23, 1953, requesting us to hold your application for exploration assistance on the subject property in abeyance until you have secured a development and/or production commitment from the Government. You also stated that you plan to submit a revised application when you reactivate this proposal.

The referenced application was made July 2, 1951; an amended program was submitted in August 1951 and the application has been held in abeyance since shortly thereafter. We wish to cooperate fully in the matter of allowing ample time for the submission of a revised program, but if the revised program is not submitted by June 30, 1953, we will then remove the referenced application from the active file and consider the matter closed.

If the subject docket should be closed for this reason, however, it would be without prejudice, and the information contained therein would still be available in the event that a revised application should later be submitted.

Sincerely yours,

Administrator

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

not mailed

Utah Construction Company
and Associates
1 Montgomery Street
San Francisco 4, California

Re: Docket No. 1829 - Manganese
Section 23, T. 48 N., R. 27 W.
Aitkin County, Minnesota

Gentlemen:

Reference is made to your application for exploration assistance at the subject property. On March 30, 1953, we wrote and requested that if you were no longer interested in exploration assistance, it would be appreciated if you would withdraw the referenced application inasmuch as your proposal was contingent upon a Defense Materials Procurement Agency contract. To date we have had no reply.

We wish to cooperate fully in the matter of allowing ample time, but if we do not hear from you by May 31, 1953, we will then remove the referenced application from the active file and consider the matter closed.

Sincerely yours,

Administrator

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

402

March 5, 1953

Memorandum

To: The Docket

From: G. C. Selfridge

Subject: Docket No. 1929 - Manganese
Section 23, T.48N., 127W
Aitken County, Minnesota

Mr. Macia telephoned today to ask if DMEA funds for exploration had been frozen.

He was informed that they had not been frozen.

He was inquiring because Mr. Young had told him that DMPA funds had been temporarily frozen.

G. C. Selfridge

GCSelfridge/pa 3-6-53

cc: Mails & Files
Admin. Reading File
Mr. Selfridge
Mr. Martin
Mr. Mittendorf

X LOCATION

JUL 3 1952

Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Re: Docket No. 1829X - Manganese
Section 23, T. 48 N., R. 27 W.
Aitkin County, Minnesota

Gentlemen:

Several months have passed since Mr. Beardsley of your Company was last in this office, at which time he indicated your intention to submit an amended application. We would like to clear our files of the old DMA dockets as soon as possible. Will you please inform us whether or not you intend to proceed with the application? We would appreciate hearing from you at your earliest convenience.

Sincerely yours,

George C. Selfridge

G. C. Selfridge, Chief
Iron and Ferro-Alloy Division

GCSelfridge:ls 7/2/52

CC: Admn. Reading File
Docket
G. C. Selfridge
N. B. Melcher, USBM
M. D. Crittenden, USGS
Field Team, Region 5

COPY

402

UNITED STATES
DEPARTMENT OF THE INTERIOR

Bureau of Mines

February 12, 1952

Mr. G. C. Selfridge, Acting Chief
Iron and Ferro-Alloy Division
Defense Minerals Administration
United States Dept. of the Interior
Washington 25, D. C.

Re: Docket No. DMA 1829X - Manganese
Sec. 23, T48, N.R. 27W
Utah Construction Co. and Associates
Aitken County, Minnesota

Dear Mr. Selfridge:

A progress report covering the results of tests made on the manganese ore referred to in the subject docket has been started. As it will be sometime before it is completed I believe it is advisable to send you a brief summary of the results of this work.

Mineral dressing tests have been made on a total of seven diamond drill cores furnished by the Mining Division. The exact location of each drill hole may be found in the files of the Bureau of Mines, Washington, D. C.

The iron-manganese formation in the area drilled was quite variable in composition as revealed by chemical analysis of the drill cores. Core recovery was irregular and in those instances where the recovery was less than 90 percent, sludge from the hole was included in the composite sample prepared from each core. This type of sample is suitable only for preliminary mineral dressing studies and should be supplemented by trench or pit samples if an accurate estimate of the mineral dressing problems involved are to be determined.

Partial analysis of the composite samples are as follows:

D.D. Hole Number	Assay, percent		
	Mn	Fe	SiO_2
1	3.60	11.8	46.4
2	1.98	11.56	42.1
3	3.08	11.96	52.5
4	3.34	13.34	48.9
5	3.46	13.18	45.8
6	3.30	12.21	52.1
7	2.62	14.96	52.6

The first step in upgrading this material was a simple washing and desliming operation on the minus 10 mesh feed. Sieve analyses had shown that a soft clayey fraction of the formation contained less manganese than the harder minerals. The weight recovery, manganese recovery, and assay obtained on each washed concentrate follow:

D.D. Hole number	Wt. recovery, percent	Mn recovery, percent	Assay, percent		
			Mn	Fe	SiO_2
1	63.0	95.1	5.5	15.2	45.7
2	58.7	81.8	2.76	12.44	52.5
3	47.2	76.0	4.96	13.65	52.9
4	57.8	83.1	4.80	14.37	50.6
5	58.5	87.9	5.20	15.42	45.5
6	58.2	91.0	5.16	13.08	53.3
7	55.6	82.3	3.88	16.15	53.8

The highest weight recovery, manganese recovery, and manganese assay were obtained from composite No. 1 which contained no sludge. All sludge recovered with the drill core had been subjected to overgrinding by the diamond drill and undoubtedly more manganese was lost in the washing operation than in the tests which contained no sludge.

Further upgrading of the washed concentrates or sands was obtained by a combination of mineral dressing operations which included the use of a classifier tube, Denver laboratory jig, Wilfley table, heavy density media and froth flotation. In no instance was it possible to separate the manganese from the iron and silica to the degree required for a ferrograde product. However, the results show that a product containing between 22 and 26 percent manganese, 13 to 15 percent iron, and 11.5 to 13.0 percent silica may be produced.

Because of the limited amount of sample available from each core these tests are only indicative of what may be expected and the results should be confirmed by larger scale tests as soon as more material can be obtained. Preliminary results however are very encouraging for the production of a marketable manganiferous product and a reasonable recovery of manganese. The production of a ferrograde product will require further treatment by a leaching process or by a duplex smelting process.

Sincerely yours,

/s/ C. E. Wood

C. E. WOOD, Chief
Metallurgical Division, Reg. V

JAN 30 1952

Mr. Cecil R. Wood, Chief
Metallurgical Division, Region V
U. S. Bureau of Mines
University Station
Minneapolis, Minnesota

Re: Docket No. DMA 1529X - Manganese
Sec. 23, T48, R29W
Utah Construction Co. and Associates
Aitkin County, Minnesota

Dear Mr. Wood:

This office understands that the Metallurgical Division of Region V is conducting tests on the manganese ore referred to in the subject docket.

When the results of this test are available, we shall appreciate receiving a copy of your report.

Sincerely yours,

G. O. Selfridge, Acting Chief
Iron and Ferro-Alloy Division

GOSentry'lm
1/28/52

cc: Admn. Reading File
Docket
E. B. Melcher, USBM
M. D. Crittenden, USGS
Field Team Reg. V
G. O. Selfridge
G. G. Sentry

November 27, 1951

Memorandum

To: Administrator

From: P. B. Blakemore

Subject: Docket DMA 1829X, Cuyuna Manganese, Minnesota
Utah Construction Company and Associates
Total $250,000.00 Gov't. Share $187,500.00 (75%)

The subject application was approved by Supply Division's letter of September 5, 1951 and received by PED on the same date.

Inasmuch as 37,800,000 gross tons of manganiferous material (3-3/4% Mn) appears to have already been proven in this deposit, the additional churn and core drilling, shaft sinking and drifting applied for could not be justified as exploration and Mr. Hayden, a representative of one of the interests, was so advised during a visit in your office.

Mr. C. T. E. Beardsley, representing another interest was also advised that the application could not be handled as exploration, but that it might be handled as a Research Loan.

The facts are, that this manganiferous material cannot be mechanically concentrated to yield a concentrate containing more than 20% Mn plus a large percentage of silica. This concentrate would not be merchantable, therefore it is proposed to treat it in an elaborate chemical plant, with sulphur dioxide and pure oxygen, under high pressure (600 psi) at elevated temperatures, so as to extract, it is claimed, with high recovery, the manganese in the form of manganese sulphate. The manganese sulphate is then to be sintered to produce a very pure, merchantable, manganous oxide. It is planned to recover a portion of the sulphur dioxide from the sintering process for re-use.

Inasmuch as no pilot plant has ever been constructed, or any plant operated, which would demonstrate the commercial value of this process, it is evident that the first step would be to establish operating factors and cost data for the chemical processing by operating a miniature of the plant proposed.

The problem is not to discover additional manganiferous material, but to determine if it is possible to recover the manganese in a merchantable form from the large proven reserves at a cost which would amortize the very large investment, assuming a G. S. A. purchase at $200.00 g. t., 48% Mn. basis.

A loan for research along these lines appears to be the only form of Governmental assistance which can be justified under such circumstances.

Other items to be considered:

1. The property is not correctly described in the lease and option.

2. The primary lessees, Todd and Scallon, charge the first sub-lessees royalty on ore shipments which is from 3 to 6 times that which they are obligated to pay the owner and require a minimum royalty five times that required by the owner. This appears unwarranted.

3. The Utah Construction Co. and Associates, second sub-lessees, have not furnished any evidence, other than their statement and the subordination agreement, that they are (sub&sub) lessees of the property. Copy of lease to Utah Construction has not been furnished.

4. The signature of the Landlord on the subordination agreement made directly to Utah Construction Co. and Associates does not correspond in title to that used in the primary lease, though the individuals signing for the landlord are the same on both instruments.

5. While the applicants are very competent contractors, expert in earth moving, they have not furnished evidence of their talent for conducting very intricate, novel and complex chemical operations and estimating theoretical costs thereof.

Recommendation:

Application to Inactive File.

P. B. Blakemore

PBBlakemore/meh
11-27-51
cc to: Reports and Records
Docket
Mr. Blakemore

DMA 1829

This is Folder no 1

For later data — See

Folder no 2

File stripped of legal documents on Jan 30, 1952 by Selfridge for Beardsley for new application.

GCL

Dma
1829

Note - This folder and Envelopes #1 + #2, henceforth constitute the original file - dated July 11 - 1951

On August 8th an amended application (mostly as to "new figures") was filed.

See Manila folder, henceforth marked "Amended Application + Correspondence" for all letters, Reports, etc.

note - assignments, subordination are in this folder.

← other side

Applicants give reserves at

Measured	37,800,000 L.T.
Indicated	23,700,000 LT.

Exploration program was to test area between shown as indicated above.

Bureau of Mines gives following estimate

Measured	33,500,000 LT
Indicated	46,850,000 LT
Inferred	75,000,000 LT

Property has been drilled, first for iron ore and later for manganese ore, by three organizations as follows: M.P. Bob

FILE COPY
SURNAME:

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.

July 17, 1951

Mr. Allen D. Christensen
Vice President
Utah Construction Company
One Montgomery Street
San Francisco, California

Subject: DMA-1829X
Re: Exploration Loan

My dear Mr. Christensen:

Receipt is acknowledged of your application and attachments for an exploration loan under the Defense Production Act of 1950.

The application was assigned Docket Number DMA-1329X and referred to Mr. George Holderer, Chief, Manganese Branch on July 11, 1951.

In any future correspondence relating to your application, kindly refer to DMA-1829X.

Sincerely yours,

LANDON F. STROBEL

Landon F. Strobel
Executive Secretary

L. F. Strobel:jc
cc: Strobel
File
Holderer
Lyon

July 17, 1951

Mr. Allen D. Christensen
Vice President
Utah Construction Company
One Montgomery Street
San Francisco, California

Subject: DMA-1829X
Re: Exploration Loan

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Receipt is acknowledged of your application and attachments for an exploration loan under the Defense Production Act of 1950.

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In any future correspondence relating to your application, kindly refer to DMA-1829X.

Sincerely yours,

LANDON F. STROBEL

Landon F. Strobel
Executive Secretary

L. F. Strobel:jc
cc: Strobel
File
✓ Holderer
Lyon

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. DMA 1829X

Date received 7-11-51

Participation

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

FILL IN THIS BLOCK

Date of application July 2, 1951

Estimated cost $500,000.00

Mineral or metal Manganese

Percentage of Government participation 75%

Location of mine Sec.23, T48N, R27W,
Aitkin County, Minn.

Date of filing MF-100 July 2, 1951

DMA Docket Number, if available 1829X

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.

(*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area.

*11. State the present and former names of the property, if any.

*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.

*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.

15. State in detail how the ore could be shipped and how and where milled.

*16. History:

(*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.

(*b*) State briefly the known history and production of adjoining and neighboring properties.

(*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

*17. Production:

(*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)

(*a*) Describe the ore or mineral deposits briefly.

(*b*) Submit available maps and assay data.

(*c*) Give estimated tonnage and grade of each class of ore reserves.

19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows:

(*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.

(*b*) Supervisors, by numbers and positions, with salaries of each.

(*c*) Cost of necessary repairs to existing facilities, structures, and buildings.

(*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.

(*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.

(*f*) Cost of rental for equipment which the operator proposes to rent.

(*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.

(*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.

(*i*) Cost of power, water, utilities, and any other items not provided for above.

24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates
(Name of company)

July 2, 1951
(Date)

By Allen P. Christensen
(Signature of authorized official)

Vice President and General Manager for The Utah Construction Company
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. DMA 1829X

Date received 7-11-51

Participation

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

FILL IN THIS BLOCK

Date of application July 2, 1951

Estimated cost $500,000.00

Mineral or metal Manganese

Percentage of Government participation 75%

Location of mine Sec. 23, T48N, R27W,
Aitkin County, Minn.

Date of filing MF-100 July 2, 1951

DMA Docket Number, if available 1829X

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract Form MF-200, for your signature.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration

JUL 11 1951

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.
NOTE.—It will be necessary to attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.
8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

The Utah Construction Company
and Associates

Vice President and General Manager
For The Utah Construction Company

July 2, 1951

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.
    (*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

    NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area.

*11. State the present and former names of the property, if any.

*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.

*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.

15. State in detail how the ore could be shipped and how and where milled.

*16. History:
    (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.
    (*b*) State briefly the known history and production of adjoining and neighboring properties.
    (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

*17. Production:
    (*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)
    (*a*) Describe the ore or mineral deposits briefly.
    (*b*) Submit available maps and assay data.
    (*c*) Give estimated tonnage and grade of each class of ore reserves.

19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

    NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows:
    (*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.
    (*b*) Supervisors, by numbers and positions, with salaries of each.
    (*c*) Cost of necessary repairs to existing facilities, structures, and buildings.
    (*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.
    (*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.
    (*f*) Cost of rental for equipment which the operator proposes to rent.
    (*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.
    (*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.
    (*i*) Cost of power, water, utilities, and any other items not provided for above.

24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates
(Name of company)

By Allen B. Thompson
(Signature of authorized official)

July 2, 1951
(Date)

Vice President and General Mgr. for the Utah Construction Company
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

Index of File
to
PRODUCTION EXPANSION DIVISION

1. 3 copies of MF-103 with attached sheets and maps
2. 3 copies of MF-100
3. 3 copies 20 photostates of drill logs with 26 sheets of assays
4. 3 copies MF-200 with attached sheets
5. 3 copies Photostate of Exploration Report
6. 3 copies letter to DMA from Christensen dated 7/2/51

8/30/51

GENERAL OFFICES
FIRST SECURITY BANK BUILDING
OGDEN, UTAH

SAN FRANCISCO OFFICE
ONE MONTGOMERY STREET
TEL. GARFIELD 1-6743

SALT LAKE CITY OFFICE
57 EAST 4TH SOUTH STREET
TEL. 3-7676

THE UTAH CONSTRUCTION COMPANY

ENGINEERS AND CONTRACTORS
SAN FRANCISCO 4, CALIFORNIA

CABLE ADDRESS
UTAHCONCO

July 2, 1951

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 11 1951
LABOON R. SHUBELL
Executive Secretary

Defense Minerals Administration
New Interior Building
Washington 25, D. C.

Gentlemen:

We are sending herewith for your consideration a proposal for supplying a high grade sintered manganese oxide product on a large scale from a domestic source.

The proposal embraces a well studied program including:

1. A large deposit of low grade manganese ore in the Cuyuna Range which has been partially drilled and proven.

2. A process for recovery of manganese developed by American Cyanamid Company (through its wholly owned subsidiary, Chemical Construction Company) and which process was recently tested by Batelle Institute and approved by them as being definitely successful in laboratory tests on ore from the above deposit.

3. An operating group with an impressive background of experience in mining and in construction and operation of metallurgical plant facilities.

The program we propose calls for three stages in the development and operating procedure, which are as follows:

A. An initial exploratory stage aided by the Defense Minerals Act, including more detailed drilling and shaft work to completely prove the deposit and test the actual ore from the deposit through commercial size equipment. This stage will require eight to twelve months time and will cost approximately $500,000.

B. Development of the mine and design and construction of a full scale beneficiation and sintering plant under terms of a purchase contract for 50,000,000 long ton units under appropriate procurement regulations with suitable guarantees against loss from cancellation by the government. This development is estimated to require twelve months time and will cost approximately $25,000,000.

C. Delivery of sintered manganese for a five year period beginning late in 1953 or early in 1954.

This program offers a sound and practical approach to the manganese supply problem, a solution of which is so essential to our steel industry. The program utilizes domestic sources which are not subject to interruption by war or external political influences, and the supply can be expanded if necessary during times of national emergency. The proven character and the broad experience of the group of participants gives the maximum assurance to the government that the contract will be fulfilled.

Respectfully submitted by,

THE UTAH CONSTRUCTION COMPANY

By Allen D. Christensen
Allen D. Christensen,
Vice President and
General Manager

ADC/jka

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. D.M.A. 1829X
Date received New figures submitted as of this date 8/7/51

Participation

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date August 3, 1951

FILL IN THIS BLOCK

Date of application July 11, 1951

Estimated cost $250,000

Mineral or metal Manganese

Percentage of Government participation 75%

Location of mine Aitkin County, Minnesota

Date of filing MF-100 July 11, 1951

DMA Docket Number, if available 1829X

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
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NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

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16—64067-1

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15. State in detail how the ore could be shipped and how and where milled.

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    (*a*) If mine is in production, furnish the following information:

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    (*a*) Describe the ore or mineral deposits briefly.
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19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

    NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

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24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Co. and Associates
(Name of company)

By C. H. Rucker
(Signature of authorized official)

August 3, 1951
(Date)

Agent
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

Form MF-103

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1 to 5, inclusive, are answered in form MF-100, which is attached.

6. Applicant is lessee.

7. Lease is in good standing. A copy of the agreement is attached.

8. A financial statement is attached to form MF-100, which accompanies this application.

9. Applicant is prepared to invest $75,000 in the project. This sum exceeds our share of the cost as detailed in question 23, and according to the provisions of Section 9 of Mineral Order 5.

The Property

10. (a) The ore body lies in section 23, Township 48 N. range 27 west, Aitkin County, Minnesota.
    (b) Explorations are to be conducted over a considerable portion of the entire section. For the purposes of this contract the property will be subdivided into 40 acre tracts, and exploration is to proceed as discoveries indicate.

11 to 14, inclusive, are answered in form MF-100.

15. Mining will be done from an open pit, using power shovel loading and truck haulage. A gravity concentrating plant is to be erected on the property, and the 20% concentrate produced will be leached by a modified sulphur dioxide process, facilities for which will probably be erected on the property. The leaching process turns out a 62% manganese content sintered oxide, which is suitable for production of ferromanganese.

16 to 18, inclusive, are answered in form MF-100.

19. The foregoing answers are believed to cover the pertinent facts.

The Exploration

20. Explorations are to be conducted for manganese, indications of which have already been established by the drilling described previously. The deposit is believed to be a folded, bedded deposit, and is known to be of considerable thickness and extent. The ore contains manganese and iron as oxides, together with silica and alumina which constitute the gangue.

21. It is estimated that about 40 holes should be drilled to substantiate further the reserve of mineral, and to gain other information necessary to plan a mine. It is expected that this work can be completed within four months of commencement. In addition to the drill holes, it is felt that an exploratory shaft, or several large core holes, should be put down on the property to gain further knowledge of the character and formation of the mineral, and to obtain samples for further work on beneficiation. Tentative drilling sections and the shaft site are indicated in red on plan E-2, which is attached, but it is expected that early findings will dictate the final plan of development.

22. This property was originally drilled as a prospect for iron ore, owing to its position relative to the Cuyuna Range. Later exploration was made with the hope of developing a body of manganiferous iron ore. In the light of recent development of a process for leaching manganese, together with the susceptability of the ore to gravity concentration, the present progra has been undertaken. Considerable ore is now known to exist, but the current exploration is necessary to plan the mine and to obtain samples for final metallurgical work.

The substantiation of this request lies in the drilling logs and metallurgical reports of work done on the ore. Photostati copies of such reports as are available are attached to this application.

The Requirements and Costs

23. It is anticipated that drilling and shaft sinking will be done under contract by firms engaged in doing this type of work in the iron ranges. Estimates of costs are based on recent experience of the U.S.B.M. and the mining companies operating in the area.

24.

Type of Work	Completion Time (from date of approval)	Cost Estimate
Exploratory Drilling	4 mo.	
8,000 ft. churn drill holes @ $7.00/ft.		$ 56,000.00
4,000 ft. NX core drill hole @ $8.00/ft.		32,000.00
Exploratory Shaft (Using freezing method)	8 mo.	120,000.00
Exploration drifts	12 mo.	36,000.00
Access road		6,000.00
		$250,000.00

Form MF-100
(March 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Form approved.
Budget Bureau No. 42-R1026.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950

NOT TO BE FILLED IN BY APPLICANT

Docket No. DMA 1829X

Date received 7-11-51

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

INSTRUCTIONS

This form is to be filed with Defense Minerals Administration, Department of the Interior, Washington 25, D. C. It should be accompanied by appropriate application form when a specific type of Government assistance is requested, in the form of (1) loan, (2) purchase contract, (3) Government guarantee of a private loan, ~~(4) Necessity Certificate pursuant to the provisions of Sec. 124-A (Amortization Deduction) of Internal Revenue Code, 1950~~, (4) priorities or allocation of mining equipment, and maintenance, repair and operating supplies, and (5) other forms of Government assistance that might arise under the Act. Submit four (4) signed copies of the form and accompanying papers. Name and address should be stamped or typed on each sheet of this form and all accompanying papers. *When a question is inapplicable it should be so stated on the form.* Additional sheets may be attached in answering any questions or in supplying additional information. (IF YOU CANNOT ANSWER A QUESTION, SO STATE.) If a question is answered elsewhere indicate where answered. It is not necessary to answer it again.

GENERAL TECHNICAL DATA

Supply the following information on separate sheets, arranged, numbered, and lettered as indicated:

1. Materials produced:
   (*a*) What are the chief mine, mill, or smelter products?
   (*b*) What are the byproducts, if any?
2. Name(s) and type(s) of mine(s), mill(s), smelter(s), refinery(ies), pit(s), quarry (ies), drilling operation(s). Include old names of property, if any. Show extent of workings, including the following:
   (*a*) Linear feet of shafts.
   (*b*) Linear feet of drifts and crosscuts.
   (*c*) Linear feet of tunnels or adits.
   (*d*) Linear feet of other mine openings (explain briefly).

   Indicate whether mine is flooded or not. Describe any pumping problems. Give size or productive capacity.
3. For each operation listed above supply the following:
   (*a*) Distance and direction from nearest town and shipping point.
   (*b*) Mining district.
   (*c*) Township, Section, Range.
   (*d*) County, State.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 11 1951
LANDON F. STROBEL
Executive Secretary

4. (*a*) State whether or not property is now in operation, and if in operation, by whom operated.
   (*b*) Are you operating this property as:
   - ☐ Owner.
   - ☐ Lessee.
   - ☐ Contractor.
5. Number of years in production _____

   If not in production or operation, estimated date when production will begin _____
6. Experience of operators:
   Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who manage the project.
7. History:
   (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for suspension of operation.
   (*b*) State briefly the known history and production of adjoining and neighboring properties.
   (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

8. Names and addresses of Officers, Directors, or Partners, and in addition thereto, the five largest stockholders if applicant is a corporation.

Name and Address (a)	Official Title (If officer is also director indicate by "D") (b)	Total of Annual Salary, Commissions, Bonuses, Etc., Received From Applicant and Affiliates During Last Fiscal Year (c)	Estimated Net Worth Outside of Interest in Applicant (d)	Number of Shares Held in Applicant Corporation		Life Insurance Carried for Benefit of Applicant	
				Common (e)	Preferred (f)	Amount (g)	Net Cash Surrender Value After Loans (h)
	Total		x x x x x			x x x x x	x x x x x

If more lines are needed continue on separate sheet.

9. Capital Stock Issues:

For Corporate Applicants

Item	Authorized (a)	Outstanding (b)	Par Value (c)	Number of Shares Outstanding (d)	Dividend Rate Last Paid* (e)
Common stock	$	$	$		
Preferred stock	$	$	$		

*Indicate period covered.

10. Production:

Item	Kind of Product (a)	1948 Total (b)	1949 Total (c)	1950 Total (d)	Present Average Monthly (e)
1. Quantity of product mined or quarried (Short, long, metric tons; barrels; pounds; etc.)					
2. Quantity of product processed (specify unit of measure and type of process)					
3. Quantity and grade of product sold or shipped (specify units of measure)					

11. Do you contemplate a change in the present average monthly rate of production? If so, state estimated maximum monthly production and basis of change.

12. Ore or Mineral Reserves:

(a) Describe the ore [illegible]ineral deposit briefly. Accompany the appli[illegible]ion by any available report on the geology and ore reserves.

(*b*) If deposit is other than placer:

(1) Submit assay plans and/or sections showing location and size of proved (measured) and probable (indicated) ore or mineral reserve.

(2) State the tonnage (indicate type of ton) and grade of each class of ore reserve, as above, and show how computed. Tabulated total ore reserve as follows:

TOTAL ORE OR MINERAL RESERVES

Ore or Mineral Reserve	Estimated Tons (a)	Metal or Mineral Content Per Ton (Grade) (b)	Gross Value Per Ton (c)	Recoverable Unit Value Per Ton (d)	Estimated Cost of Production Per Ton (e)
Measured (proved)					
Indicated (probable)					

(*c*) If placer:

(1) Give estimated total yardage and average marketable mineral content of each deposit.

(2) Submit map showing location of placer deposit and surrounding area, with all test holes or pits. Submit logs of each hole and test pit with depth and average value of each.

(3) Describe gravel, stating whether fine, medium or coarse; loose, tight, cemented, or frozen, and whether it contains stumps or boulders more than 1 foot in diameter; if so, how large, and in what proportion.

(4) Describe bedrock, giving type (granite, sandstone, shale, etc.) and state whether it is hard or soft, smooth, uneven or rough.

(5) Describe overburden, stating whether loose, tight, or cemented; fine or coarse textured; furnish estimate of average thickness and total amount.

(6) Tabulate the reserves using the form outlined above for ore or mineral reserves.

13. Access Roads:

Give road distances to shipping, supply and residence points, stating kind and condition of roads.

14. Water Supply:

State source and quantity of water available for operations and whether sufficient for all seasons of year.

15. Power:

State amount of power used, rate per hour, and source thereof.

16. Labor:

State number and classes (miners, muckers, millmen, etc.) of men employed during a recent representative payroll period.

17. Equipment and Facilities:

Describe present equipment on the property, including buildings. (State condition.) List major pieces of equipment now owned or controlled and in serviceable condition available for this operation.

18. Are there any particular conditions or circumstances affecting your operations that are not described above? If so, explain.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates
(Name of company)

By Allen R. Christensen
(Signature of authorized official)

July 2, 1951
(Date)

Vice President and General Mg
for The Utah Construction
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—63792-1

Form MF-100

U.S.DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1. (a) The property will produce manganese oxide ore, which will be gravity concentrated on the property. This concentrate will, in turn, be leached to provide a high grade, high purity product suitable for ferro-manganese production.

(b) The ore is high in iron, and effort will be made to recover this as an iron ore.

2. The property is known only by its description, section 23, township 48N, range 27W. Operations to date have consisted of sampling by churn - and diamond core - drilling, and metallurgical testing, as described below. The total amount of churn drilling is 14,360 feet and the total amount of diamond core drilling is 2,383 feet.

3. (a) The property is about eight miles north of Aitkin, Minnesota. The town, which is the county seat, is served by the Northern Pacific Railroad.

(b) The property is north-east of the Cuyuna Range iron mining district.

(c)(d) The ore body lies in section 23, township 48N, range 27W, Aitkin County, Minnesota.

4. (a) Applicant is engaged in an engineering program leading to the production of a 20% gravity concentrate from which a 62% sintered manganese oxide will be prepared by a modified sulphur dioxide leaching process. Continued explorations will furnish additional technical data to be utilized in completing plant designs.

(b) Applicant is the lessee.

5. Production is not yet under way, but is expected to commence within twenty months.

6. Experience of the operators:

The Utah Construction Company was organized in 1900, and since that time has engaged in heavy construction of all kinds, including hydroelectric power projects, railroads, industrial plants, tunnels, shafts, and military installations of all kinds including a complicated plant and installations for the Chemical Warfare Department.

For a long time the company has been associated with important mining companies in the performance of mining and stripping work for Kennecott Copper Corporation, Pittsburg Coal Company, and later the Pittsburg Consolidated Coal Company, Colorado Fuel and Iron Corporation, Columbia Iron Mining Company (Geneva Steel Company), and others.

Important achievements of the company have been the construction of plant facilities for Kennecott Copper Corporation which included smelting works, electrolytic refining plant, power house, and a concentration plant. The company successfully performed the general contract for construction of the major part of the Geneva Steel Plant for the Defense Plant Corporation. Other plant facilities built by the company are the design and construction of a zinc fuming plant for American Smelting and Refining Company, a chemical plant for Darco Corporation, a cobalt refinery for Howe Sound Company, and similar projects for other mining companies.

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Production of iron ore from our own iron mining property near Cedar City, Utah is 150,000 to 200,000 tons per month, and we are shipping ore to Kaiser Steel Company at Fontana, California, to Geneva Steel Company at Geneva and Ironton, Utah, to Carnegie Illinois Steel Company at Chicago and Pittsburg, to Inland Steel Company at Chicago, and to others.

In British Columbia we are opening a new open pit mine which will be processed through a magnetic separator plant with a capacity of 75,000 tons per month.

Associated with us are Foley Brothers, Inc. of St. Paul, Minn., a firm about seventy five years old with long experience in mining and construction work. Located in St. Paul Minn., it has had a wide knowledge and experience in Minnesota Conditions and activities and on the iron range, and has performed construction work throughout the U. S., Canada and Alaska. During the past 27 years it has operated the world's largest open pit coal mine at Colstrip, Montana, currently producing about two million tons of coal annually, has acted as consultant and operator for the government of India in connection with open pit mines northwest of Calcutta and other similar projects.

MF 100

8. See financial statement attached for officers and directors. The five largest stockholders are:

Allen D. Christensen &
Carmen Christensen
1 Montgomery Street
San Francisco, California

Thomas D. Dee
Ogden, Utah

Eccles Hotel Company
Ogden, Utah

E. O. Wattis Estate
% Shepard Mitchell
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Beverly Hills, California

P. L. & Phyllis Wattis
220 Bush Street
San Francisco, California

7. (a) This property has been drilled, first for possible iron ore, and later for manganese ore, by three independent organizations. The first explorations were made by M.P.Botsford of Crosby, Minn. in 1913 and by the Crosby Exploration Company in 1917. Later, in 1947, the M.A.Hanna Coal and Ore Company put down a number of churn drill holes, and as recently as the fall of 1950, the U.S.Bureau of Mines made a series of diamond drill holes. The logs of all of these holes are available, and the split cores may be seen at Region V headquarters, U.S.B.M., Minneapolis, Minn. The manganiferous material on this property appears to be extensive, and has been shown to be susceptible to beneficiation by simple procedures.

(b) While this property may be considered contiguous to the Cuyuna Range iron formation, it is distinct and separate from the existing mines and is removed from the nearest mine by more than twenty miles.

(c) The private reports which have been made on this property are confidential and not immediately available. All of the reports, however, are substantiated in all respects by those of the U.S.B.M., Region V.

10. Operations have not reached the production stage.

11. Proposed production is at the rate of 16,500 L.T. per 24 hrs. for 200 days per year. This will produce some 10,000,000 long ton units of manganese per year.

12. (a) The mineral body consists of bedded sedimentary deposits, considerably metamorphosed and lying in the form of an eroded anticline covered by alluviam some 150 feet thick. The mineral bed appears to vary from 150 to 250 feet in thickness. Assays have run from less than 1% to over 20% Mn. Average minable material is believed to run 3 3/4% Mn. The mineral consists of grains of manganiferous material of varying sizes embedded in fine, dense clayey material.

(b) U.S.B.M. drilling log of 5/13/50, Aitkin County, Minn. Sec. Ref.1072 is referred to as substantiation, and a plan of the drilling is attached.

Mineral reserve	Estimated tons	% Mn.	Total Mn. content	Total recoverable long tons	Est.cost of prod.
Measured	37,800,000 L.T.	3 3/4%	1,400,000	1,100,000	$6 / L.T. of 20% concentrate
Indicated	23,700,000 "	"	880,000	710,000	"

13. It will be necessary to build about two miles of access road from a good county highway. A railroad spur about ten miles long is required. The entire area is perfectly flat, and the cost of these access facilities would be at the minimum for such works.

14. Blind Lake, about 500 acres in extent, is about half a mile due north of the northwest corner of the section, and could supply all the water needed for beneficiation. There would be no seasonal shortage.

15. Power is available from the Minnesota Power and Light Co's. grid, which is less than six miles distant. The rate for the estimated 2,500 kw required is under 1¼¢ per kw hr.

16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

MANGANESE PRODUCTION FROM LOW GRADE CUYUNA ORES

It is proposed to utilize a supply of low grade manganiferous material occurring on section 23-T48N R27W, in Aitkin County, Minnesota. The mineral apparently occurs in a syncline. Churn and diamond core drilling indicate a probable ore body roughly rectangular, about 1000' wide, and from 5000' to 6000' long. The thickness of mineralization varies from 150' to 250', but the thicker portions contain leaner streaks, which brings the average more nearly to 150'. This indicates a probable tonnage of 62,000,000. With an average content of recoverable manganese of 3%, this shows the possibility of recovering some 190,000,000 long ton units of manganese.

Preliminary ore dressing work by three independent laboratories demonstrates that greater than 80% manganese recovery is possible when concentrating 4.5% ore to 20%. There should be no difficulty in achieving a similar result even with the grade of the ore falling to nearly 3%. This is due to the unusual characteristic of the formation, wherein the gangue exists chiefly as a veryfine clayey material which may be washed away. Further refinement is then effected by gravity separation, such as sink-float.

The area is perfectly flat, and the overburden consists of sandy loam, clay, gravel and boulders to a depth of 150' over the entire ore body. Because of this thickness of overburden, open pit mining operations must be carried out on a large scale to be economical.

With a proposed leaching plant designed for a yearly production of 10,000,000 long ton units of manganese as a 61% manganese sinter, and assuming 350 working days per year in the leaching plant and 300 working days in the mine, ore production would be 11,000 long tons per 24 hours.

Owing to the depth of overburden, the only means of sampling the ore has been through some 40 churn-drill holes and 7 diamond core-drill holes. These show the undoubted existence of an enormous quantity of potential ore; a great deal is left to be desired. But additional information on ore dressing and on the actual quality of ore which could be mined are desired.

In order to prove further the extent of the ore body, and to define barren areas for the spoil banks, tailings ponds and plant facilities, it will be necessary to drill more holes. It is estimated that about 40 more holes should be drilled. Because equipment procurement entails a long delay, and because the large capital outlay magnifies the consequence of errors in calculations, it is considered desirable that run of mine samples, rather than drill cores or sludge, be obtained for ore dressing work. When it is mentioned that the ore dressing will probably entail the expenditure of about $1,000,000, it can readily be seen that the sinking of an exploratory shaft for sample mining is amply justified.

MANGANESE PRODUCTION FROM LOW GRADE CUYUNA ORES (Cont'd)

With drilling expected to cost about $60,000, the shaft $100,000 mining of ore for pilot ore dressing and pilot leaching operations $25,000, and ore dressing research and piloting $275,000, it will be seen that exploration capital of $500,000 should be made available.

Using the most nearly equivalent operations as guides and basing stripping costs on large scale contracts in the locality, a mining and concentrating cost of $5.47 per ton of 20% concentrate is obtained. For purposes of estimate it is desirable to reduce all costs to the basis of long ton units of manganese content (22.4 lb.). On this basis, mining and concentrating would cost $0.278 /long ton unit.

It should be noted that an increase in the rate of mining tends to reduce the cost of producing concentrates, and it is indicated that production of 100,000 units of manganese per day would reduce the cost of concentrates to about $0.2415 /long ton unit.

Because of the low grade of the ore, a small change in the assay has a large effect on the cost of the concentrate. On the 200 ton per day operation, a change in assay of ½% changes the cost of concentrates by 14%. This serves to stress the importance of thorough exploration of the ore body.

MANGANESE RECOVERY PLANT

Production Cost of Oxide Sinter
(Five Year Purchase Contract-Five Year Amortization)

	Cost/L Ton Unit of Mn.
Mining	0.21
Concentrating	0.07
Royalty	0.07
Direct Operating Expense Chemical Plant (p.13 Chemico report of March 22, 1951)	0.473
Amortization	0.32
Interest	0.064
Taxes and General Administration Exp.	0.10
Royalty on Process	0.10
Corporate Income Tax	0.28
Profit	0.28
Net Selling Price	$1.967

AMORTIZATION

Plant Cost (from Chemico report) P.7 $10,500,000
Adjustment for increase in
annual capacity from 66,000 ST to 100,000 LT x1.5 = $16,000,000

$$\frac{\$16,000,000}{50,000,000 \text{ units}} = \$0.32/\text{LT unit of Mn in sinter}$$

INTEREST

16,000,000 @ 4%

$$\frac{16,000,000 \times 4}{10,000,000 \times 100} = \$0.064/\text{LT unit of Mn in sinter}$$

TAXES AND GENERAL ADMINISTRATIVE EXPENSE

(From Chemico report) P.14

Operating labour	7.75	
Supervision and Overhead	2.65	
	10.40	÷ 100 = 0.104
Payroll tax @ 5% =	0.104 x 0.05	= 0.0052

Local property taxes @ 2% = 16,000,000 x 0.62 ÷ 10,000,000 = 0.032

Administration @ 3 1/2% of gross sales = $\frac{19,500,000 \times 0.035}{10,000,000}$ = 0.0683 $0.1003/LT unit of Mn sinter

CORPORATE INCOME TAX

Estimated gross profit before taxes 30% of $19,000,000

$$\frac{19,000,000 \times 30}{10,000,000 \times 100} = 0.57/\text{unit}$$

Corporate @ 50% of profit = 0.57 x 0.5 = $0.285/LT unit of Mn in sinter

May 23, 1951

MANGANESE

Ore samples have assayed	2.5 - 7.5%	Mn
Average is expected to be	3.75%	Mn
Recovery is expected to be	3%	Mn

All on the basis of per ton mined

Concentration to 20% is expected

Concentration ratio is 6.67:1

All figures following are based on reaching full production the first year, and the mining cost is lower by reason of distributing the entire stripping cost over five years' ore production.

No taxes have been included.

200 x 5 x 6.67 = 6670 T/day

6670 x 365 = 2,435,000 T/yr.

2,500,000 T/yr.

Figure 200 working days in the mine.

$\frac{2,500,000}{200}$ = 12,500 T/24 hrs.

$\frac{12,500}{24}$ = 521 T/hr.

PRODUCTION OF CONCENTRATE

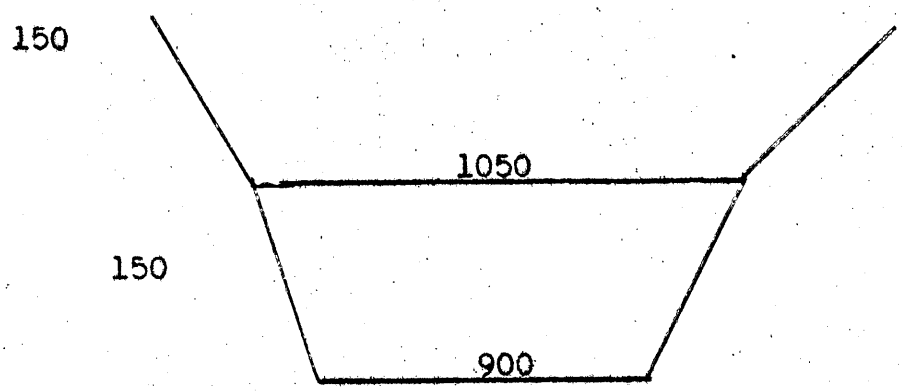
		5 yr. basis
Mining cost, including stripping		0.622
Concentrating		0.211
	Per ton ore mined	0.833
	Per ton concentrate shipped	5.58

On the basis of 3% Mn recoverable in the concentrate, the cost of concentrate per ton of contained Mn is:

$$\frac{0.82}{0.03} = \$27.80$$

Exclusive of royalties, depletion, taxes, etc.

MINING COST



Volume overburden $= \frac{150}{3}$ (1500 + 1050 + 1500 x 1050) = 50 (2250000 + 1102500 + 1575000)

= 4927500 x 50 = 245380000 cf. or 8780000 cy.

Volume ore $= \frac{150}{3}$ (1050 + 900 + 1050 x 900) = (1102500 + 810000 + 945000) 50

= (2857500) 50 = 142,780,00 cf, or5,285,000 cy.

with sp. gr. 2.7 = 10,650,000 gross tons.

Cost:

Stripping	8,780,000 Cy. @ 40¢	= 3,512,000	
Mining	5,285,000 Cy. @ 60¢	= 3,170,000	
		6,682,000	

Cost per ton $= \frac{6682000}{10650000}$ = \$0.622/Ton mined

Stripping ratio = 0.816 Cy./Ton gross

COST OF CONCENTRATION

	Per ton ore mined
Plant amortization, 5 year write-off	0.08
Labor, including maintenance	0.0476
Maintenance & Repair materials	0.016
Utilities	0.0438
	0.1874
Administration & Overhead 50% of labor	0.0238
Per ton ore mined	0.2112
Cost of concentration	
Use	0.21
Or	1.40 per ton concentrates shipped.

ORE DRESSING PLANT

Buildings	$ 200,000
Crushers	68,000
Screens	20,000
Washing trommell	20,000
Log wahsers	40,000
Rod mill	35,000
Conveyors	30,000
Wilfley tables	35,000
Screw classifiers	60,000
Sink-float	100,000
Bins	50,000
Water supply	50,000
Tails disposal	50,000
	$ 758,000
Contingencies	76,000
Engineering	76,000
	$ 910,000
Use	$1,000,000.00

Cost per ton mined $= \frac{1,000,000}{12,500,000} = 0.08$

CONCENTRATING PLANT LABOUR

Foreman	3 @ 25.00 per diem	$ 75.00
Chemist		20.00
Operators	24 @ 15.00	360.00
Maintenance	(2 elect, 2 pipe fitters, 2 mech.)	140.00
		$595.00 per diem

$$\frac{595}{12,500} = \$0.0476/T \text{ mined}$$

UTILITIES FOR ORE DRESSING PLANT

	HP	
Crushers @	400	
Screens @	40	
Washing trommell	200	
Red mill	200	
Log washers	100	
Conveyors	150	
Wilfley tables	50	
Screw classifiers	50	
Water supply	125	
Tails disposal pumps	200	
	1515 HP	
		1780
		50 kw
Lighting, etc.		1830

Or 1850 kw

Use figure of 0.01¼ per kw hr or 22.80 per hr

Cost per ton of ore mined $= \frac{22.80}{521} = 0.0438$ per ton ore mined.

CONCENTRATING PLANT MAINTENANCE AND REPAIRS

Crusher replacements	$10,000.00 per an.
Screen replacements	4,000.00
Log washer "	2,000.00
Trommell "	2,500.00
Conveyor	2,500.00
Wilfley table "	3,500.00
Classifiers "	1,000.00
Pump "	10,000.00
Building repairs	1,000.00
Piping replacements	2,500.00
Miscellaneous supplies	1,000.00
	$40,000.00 per an.

Or $0.016 per ton mined

Form MF-100

U.S. DEPARTMENT OF THE INTERIOR
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GENERAL TECHNICAL DATA
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8. & 9. See financial statement of The Utah Construction Company.

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17. There is no improvement on the property.

18. All conditions are believed to be described above.

GENERAL OFFICES
FIRST SECURITY BANK BUILDING
OGDEN, UTAH

SAN FRANCISCO OFFICE
ONE MONTGOMERY STREET
TEL. GARFIELD 1-6743

SALT LAKE CITY OFFICE
57 EAST 4TH SOUTH STREET
TEL. 3-7676

THE UTAH CONSTRUCTION COMPANY

ENGINEERS AND CONTRACTORS

SAN FRANCISCO 4, CALIFORNIA

CABLE ADDRESS
UTAHCONCO

July 2, 1951

DEPARTMENT OF THE INTERIOR
JUL 11 1951
STROBEL
Secretary

Defense Minerals Administration
New Interior Building
Washington 25, D. C.

Gentlemen:

We are sending herewith for your consideration a proposal for supplying a high grade sintered manganese oxide product on a large scale from a domestic source.

The proposal embraces a well studied program including:

1. A large deposit of low grade manganese ore in the Cuyuna Range which has been partially drilled and proven.

2. A process for recovery of manganese developed by American Cyanamid Company (through its wholly owned subsidiary, Chemical Construction Company) and which process was recently tested by Batelle Institute and approved by them as being definitely successful in laboratory tests on ore from the above deposit.

3. An operating group with an impressive background of experience in mining and in construction and operation of metallurgical plant facilities.

The program we propose calls for three stages in the development and operating procedure, which are as follows:

A. An initial exploratory stage aided by the Defense Minerals Act, including more detailed drilling and shaft work to completely prove the deposit and test the actual ore from the deposit through commercial size equipment. This stage will require eight to twelve months time and will cost approximately $500,000.

B. Development of the mine and design and construction of a full scale beneficiation and sintering plant under terms of a purchase contract for 50,000,000 long ton units under appropriate procurement regulations with suitable guarantees against loss from cancellation by the government. This development is estimated to require twelve months time and will cost approximately $25,000,000.

THE UTAH CONSTRUCTION COMPANY
SAN FRANCISCO, CALIFORNIA

C. Delivery of sintered manganese for a five year period beginning late in 1953 or early in 1954.

This program offers a sound and practical approach to the manganese supply problem, a solution of which is so essential to our steel industry. The program utilizes domestic sources which are not subject to interruption by war or external political influences, and the supply can be expanded if necessary during times of national emergency. The proven character and the broad experience of the group of participants gives the maximum assurance to the government that the contract will be fulfilled.

Respectfully submitted by,

THE UTAH CONSTRUCTION COMPANY

By Allen D. Christensen
Allen D. Christensen,
Vice President and
General Manager

ADC/jka

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. D.M.A. 1829X
New figures submitted as of this date 8/7/51
Date received
Participation

The Utah Construction Co.
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date August 3, 1951

FILL IN THIS BLOCK

Date of application July 11, 1951

Estimated cost $250,000

Mineral or metal Manganese

Percentage of Government participation 75%

Location of mine Aitkin County, Minnesota

Date of filing MF-100 July 11, 1951

DMA Docket Number, if available 1829X

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.

(*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area.

*11. State the present and former names of the property, if any.

*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.

*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.

15. State in detail how the ore could be shipped and how and where milled.

*16. History:

(*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.

(*b*) State briefly the known history and production of adjoining and neighboring properties.

(*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

*17. Production:

(*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)

(*a*) Describe the ore or mineral deposits briefly.

(*b*) Submit available maps and assay data.

(*c*) Give estimated tonnage and grade of each class of ore reserves.

19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows:

(*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.

(*b*) Supervisors, by numbers and positions, with salaries of each.

(*c*) Cost of necessary repairs to existing facilities, structures, and buildings.

(*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.

(*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.

(*f*) Cost of rental for equipment which the operator proposes to rent.

(*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.

(*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.

(*i*) Cost of power, water, utilities, and any other items not provided for above.

24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Co. and Associates
(Name of company)

By C. H. Searcy
(Signature of authorized official)

August 3, 1951
(Date)

Agent
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

Form MF-103

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1 to 5, inclusive, are answered in form MF-100, which is attached.

6. Applicant is lessee.

7. Lease is in good standing. A copy of the agreement is attached.

8. A financial statement is attached to form MF-100, which accompanies this application.

9. Applicant is prepared to invest $75,000 in the project. This sum exceeds our share of the cost as detailed in question 23, and according to the provisions of Section 9 of Mineral Order 5.

The Property

10. (a) The ore body lies in section 23, Township 48 N. range 27 west, Aitkin County, Minnesota.
    (b) Explorations are to be conducted over a considerable portion of the entire section. For the purposes of this contract the property will be subdivided into 40 acre tracts, and exploration is to proceed as discoveries indicate.

11 to 14, inclusive, are answered in form MF-100.

15. Mining will be done from an open pit, using power shovel loading and truck haulage. A gravity concentrating plant is to be erected on the property, and the 20% concentrate produced will be leached by a modified sulphur dioxide process, facilities for which will probably be erected on the property. The leaching process turns out a 62% manganese content sintered oxide, which is suitable for production of ferromanganese.

16 to 18, inclusive, are answered in form MF-100.

19. The foregoing answers are believed to cover the pertinent facts.

The Exploration

20. Explorations are to be conducted for manganese, indications of which have already been established by the drilling described previously. The deposit is believed to be a folded, bedded deposit, and is known to be of considerable thickness and extent. The ore contains manganese and iron as oxides, together with silica and alumina which constitute the gangue.

21. It is estimated that about 40 holes should be drilled to substantiate further the reserve of mineral, and to gain other information necessary to plan a mine. It is expected that this work can be completed within four months of commencement. In addition to the drill holes, it is felt that an exploratory shaft, or several large core holes, should be put down on the property to gain further knowledge of the character and formation of the mineral, and to obtain samples for further work on beneficiation. Tentative drilling sections and the shaft site are indicated in red on plan E-2, which is attached, but it is expected that early findings will dictate the final plan of development.

22. This property was originally drilled as a prospect for iron ore, owing to its position relative to the Cuyuna Range. Later exploration was made with the hope of developing a body of manganiferous iron ore. In the light of recent development of a process for leaching manganese, together with the susceptability of the ore to gravity concentration, the present program has been undertaken. Considerable ore is now known to exist, but the current exploration is necessary to plan the mine and to obtain samples for final metallurgical work.

The substantiation of this request lies in the drilling logs and metallurgical reports of work done on the ore. Photostatic copies of such reports as are available are attached to this application.

The Requirements and Costs

23. It is anticipated that drilling and shaft sinking will be done under contract by firms engaged in doing this type of work in the iron ranges. Estimates of costs are based on recent experience of the U.S.B.M. and the mining companies operating in the area.

24.

Type of Work	Completion Time (from date of approval)	Cost Estimate
Exploratory Drilling	4 mo.	
8,000 ft. churn drill holes @ $7.00/ft.		$ 56,000.00
4,000 ft. NX core drill hole @ $8.00/ft.		32,000.00
Exploratory Shaft (Using freezing method)	8 mo.	120,000.00
Exploration drifts	12 mo.	36,000.00
Access road		6,000.00
		$250,000.00

Form MF-100
(March 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Form approved.
Budget Bureau No. 42-R1026.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950

NOT TO BE FILLED IN BY APPLICANT

Docket No. DMA 1829X

Date received 7-10-51

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

INSTRUCTIONS

This form is to be filed with Defense Minerals Administration, Department of the Interior, Washington 25, D. C. It should be accompanied by appropriate application form when a specific type of Government assistance is requested, in the form of (1) loan, (2) purchase contract, (3) Government guarantee of a private loan, (4) Necessity Certificate pursuant to the provisions of Sec. 124-A (Amortization Deduction) of Internal Revenue Code, 1950, (5) priorities or allocation of mining equipment, and maintenance, repair and operating supplies, and (6) other forms of Government assistance that might arise under the Act. Submit four (4) signed copies of the form and accompanying papers. Name and address should be stamped or typed on each sheet of this form and all accompanying papers. *When a question is inapplicable it should be so stated on the form.* Additional sheets may be attached in answering any questions or in supplying additional information. (IF YOU CANNOT ANSWER A QUESTION, SO STATE.) If a question is answered elsewhere indicate where answered. It is not necessary to answer it again.

GENERAL TECHNICAL DATA

Supply the following information on separate sheets, arranged, numbered, and lettered as indicated:

1. Materials produced:
   (*a*) What are the chief mine, mill, or smelter products?
   (*b*) What are the byproducts, if any?
2. Name(s) and type(s) of mine(s), mill(s), smelter(s), refinery(ies), pit(s), quarry (ies), drilling operation(s). Include old names of property, if any. Show extent of workings, including the following:
   (*a*) Linear feet of shafts.
   (*b*) Linear feet of drifts and crosscuts.
   (*c*) Linear feet of tunnels or adits.
   (*d*) Linear feet of other mine openings (explain briefly).

   Indicate whether mine is flooded or not. Describe any pumping problems. Give size or productive capacity.
3. For each operation listed above supply the following:
   (*a*) Distance and direction from nearest town and shipping point.
   (*b*) Mining district.
   (*c*) Township, Section, Range.
   (*d*) County, State.
4. (*a*) State whether or not property is now in operation, and if in operation, by whom operated.
   (*b*) Are you operating this property as:
   - ☐ Owner.
   - ☐ Lessee.
   - ☐ Contractor.
5. Number of years in production _____

   If not in production or operation, estimated date when production will begin _____
6. Experience of operators:

   Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who manage the project.
7. History:
   (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for suspension of operation.
   (*b*) State briefly the known history and production of adjoining and neighboring properties.
   (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 11 1951
LANDON F. STROBEL
Executive Secretary

8. Names and addresses of Officers, Directors, or Partners, and in addition thereto, the five largest stockholders if applicant is a corporation.

Name and Address (a)	Official Title (If officer is also director indicate by "D") (b)	Total of Annual Salary, Commissions, Bonuses, Etc., Received From Applicant and Affiliates During Last Fiscal Year (c)	Estimated Net Worth Outside of Interest in Applicant (d)	Number of Shares Held in Applicant Corporation: Common (e)	Number of Shares Held in Applicant Corporation: Preferred (f)	Life Insurance Carried for Benefit of Applicant: Amount (g)	Life Insurance Carried for Benefit of Applicant: Net Cash Surrender Value After Loans (h)
	Total		x x x x x			x x x x x	x x x x x

If more lines are needed continue on separate sheet.

9. Capital Stock Issues:

For Corporate Applicants

Item	Authorized (a)	Outstanding (b)	Par Value (c)	Number of Shares Outstanding (d)	Dividend Rate Last Paid* (e)
Common stock	$	$	$		
Preferred stock	$	$	$		

*Indicate period covered.

10. Production:

Item	Kind of Product (a)	1948 Total (b)	1949 Total (c)	1950 Total (d)	Present Average Monthly (e)
1. Quantity of product mined or quarried (Short, long, metric tons; barrels; pounds; etc.)					
2. Quantity of product processed (specify unit of measure and type of process)					
3. Quantity and grade of product sold or shipped (specify units of measure)					

11. Do you contemplate a change in the present average monthly rate of production? If so, state estimated maximum monthly production and basis of change.

12. Ore or Mineral Reserves:

(a) Describe the ore or mineral deposit briefly. Accompany the application by any available report on the geology and ore reserves.

(*b*) If deposit is other than placer:

(1) Submit assay plans and/or sections showing location and size of proved (measured) and probable (indicated) ore or mineral reserve.

(2) State the tonnage (indicate type of ton) and grade of each class of ore reserve, as above, and show how computed. Tabulated total ore reserve as follows:

TOTAL ORE OR MINERAL RESERVES

Ore or Mineral Reserve	Estimated Tons (a)	Metal or Mineral Content Per Ton (Grade) (b)	Gross Value Per Ton (c)	Recoverable Unit Value Per Ton (d)	Estimated Cost of Production Per Ton (e)
Measured (proved)					
Indicated (probable)					

(*c*) If placer:

(1) Give estimated total yardage and average marketable mineral content of each deposit.

(2) Submit map showing location of placer deposit and surrounding area, with all test holes or pits. Submit logs of each hole and test pit with depth and average value of each.

(3) Describe gravel, stating whether fine, medium or coarse; loose, tight, cemented, or frozen, and whether it contains stumps or boulders more than 1 foot in diameter; if so, how large, and in what proportion.

(4) Describe bedrock, giving type (granite, sandstone, shale, etc.) and state whether it is hard or soft, smooth, uneven or rough.

(5) Describe overburden, stating whether loose, tight, or cemented; fine or coarse textured; furnish estimate of average thickness and total amount.

(6) Tabulate the reserves using the form outlined above for ore or mineral reserves.

13. Access Roads:

Give road distances to shipping, supply and residence points, stating kind and condition of roads.

14. Water Supply:

State source and quantity of water available for operations and whether sufficient for all seasons of year.

15. Power:

State amount of power used, rate per hour, and source thereof.

16. Labor:

State number and classes (miners, muckers, millmen, etc.) of men employed during a recent representative payroll period.

17. Equipment and Facilities:

Describe present equipment on the property, including buildings. (State condition.) List major pieces of equipment now owned or controlled and in serviceable condition available for this operation.

18. Are there any particular conditions or circumstances affecting your operations that are not described above? If so, explain.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates
(Name of company)

By Allen D. Christensen
(Signature of authorized official)

Vice President and General Man
for The Utah Construction Comp
(Title)

July 2, 1951
(Date)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—63792-1

Form MF-100

U.S.DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1. (a) The property will produce manganese oxide ore, which will be gravity concentrated on the property. This concentrate will, in turn, be leached to provide a high grade, high purity product suitable for ferro-manganese production.

(b) The ore is high in iron, and effort will be made to recover this as an iron ore.

2. The property is known only by its description, section 23, township 48N, range 27W. Operations to date have consisted of sampling by churn - and diamond core - drilling, and metallurgical testing, as described below. The total amount of churn drilling is 14,360 feet and the total amount of diamond core drilling is 2,583 feet.

3. (a) The property is about eight miles north of Aitkin, Minnesota. The town, which is the county seat, is served by the Northern Pacific Railroad.

(b) The property is north-east of the Cuyuna Range iron mining district.

(c)(d) The ore body lies in section 23, township 48N, range 27W, Aitkin County, Minnesota.

4. (a) Applicant is engaged in an engineering program leading to the production of a 20% gravity concentrate from which a 62% sintered manganese oxide will be prepared by a modified sulphur dioxide leaching process. Continued explorations will furnish additional technical data to be utilized in completing plant designs.

(b) Applicant is the lessee.

5. Production is not yet under way, but is expected to commence within twenty months.

6. Experience of the operators:

The Utah Construction Company was organized in 1900, and since that time has engaged in heavy construction of all kinds, including hydroelectric power projects, railroads, industrial plants, tunnels, shafts, and military installations of all kinds including a complicated plant and installations for the Chemical Warfare Department.

For a long time the company has been associated with important mining companies in the performance of mining and stripping work for Kennecott Copper Corporation, Pittsburg Coal Company, and later the Pittsburg Consolidated Coal Company, Colorado Fuel and Iron Corporation, Columbia Iron Mining Company (Geneva Steel Company), and others.

Important achievements of the company have been the construction of plant facilities for Kennecott Copper Corporation which included smelting works, electrolytic refining plant, power house, and a concentration plant. The company successfully performed the general contract for construction of the major part of the Geneva Steel Plant for the Defense Plant Corporation. Other plant facilities built by the company are the design and construction of a zinc fuming plant for American Smelting and Refining Company, a chemical plant for Darco Corporation, a cobalt refinery for Howe Sound Company, and similar projects for other mining companies.

Continuous maintenance contracts are currently being performed for Geneva Steel Company and the Salt Lake Refinery.

Production of iron ore from our own iron mining property near Cedar City, Utah is 150,000 to 200,000 tons per month, and we are shipping ore to Kaiser Steel Company at Fontana, California, to Geneva Steel Company at Geneva and Ironton, Utah, to Carnegie Illinois Steel Company at Chicago and Pittsburg, to Inland Steel Company at Chicago, and to others.

In British Columbia we are opening a new open pit mine which will be processed through a magnetic separator plant with a capacity of 75,000 tons per month.

Associated with us are Foley Grothers, Inc. of St. Paul, Minn., a firm about seventy five years old with long experience in mining and construction work. Located in St. Paul Minn., it has had a wide knowledge and experience in Minnesota Conditions and activities and on the iron range, and has performed construction work throughout the U. S., Canada and Alaska. During the past 27 years it has operated the world's largest open pit coal mine at Colstrip, Montana, currently producing about two million tons of coal annually, has acted as consultant and operator for the government of India in connection with open pit mines northwest of Calcutta and other similar projects.

MF 100

8. See financial statement attached for officers and directors. The five largest stockholders are:

Allen D. Christensen &
Carmen Christensen
1 Montgomery Street
San Francisco, California

Thomas D. Dee
Ogden, Utah

Eccles Hotel Company
Ogden, Utah

E. O. Wattis Estate
% Shepard Mitchell
815 No. Bedford Drive
Beverly Hills, California

P. L. & Phyllis Wattis
220 Bush Street
San Francisco, California

7. (a) This property has been drilled, first for possible iron ore, and later for manganese ore, by three independent organizations. The first explorations were made by M.P.Botsford of Crosby, Minn. in 1913 and by the Crosby Exploration Company in 1917. Later, in 1947, the M.A.Hanna Coal and Ore Company put down a number of churn drill holes, and as recently as the fall of 1950, the U.S.Bureau of Mines made a series of diamond drill holes. The logs of all of these holes are available, and the split cores may be seen at Region V headquarters, U.S.B.M., Minneapolis, Minn. The manganiferous material on this property appears to be extensive, and has been shown to be susceptible to beneficiation by simple procedures.

(b) While this property may be considered contiguous to the Cuyuna Range iron formation, it is distinct and separate from the existing mines and is removed from the nearest mine by more than twenty miles.

(c) The private reports which have been made on this property are confidential and not immediately available. All of the reports, however, are substantiated in all respects by those of the U.S.B.M., Region V.

10. Operations have not reached the production stage.

11. Proposed production is at the rate of 16,500 L.T. per 24 hrs. for 200 days per year. This will produce some 10,000,000 long ton units of manganese per year.

12.0(a) The mineral body consists of bedded sedimentary deposits, considerably metamorphosed and lying in the form of an eroded anticline covered by alluviam some 150 feet thick. The mineral bed appears to vary from 150 to 250 feet in thickness. Assays have run from less than 1% to over 20% Mn. Average minable material is believed to run 3 3/4% Mn. The mineral consists of grains of manganiferous material of varying sizes embedded in fine, dense clayey material.

(b) U.S.B.M. drilling log of 5/13/50, Aitkin County, Minn. Sec. Ref.1072 is referred to as substantiation, and a plan of the drilling is attached.

Mineral reserve	Estimated tons	% Mn.	Total Mn. content	Total recoverable long tons	Est.cost of prod.
Measured	37,800,000 L.T.	3 3/4%	1,400,000	1,100,000	$6 / L.T. of 20% concentrate
Indicated	23,700,000 "	"	880,000	710,000	"

13. It will be necessary to build about two miles of access road from a good county highway. A railroad spur about ten miles long is required. The entire area is perfectly flat, and the cost of these access facilities would be at the minimum for such works.

14. Blind Lake, about 500 acres in extent, is about half a mile due north of the northwest corner of the section, and could supply all the water needed for beneficiation. There would be no seasonal shortage.

15. Power is available from the Minnesota Power and Light Co's. grid, which is less than six miles distant. The rate for the estimated 2,500 kw required is under 1½¢ per kw hr.

16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

Form MF-100

U.S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1. (a) The property will produce manganese oxide ore, which will be gravity concentrated on the property. This concentrate will, in turn, be leached to provide a high grade, high purity product suitable for ferro-manganese production.

   (b) The ore is high in iron, and effort will be made to recover this as an iron ore.

2. The property is known only by its description, section 23, Township 48N, range 27W. Operations to date have consisted of sampling by churn - and diamond core - drilling, and metallurgical testing, as described below. The total amount of churn-drilling is 14,360 feet and the total amount of diamond core drilling is 2,583 feet.

3. (a) The property is about eight miles north of Aitkin, Minnesota. The town, which is the county seat, is served by the Northern Pacific Railroad.

   (b) The property is north-east of the Cuyuna Range iron mining district.

(c) (d) The ore body lies in section 23, township 48N, range 27W, Aitkin County, Minnesota.

4. (a) Applicant is engaged in an engineering program leading to the production of a 20% gravity concentrate from which a 62% sintered manganese oxide will be prepared by a modified sulphur dioxide leaching process. Continued explorations will furnish additional technical data to be utilized in completing plant designs.

   (b) Applicant is the lessee.

5. Production is not yet under way, but is expected to commence within twenty months.

6. Experience of the operators:

   The Utah Construction Company was organized in 1900, and since that time has engaged in heavy construction of all kinds, including hydroelectric power projects, railroads, industrial plants, tunnels, shafts, and military installations of all kinds including a complicated plant and installations for the Chemical Warfare Department.

6. Cont. For a long time the company has been associated with important mining companies in the performance of mining and stripping work for Kennecott Copper Corporation, Pittsburg Coal Company, and later the Pittsburg Consolidated Coal Company, Colorado Fuel and Iron Corporation, Columbia Iron Mining Company (Geneva Steel Company), and others.

Important achievements of the company have been the construction of plant facilities for Kennecott Copper Corporation which included smelting works, electrolytic refining plant, power house, and a concentration plant. The company successfully performed the general contract for construction of the major part of the Geneva Steel Plant for the Defense Plant Corporation. Other plant facilities built by the company are the design and construction of a zinc fuming plant for American Smelting and Refining Company, a chemical plant for Darco Corporation, a cobalt refinery for Howe Sound Company, and similar projects for other mining companies.

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Production of iron ore from our own iron mining property near Cedar City, Utah is 150,000 to 200,000 tons per month, and we are shipping ore to Kaiser Steel Company at Fontana, California, to Geneva Steel Company at Geneva and Ironton, Utah, to Carnegie Illinois Steel Company at Chicago and Pittsburg, to Inland Steel Company at Chicago, and to others.

In British Columbia we are opening a new open pit mine which will be processed through a magnetic separator plant with a capacity of 75,000 tons per month.

Associated with us are Foley Brothers, Inc. of St. Paul, Minn., a firm about seventy five years old with long experience in mining and construction work. Located in St. Paul, Minn., it has a wide knowledge and experience in Minnesota conditions and activities and on the iron range, and has performed construction work throughout the U. S., Canada and Alaska. During the past 27 years it has operated the world's largest open pit coal mine at Colstrip, Montana, currently producing about two million tons of coal annually, has acted as consultant and operator for the government of India in connection with open pit mines northwest of Calcutta and other similar projects.

7. (a) This property has been drilled, first for possible iron ore, and later for manganese ore, by three independent organizations. The first explorations were made by M. P. Botsford of Crosby, Minn. in 1913 and by the Crosby Exploration Company in 1917. Later, in 1947, the M.A. Hanna Coal and Ore Company put down a number of churn drill holes, and as recently as the fall of 1950, the U. S. Bureau of Mines made a series of diamond drill holes. The logs of all of these holes are available, and the split cores may be seen at Region V headquarters, U.S.B.M., Minneapolis, Minn.

7. (a) Cont. The manganiferous material on this property appears to be extensive, and has been shown to be susceptible to beneficiation by simple procedures.

(b) While this property may be considered contiguous to the Cuyuna Range iron formation, it is distinct and separate from the existing mines and is removed from the nearest mine by more than twenty miles.

(c) The private reports which have been made on this property are confidential and not immediately available. All of the reports, however, are substantiated in all respects by those of the U.S.B.M., Region V.

8. See financial statement attached for officers and directors. The five largest stockholders are:

Allen D. Christensen &
Carmen Christensen
1 Montgomery Street
San Francisco, California

Thomas D. Dee
Ogden, Utah

Eccles Hotel Company
Ogden, Utah

E. O. Wattis Estate
% Shepard Mitchell
815 No. Bedford Drive
Beverly Hills, California

P. L. & Phyllis Wattis
220 Bush Street
San Francisco, California

8. & 9. See financial statement of The Utah Construction Company.

10. Operations have not reached the production stage.

11. Proposed production is at the rate of 16,000 L. T. per 24 hrs. for 300 days per year. This will produce some 10,000,000 long ton units of manganese per year.

12. (a) The mineral body consists of bedded sedimentary deposits, considerably metamorphosed and lying in the form of an eroded anticline covered by alluviam some 150 feet thick. The mineral bed appears to vary from 150 to 250 feet in thickness. Assays have run from less than 1% to cover 20% Mn. Average minable material is believed to run 3 3/4% Mn. The mineral consists of grains of manganiferous material of varying sized embedded in fine, dense clayey material.

12. (b) Cont. U.S.B.M. drilling log of 5/13/50, Aitkin County, Minn. Sec. Ref. 1072 is referred to as substantiation, and a plan of the drilling is attached.

Mineral reserve	Estimated tons	% Mn.	Total Mn. content	Total recoverable long tons	Est.Cost of prod.
Measured	37,800,000	L.T. 3 3/4%	1,400,000	1,100,000	$6 / L.T. of 20% concentrate
Indicated	23,700,000	" "	880,000	710,000	"

13. It will be necessary to build about two miles of access road from a good county highway. A railroad spur about ten miles long is required. The entire area is perfectly flat, and the cost of these access facilities would be at the minimum for such works.

14. Blind Lake, about 500 acres in extent, is about half a mile due north of the northwest corner of the section, and could supply all the water needed for beneficiation. There would be no seasonal shortage.

15. Power is available from the Minnesota Power and Light Co's. grid, which is less than six miles distant. The rate for the estimated 2,500 kw required is under 1½¢/kw hr.

16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

MANGANESE PRODUCTION FROM LOW GRADE CUYUNA ORES

It is proposed to utilize a supply of low grade manganiferous material occurring on section 23-T48N R27W, in Aitkin County, Minnesota. The mineral apparently occurs in a syncline. Churn and diamond core drilling indicate a probable ore body roughly rectangular, about 1000' wide, and from 5000' to 6000' long. The thickness of mineralization varies from 150' to 250', but the thicker portions contain leaner streaks, which brings the average more nearly to 150'. This indicates a probable tonnage of 62,000,000. With an average content of recoverable manganese of 3%, this shows the possibility of recovering some 190,000,000 long ton units of manganese.

Preliminary ore dressing work by three independent laboratories demonstrates that greater than 80% manganese recovery is possible when concentrating 4.5% ore to 20%. There should be no difficulty in achieving a similar result even with the grade of the ore falling to nearly 3%. This is due to the unusual characteristic of the formation, wherein the gangue exists chiefly as a veryfine clayey material which may be washed away. Further refinement is then effected by gravity separation, such as sink-float.

The area is perfectly flat, and the overburden consists of sandy loam, clay, gravel and boulders to a depth of 150' over the entire ore body. Because of this thickness of overburden, open pit mining operations must be carried out on a large scale to be economical.

With a proposed leaching plant designed for a yearly production of 10,000,000 long ton units of manganese as a 61% manganese sinter, and assuming 350 working days per year in the leaching plant and 300 working days in the mine, ore production would be 11,000 long tons per 24 hours.

Owing to the depth of overburden, the only means of sampling the ore has been through some 40 churn-drill holes and 7 diamond core-drill holes. These show the undoubted existence of an enormous quantity of potential ore; a great deal is left to be desired. But additional information on ore dressing and on the actual quality of ore which could be mined are desired.

In order to prove further the extent of the ore body, and to define barren areas for the spoil banks, tailings ponds and plant facilities, it will be necessary to drill more holes. It is estimated that about 40 more holes should be drilled. Because equipment procurement entails a long delay, and because the large capital outlay magnifies the consequence of errors in calculations, it is considered desirable that run of mine samples, rather than drill cores or sludge, be obtained for ore dressing work. When it is mentioned that the ore dressing will probably entail the expenditure of about $1,000,000, it can readily be seen that the sinking of an exploratory shaft for sample mining is amply justified.

MANGANESE PRODUCTION FROM LOW GRADE GUYUNA ORES (Cont'd)

With drilling expected to cost about $60,000, the shaft $100,000 mining of ore for pilot ore dressing and pilot leaching operations $25,000, and ore dressing research and piloting $275,000, it will be seen that exploration capital of $500,000 should be made available.

Using the most nearly equivalent operations as guides and basing stripping costs on large scale contracts in the locality, a mining and concentrating cost of $5.47 per ton of 20% concentrate is obtained. For purposes of estimate it is desirable to reduce all costs to the basis of long ton units of manganese content (22.4 lb.). On this basis, mining and concentrating would cost $0.278 /long ton unit.

It should be noted that an increase in the rate of mining tends to reduce the cost of producing concentrates, and it is indicated that production of 100,000 units of manganese per day would reduce the cost of concentrates to about $0.2415 /long ton unit.

Because of the low grade of the ore, a small change in the assay has a large effect on the cost of the concentrate. On the 200 ton per day operation, a change in assay of ½% changes the cost of concentrates by 14%. This serves to stress the importance of thorough exploration of the ore body.

May 23, 1951

MANGANESE

Ore samples have assayed	2.5 - 7.5%	Mn
Average is expected to be	3.75%	Mn
Recovery is expected to be	3%	Mn

All on the basis of per ton mined

Concentration to 20% is expected

Concentration ratio is 6.67:1

All figures following are based on reaching full production the first year, and the mining cost is lower by reason of distributing the entire stripping cost over five years' ore production.

No taxes have been included.

200 x 5 x 6.67 = 6670 T/day

6670 x 365 = 2,435,000 T/yr.

2,500,000 T/yr.

Figure 200 working days in the mine.

$\frac{2,500,000}{200}$ = 12,500 T/24 hrs.

$\frac{12,500}{24}$ = 521 T/hr.

PRODUCTION OF CONCENTRATE

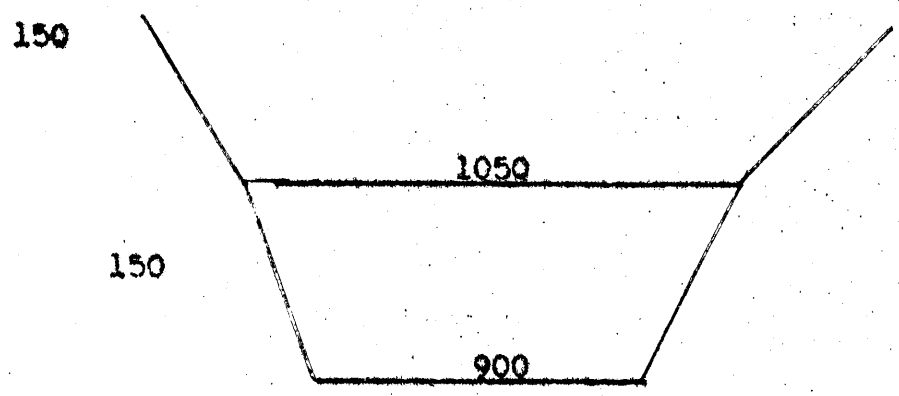
		5 yr. basis
Mining cost, including stripping		0.622
Concentrating		0.211
	Per ton ore mined	0.833
	Per ton concentrate shipped	5.58

On the basis of 3% Mn recoverable in the concentrate, the cost of concentrate per ton of contained Mn is:

$$\frac{0.82}{0.03} = \$27.80$$

Exclusive of royalties, depletion, taxes, etc.

MINING COST



Volume overburden $= \frac{150}{3}$ (1500 + 1050 + 1500 x 1050) = 50 (2250000 + 1102500 + 1575000)

= 4927500 x 50 = 245380000 cf. or 8780000 cy.

Volume ore $= \frac{150}{3}$ (1050 + 900 + 1050 x 900) = (1102500 + 810000 + 945000) 50

= (2857500) 50 = 142,780,00 cf. or5,285,000 cy.

with sp. gr. 2.7 = 10,650,000 gross tons.

Cost:

Stripping	8,780,000 Cy. @ 40¢	=	3,512,000
Mining	5,285,000 Cy. @ 60¢	=	3,170,000
			6,682,000

Cost per ton $= \frac{6682000}{10650000}$ = $0.622/Ton mined

Stripping ratio = 0.816 Cy./Ton gross

COST OF CONCENTRATION

	Per ton ore mined
Plant amortization, 5 year write-off	0.08
Labor, including maintenance	0.0476
Maintenance & Repair materials	0.016
Utilities	0.0438
	0.1874
Administration & Overhead 50% of labor	0.0238
Per ton ore mined	0.2112
Cost of concentration	
Use	0.21
Or	1.40 per ton concentrate shipped.

ORE DRESSING PLANT

Buildings	$ 200,000
Crushers	68,000
Screens	20,000
Washing trommell	20,000
Log wahsers	40,000
Rod mill	35,000
Conveyors	30,000
Wilfley tables	35,000
Screw classifiers	60,000
Sink-float	100,000
Bins	50,000
Water supply	50,000
Tails disposal	50,000
	$ 758,000
Contingencies	76,000
Engineering	76,000
	$ 910,000
Use	$1,000,000.00

$$\text{Cost per ton mined} = \frac{1,000,000}{12,500,000} = 0.08$$

CONCENTRATING PLANT LABOUR

Foreman	3 @ 25.00 per diem	$ 75.00
Chemist		20.00
Operators	24 @ 15.00	360.00
Maintenance	(2 elect, 2 pipe fitters, 2 mech.)	140.00
		$595.00 per diem

$$\frac{595}{12,500} = \$0.0476/T \text{ mined}$$

UTILITIES FOR ORE DRESSING PLANT

	HP	
Crushers @	400	
Screens @	40	
Washing trommell	200	
Rod mill	200	
Log washers	100	
Conveyors	150	
Wilfley tables	50	
Screw classifiers	50	
Water supply	125	
Tails disposal pumps	200	
	1515 HP	
		1780
		50 kw
Lighting, etc.		1830

Or 1850 kw

Use figure of 0.01¼ per kw hr or 22.80 per hr

Cost per ton of ore mined $= \frac{22.80}{521} = 0.0438$ per ton ore mined.

CONCENTRATING PLANT MAINTENANCE AND REPAIRS

Crusher replacements	$10,000.00 per an.
Screen replacements	4,000.00
Log washer "	2,000.00
Trommell "	2,500.00
Conveyor	2,500.00
Wilfley table "	3,500.00
Classifiers "	1,000.00
Pump "	10,000.00
Building repairs	1,000.00
Piping replacements	2,500.00
Miscellaneous supplies	1,000.00
	$40,000.00 per an.

Or $0.016 per ton mined

GENERAL OFFICES
FIRST SECURITY BANK BUILDING
OGDEN, UTAH

SAN FRANCISCO OFFICE
ONE MONTGOMERY STREET
TEL. GARFIELD 1-6743

SALT LAKE CITY OFFICE
57 EAST 4TH SOUTH STREET
TEL. 3-7676

THE UTAH CONSTRUCTION COMPANY

ENGINEERS AND CONTRACTORS

SAN FRANCISCO 4, CALIFORNIA

CABLE ADDRESS
UTAHCONCO

July 2, 1951

RECEIVED
JUL 11 1951
LANDON F. STROBEL
Executive Secretary

Defense Minerals Administration
New Interior Building
Washington 25, D. C.

Gentlemen:

We are sending herewith for your consideration a proposal for supplying a high grade sintered manganese oxide product on a large scale from a domestic source.

The proposal embraces a well studied program including:

1. A large deposit of low grade manganese ore in the Cuyuna Range which has been partially drilled and proven.

2. A process for recovery of manganese developed by American Cyanamid Company (through its wholly owned subsidiary, Chemical Construction Company) and which process was recently tested by Batelle Institute and approved by them as being definitely successful in laboratory tests on ore from the above deposit.

3. An operating group with an impressive background of experience in mining and in construction and operation of metallurgical plant facilities.

The program we propose calls for three stages in the development and operating procedure, which are as follows:

A. An initial exploratory stage aided by the Defense Minerals Act, including more detailed drilling and shaft work to completely prove the deposit and test the actual ore from the deposit through commercial size equipment. This stage will require eight to twelve months time and will cost approximately ~~$500,000~~ $250,000.

B. Development of the mine and design and construction of a full scale beneficiation and sintering plant under terms of a purchase contract for 50,000,000 long ton units under appropriate procurement regulations with suitable guarantees against loss from cancellation by the government. This development is estimated to require twelve months time and will cost approximately $25,000,000.

C. Delivery of sintered manganese for a five year period beginning late in 1953 or early in 1954.

This program offers a sound and practical approach to the manganese supply problem, a solution of which is so essential to our steel industry. The program utilizes domestic sources which are not subject to interruption by war or external political influences, and the supply can be expanded if necessary during times of national emergency. The proven character and the broad experience of the group of participants gives the maximum assurance to the government that the contract will be fulfilled.

Respectfully submitted by,

THE UTAH CONSTRUCTION COMPANY

By Allen D. Christensen
Allen D. Christensen,
Vice President and
General Manager

ADC/jka

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. D.M.A. 1829X
New figures submitted as of this date 8/7/51
Date received
Participation

The Utah Construction Company
and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date August 3, 1951

FILL IN THIS BLOCK

Date of application July 11, 1951

Estimated cost $250,000

Mineral or metal Manganese

Percentage of Government participation 75%

Location of mine Aitkin County, Minnesota

Date of filing MF-100 July 11, 1951

DMA Docket Number, if available 1829X

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.
    (*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

    NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area.

*11. State the present and former names of the property, if any.

*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.

*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.

15. State in detail how the ore could be shipped and how and where milled.

*16. History:
    (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.
    (*b*) State briefly the known history and production of adjoining and neighboring properties.
    (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

*17. Production:
    (*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)
    (*a*) Describe the ore or mineral deposits briefly.
    (*b*) Submit available maps and assay data.
    (*c*) Give estimated tonnage and grade of each class of ore reserves.

19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

    NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows:
    (*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.
    (*b*) Supervisors, by numbers and positions, with salaries of each.
    (*c*) Cost of necessary repairs to existing facilities, structures, and buildings.
    (*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.
    (*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.
    (*f*) Cost of rental for equipment which the operator proposes to rent.
    (*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.
    (*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.
    (*i*) Cost of power, water, utilities, and any other items not provided for above.

24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Co. and Associates
(Name of company)

By C. R. Gardner
(Signature of authorized official)

August 3, 1951
(Date)

Agent
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

Form MF-103

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1 to 5, inclusive, are answered in form MF-100, which is attached.

6. Applicant is lessee.

7. Lease is in good standing. A copy of the agreement is attached.

8. A financial statement is attached to form MF-100, which accompanies this application.

9. Applicant is prepared to invest $75,000 in the project. This sum exceeds our share of the cost as detailed in question 23, and according to the provisions of Section 9 of Mineral Order 5.

The Property

10. (a) The ore body lies in section 23, Township 48 N. range 27 west, Aitkin County, Minnesota.
    (b) Explorations are to be conducted over a considerable portion of the entire section. For the purposes of this contract the property will be subdivided into 40 acre tracts, and exploration is to proceed as discoveries indicate.

11 to 14, inclusive, are answered in form MF-100.

15. Mining will be done from an open pit, using power shovel loading and truck haulage. A gravity concentrating plant is to be erected on the property, and the 20% concentrate produced will be leached by a modified sulphur dioxide process, facilities for which will probably be erected on the property. The leaching process turns out a 62% manganese content sintered oxide, which is suitable for production of ferromanganese.

16 to 18, inclusive, are answered in form MF-100.

19. The foregoing answers are believed to cover the pertinent facts.

The Exploration

20. Explorations are to be conducted for manganese, indications of which have already been established by the drilling described previously. The deposit is believed to be a folded, bedded deposit, and is known to be of considerable thickness and extent. The ore contains manganese and iron as oxides, together with silica and alumina which constitute the gangue.

21. It is estimated that about 40 holes should be drilled to substantiate further the reserve of mineral, and to gain other information necessary to plan a mine. It is expected that this work can be completed within four months of commencement. In addition to the drill holes, it is felt that an exploratory shaft, or several large core holes, should be put down on the property to gain further knowledge of the character and formation of the mineral, and to obtain samples for further work on beneficiation. Tentative drilling sections and the shaft site are indicated in red on plan E-2, which is attached, but it is expected that early findings will dictate the final plan of development.

22. This property was originally drilled as a prospect for iron ore, owing to its position relative to the Cuyuna Range. Later exploration was made with the hope of developing a body of manganiferous iron ore. In the light of recent development of a process for leaching manganese, together with the susceptability of the ore to gravity concentration, the present program has been undertaken. Considerable ore is now known to exist, but the current exploration is necessary to plan the mine and to obtain samples for final metallurgical work.

The substantiation of this request lies in the drilling logs and metallurgical reports of work done on the ore. Photostatic copies of such reports as are available are attached to this application.

The Requirements and Costs

23. It is anticipated that drilling and shaft sinking will be done under contract by firms engaged in doing this type of work in the iron ranges. Estimates of costs are based on recent experience of the U.S.B.M. and the mining companies operating in the area.

24.

Type of Work	Completion Time (from date of approval)	Cost Estimate
Exploratory Drilling	4 mo.	
8,000 ft. churn drill holes @ $7.00/ft.		$ 56,000.00
4,000 ft. NX core drill hole @ $8.00/ft.		32,000.00
Exploratory Shaft (Using freezing method)	8 mo.	120,000.00
Exploration drifts	12 mo.	36,000.00
Access road		6,000.00
		$250,000.00

Form MF-100
(March 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Form approved.
Budget Bureau No. 42-R1026.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950

NOT TO BE FILLED IN BY APPLICANT

Docket No. DMA 1829X

Date received 7-11-51

The Utah Construction Company and Associates
1 Montgomery Street
San Francisco, California

Name and address of applicant

Date July 2, 1951

INSTRUCTIONS

This form is to be filed with Defense Minerals Administration, Department of the Interior, Washington 25, D. C. It should be accompanied by appropriate application form when a specific type of Government assistance is requested, in the form of (1) loan, (2) purchase contract, (3) Government guarantee of a private loan, ~~(4) Necessity Certificate pursuant to the provisions of Sec. 124 A (Amortization Deduction) of Internal Revenue Code, 1950~~; ~~(5)~~ priorities or allocation of mining equipment, and maintenance, repair and operating supplies, and (5) other forms of Government assistance that might arise under the Act. Submit four (4) signed copies of the form and accompanying papers. Name and address should be stamped or typed on each sheet of this form and all accompanying papers. *When a question is inapplicable it should be so stated on the form.* Additional sheets may be attached in answering any questions or in supplying additional information. (IF YOU CANNOT ANSWER A QUESTION, SO STATE.) If a question is answered elsewhere indicate where answered. It is not necessary to answer it again.

GENERAL TECHNICAL DATA

Supply the following information on separate sheets, arranged, numbered, and lettered as indicated:

1. Materials produced:
   (*a*) What are the chief mine, mill, or smelter products?
   (*b*) What are the byproducts, if any?
2. Name(s) and type(s) of mine(s), mill(s), smelter(s), refinery(ies), pit(s), quarry (ies), drilling operation(s). Include old names of property, if any. Show extent of workings, including the following:
   (*a*) Linear feet of shafts.
   (*b*) Linear feet of drifts and crosscuts.
   (*c*) Linear feet of tunnels or adits.
   (*d*) Linear feet of other mine openings (explain briefly).

   Indicate whether mine is flooded or not. Describe any pumping problems. Give size and productive capacity.
3. For each operation listed above supply the following:
   (*a*) Distance and direction from nearest town and shipping point.
   (*b*) Mining district.
   (*c*) Township, Section, Range.
   (*d*) County, State.
4. (*a*) State whether or not property is now in operation, and if in operation, by whom operated.
   (*b*) Are you operating this property as:
   - ☐ Owner.
   - ☐ Lessee.
   - ☐ Contractor.
5. Number of years in production .....

   If not in production or operation, estimated date when production will begin .....
6. Experience of operators:
   Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who manage the project.
7. History:
   (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for suspension of operation.
   (*b*) State briefly the known history and production of adjoining and neighboring properties.
   (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL 11 1951
LANDON F. STROBEL
Executive Secretary

8. Names and addresses of Officers, Directors, or Partners, and in addition thereto, the five largest stockholders if applicant is a corporation.

Name and Address (a)	Official Title (If officer is also director indicate by "D") (b)	Total of Annual Salary, Commissions, Bonuses, Etc., Received From Applicant and Affiliates During Last Fiscal Year (c)	Estimated Net Worth Outside of Interest in Applicant (d)	Number of Shares Held in Applicant Corporation		Life Insurance Carried for Benefit of Applicant	
				Common (e)	Preferred (f)	Amount (g)	Net Cash Surrender Value After Loans (h)
	Total		x x x x x			x x x x x	x x x x x

If more lines are needed continue on separate sheet.

9. Capital Stock Issues:

For Corporate Applicants

Item	Authorized (a)	Outstanding (b)	Par Value (c)	Number of Shares Outstanding (d)	Dividend Rate Last Paid* (e)
Common stock	$	$	$		
Preferred stock	$	$	$		

*Indicate period covered.

10. Production:

Item	Kind of Product (a)	1948 Total (b)	1949 Total (c)	1950 Total (d)	Present Average Monthly (e)
1. Quantity of product mined or quarried (Short, long, metric tons; barrels; pounds; etc.)					
2. Quantity of product processed (specify unit of measure and type of process)					
3. Quantity and grade of product sold or shipped (specify units of measure)					

11. Do you contemplate a change in the present average monthly rate of production? If so, state estimated maximum monthly production and basis of change.

12. Ore or Mineral Reserves:

(a) Describe the ore or mineral deposit briefly. Accompany the application by any available report on the geology and ore reserves.

(b) If deposit is other than placer:

(1) Submit assay plans and/or sections showing location and size of proved (measured) and probable (indicated) ore or mineral reserve.

(2) State the tonnage (indicate type of ton) and grade of each class of ore reserve, as above, and show how computed. Tabulated total ore reserve as follows:

TOTAL ORE OR MINERAL RESERVES

Ore or Mineral Reserve	Estimated Tons (a)	Metal or Mineral Content Per Ton (Grade) (b)	Gross Value Per Ton (c)	Recoverable Unit Value Per Ton (d)	Estimated Cost of Production Per Ton (e)
Measured (proved)					
Indicated (probable)					

(c) If placer:

(1) Give estimated total yardage and average marketable mineral content of each deposit.

(2) Submit map showing location of placer deposit and surrounding area, with all test holes or pits. Submit logs of each hole and test pit with depth and average value of each.

(3) Describe gravel, stating whether fine, medium or coarse; loose, tight, cemented, or frozen, and whether it contains stumps or boulders more than 1 foot in diameter; if so, how large, and in what proportion.

(4) Describe bedrock, giving type (granite, sandstone, shale, etc.) and state whether it is hard or soft, smooth, uneven or rough.

(5) Describe overburden, stating whether loose, tight, or cemented; fine or coarse textured; furnish estimate of average thickness and total amount.

(6) Tabulate the reserves using the form outlined above for ore or mineral reserves.

13. Access Roads:

Give road distances to shipping, supply and residence points, stating kind and condition of roads.

14. Water Supply:

State source and quantity of water available for operations and whether sufficient for all seasons of year.

15. Power:

State amount of power used, rate per hour, and source thereof.

16. Labor:

State number and classes (miners, muckers, millmen, etc.) of men employed during a recent representative payroll period.

17. Equipment and Facilities:

Describe present equipment on the property, including buildings. (State condition.) List major pieces of equipment now owned or controlled and in serviceable condition available for this operation.

18. Are there any particular conditions or circumstances affecting your operations that are not described above? If so, explain.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

The Utah Construction Company and Associates
(Name of company)

By _____
(Signature of authorized official)

July 2, 1951
(Date)

Vice President & General Manager for The Utah Construction Company
(Title)

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—63792-1

Form MF-100

U.S.DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION.

GENERAL TECHNICAL DATA
FOR USE UNDER THE
DEFENSE PRODUCTION ACT OF 1950.

June 27, 1951

1. (a) The property will produce manganese oxide ore, which will be gravity concentrated on the property. This concentrate will, in turn, be leached to provide a high grade, high purity product suitable for ferro-manganese production.

   (b) The ore is high in iron, and effort will be made to recover this as an iron ore.

2. The property is known only by its description, section 23, township 48N, range 27W. Operations to date have consisted of sampling by churn - and diamond core - drilling, and metallurgical testing, as described below. The total amount of churn drilling is 14,360 feet and the total amount of diamond core drilling is 2,583 feet.

3. (a) The property is about eight miles north of Aitkin, Minnesota. The town, which is the county seat, is served by the Northern Pacific Railroad.

   (b) The property is north-east of the Cuyuna Range iron mining district.

   (c)(d) The ore body lies in section 23, township 48N, range 27W, Aitkin County, Minnesota.

4. (a) Applicant is engaged in an engineering program leading to the production of a 20% gravity concentrate from which a 62% sintered manganese oxide will be prepared by a modified sulphur dioxide leaching process. Continued explorations will furnish additional technical data to be utilized in completing plant designs.

   (b) Applicant is the lessee.

5. Production is not yet under way, but is expected to commence within twenty months.

6. Experience of the operators:

The Utah Construction Company was organized in 1900, and since that time has engaged in heavy construction of all kinds, including hydroelectric power projects, railroads, industrial plants, tunnels, shafts, and military installations of all kinds including a complicated plant and installations for the Chemical Warfare Department.

For a long time the company has been associated with important mining companies in the performance of mining and stripping work for Kennecott Copper Corporation, Pittsburg Coal Company, and later the Pittsburg Consolidated Coal Company, Colorado Fuel and Iron Corporation, Columbia Iron Mining Company (Geneva Steel Company), and others.

Important achievements of the company have been the construction of plant facilities for Kennecott Copper Corporation which included smelting works, electrolytic refining plant, power house, and a concentration plant. The company successfully performed the general contract for construction of the major part of the Geneva Steel Plant for the Defense Plant Corporation. Other plant facilities built by the company are the design and construction of a zinc fuming plant for American Smelting and Refining Company, a chemical plant for Darco Corporation, a cobalt refinery for Howe Sound Company, and similar projects for other mining companies.

Continuous maintenance contracts are currently being performed for Geneva Steel Company and the Salt Lake Refinery.

Production of iron ore from ~~our~~ the iron mining property near Cedar City, Utah is 150,000 to 200,000 tons per month, and we are shipping ore to Kaiser Steel Company at Fontana, California, to Geneva Steel Company at Geneva and Ironton, Utah, to Carnegie Illinois Steel Company at Chicago and Pittsburg, to Inland Steel Company at Chicago, and to others.

In British Columbia ~~we are~~ it is opening a new open pit mine which will be processed through a magnetic separator plant with a capacity of 75,000 tons per month.

The applicant is

Associated with ~~us are~~ Foley Brothers, Inc. of St. Paul, Minn., a firm about seventy five years old with long experience in mining and construction work. Located in St. Paul Minn., it has had a wide knowledge and experience in Minnesota Conditions and activities and on the iron range, and has performed construction work throughout the U. S., Canada and Alaska. During the past 27 years it has operated the world's largest open pit coal mine at Colstrip, Montana, currently producing about two million tons of coal annually, has acted as consultant and operator for the government of India in connection with open pit mines northwest of Calcutta and other similar projects.

MF 100

8. See financial statement attached for officers and directors. The five largest stockholders are:

Allen D. Christensen &
Carmen Christensen
1 Montgomery Street
San Francisco, California

Thomas D. Dee
Ogden, Utah

Eccles Hotel Company
Ogden, Utah

E. O. Wattis Estate
% Shepard Mitchell
815 No. Bedford Drive
Beverly Hills, California

P. L. & Phyllis Wattis
220 Bush Street
San Francisco, California

7. (a) This property has been drilled, first for possible iron ore, and later for manganese ore, by three independent organizations. The first explorations were made by M.P.Botsford of Crosby, Minn. in 1913 and by the Crosby Exploration Company in 1917. Later, in 1947, the M.A.Hanna Coal and Ore Company put down a number of churn drill holes, and as recently as the fall of 1950, the U.S.Bureau of Mines made a series of diamond drill holes. The logs of all of these holes are available, and the split cores may be seen at Region V headquarters, U.S.B.M., Minneapolis, Minn. The manganiferous material on this property appears to be extensive, and has been shown to be susceptible to beneficiation by simple procedures.

(b) While this property may be considered contiguous to the Cuyuna Range iron formation, it is distinct and separate from the existing mines and is removed from the nearest mine by more than twenty miles.

(c) The private reports which have been made on this property are nonfidential and not immediately available. All of the reports, however, are substantiated in all respects by those of the U.S.B.M., Region V.

10. Operations have not reached the production stage.

11. Proposed production is at the rate of 16,500 L.T. per 24 hrs. for 200 days per year. This will produce some 10,000,000 long ton units of manganese per year.

12. (a) The mineral body consists of bedded sedimentary deposits, considerably metamorphosed and lying in the form of an eroded anticline covered by alluviam some 150 feet thick. The mineral bed appears to vary from 150 to 250 feet in thickness. Assays have run from less than 1% to over 20% Mn. Average minable material is believed to run 3 3/4% Mn. The mineral consists of grains of manganiferous material of varying sizes embedded in fine, dense clayey material.

(b) U.S.B.M. drilling log of 5/13/50, Aitkin County, Minn. Sec. Ref.1072 is referred to as substantiation, and a plan of the drilling is attached.

Mineral reserve	Estimated tons	% Mn.	Total Mn. content	Total recoverable long tons	Est.cost of prod.
Measured	37,800,000 LT.	3 3/4%	1,400,000	1,100,000	$6 / L.T. of 20% concentrate
Indicated	23,700,000 "	"	880,000	710,000	"

13. It will be necessary to build about two miles of access road from a good county highway. A railroad spur about ten miles long is required. The entire area is perfectly flat, and the cost of these access facilities would be at the minimum for such works.

14. Blind Lake, about 500 acres in extent, is about half a mile due north of the northwest corner of the section, and could supply all the water needed for beneficiation. There would be no seasonal shortage.

15. Power is available from the Minnesota Power and Light Co's. grid, which is less than six miles distant. The rate for the estimated 2,500 kw required is under 1½¢ per kw hr.

16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

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8. & 9. See financial statement of The Utah Construction Company.

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16. Varying numbers have been employed by previous interests to conduct drilling operations. None is employed at present.

17. There is no improvement on the property.

18. All conditions are believed to be described above.

MANGANESE PRODUCTION FROM LOW GRADE CUYUNA ORES

It is proposed to utilize a supply of low grade manganiferous material occurring on section 23-T48N R27W, in Aitkin County, Minnesota. The mineral apparently occurs in a syncline. Churn and diamond core drilling indicate a probable ore body roughly rectangular, about 1000' wide, and from 5000' to 6000' long. The thickness of mineralization varies from 150' to 250', but the thicker portions contain leaner streaks, which brings the average more nearly to 150'. This indicates a probable tonnage of 62,000,000. With an average content of recoverable manganese of 3%, this shows the possibility of recovering some 190,000,000 long ton units of manganese.

Preli inary ore dressing work by three independent laboratories demonstrates that greater than 80% manganese recovery is possible when concentrating 4.5% ore to 20%. There should be no difficulty in achieving a similar result even with the grade of the ore falling to nearly 3%. This is due to the unusual characteristic of the formation, wherein the gangue exists chiefly as a veryfine clayey material which may be washed away. Further refinement is then effected by gravity separation, such as sink-float.

The area is perfectly flat, and the overburden consists of sandy loam, clay, gravel and boulders to a depth of 150' over the entire ore body. Because of this thickness of overburden, open pit mining operations must be carried out on a large scale to be economical.

With a proposed leaching plant desi ned for a yearly production of 10,000,000 long ton units of manganese as a 61% manganese sinter, and assuming 350 working days per year in the leaching plant and 300 working days in the mine, ore production would be 11,000 long tons per 24 hours.

Owing to the depth of overburden, the only means of sampling the ore has been through some 40 churn-drill holes and 7 diamond core-drill holes. These show the undoubted existence of an enormous quantity of potential ore; a great deal is left to be desired. But additional information on ore dressing and on the actual quality of ore which could be mined are desired.

In order to prove further the extent of the ore body, and to define barren areas for the spoil banks, tailings ponds and plant facilities, it will be necessary to drill more holes. It is estimated that about 40 more holes should be drilled. Because equipment procurement entails a long delay, and because the large capital outlay magnifies the consequence of errors in calculations, it is considered desirable that run of mine samples, rather than drill cores or sludge, be obtained for ore dressing work. When it is mentioned that the ore dressing will probably entail the expenditure of about $1,000,000, it can readily be seen that the sinking of an exploratory shaft for sample mining is amply justified.

MANGANESE PRODUCTION FROM LOW GRADE COYUNA ORES (Cont'd)

With drilling expected to cost about $60,000, the shaft $100,000 mining of ore for pilot ore dressing and pilot leaching operations $25,000, and ore dressing research and piloting $275,000, it will be seen that exploration capital of $500,000 should be made available.

Using the most nearly equivalent operations as guides and basing stripping costs on large scale contracts in the locality, a mining and concentrating cost of $5.47 per ton of 20% concentrate is obtained. For purposes of estimate it is desirable to reduce all costs to the basis of long ton units of manganese content (22.4 lb.). On this basis, mining and concentrating would cost $0.278 /long ton unit.

It should be noted that an increase in the rate of mining tends to reduce the cost of producing concentrates, and it is indicated that production of 100,000 units of manganese per day would reduce the cost of concentrates to about $0.2415 /long ton unit.

Because of the low grade of the ore, a small change in the assay has a large effect on the cost of the concentrate. On the 200 ton per day operation, a change in assay of ½% changes the cost of concentrates by 14%. This serves to stress the importance of thorough exploration of the ore body.

May 23, 1951

MANGANESE

Ore samples have assayed	2.5 - 7.5%	Mn
Average is expected to be	3.75%	Mn
Recovery is expected to be	3%	Mn

All on the basis of per ton mined

Concentration to 20% is expected

Concentration ratio is 6.67:1

All figures following are based on reaching full production the first year, and the mining cost is lower by reason of distributing the entire stripping cost over five years' ore production.

No taxes have been included.

200 x 5 x 6.67 = 6670 T/day

6670 x 365 = 2,435,000 T/yr.

2,500,000 T/yr.

Figure 200 working days in the mine.

$\frac{2,500,000}{200}$ = 12,500 T/24 hrs.

$\frac{12,500}{24}$ = 521 T/hr.

PRODUCTION OF CONCENTRATE

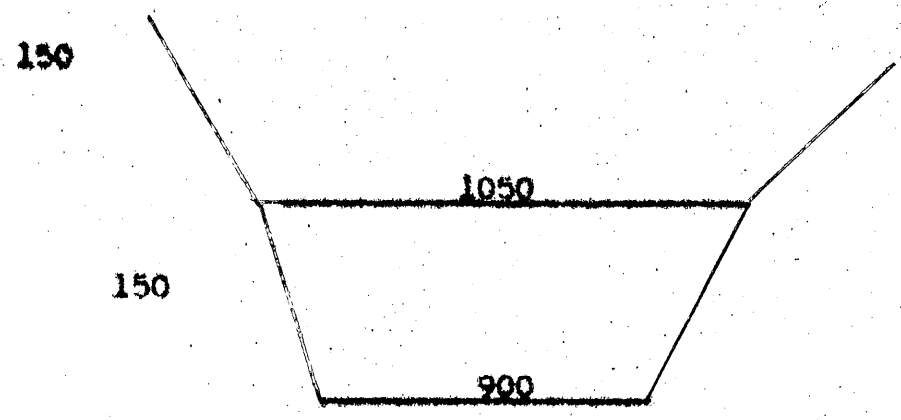
	5 yr. basis
Mining cost, including stripping	0.622
Concentrating	0.211
Per ton ore mined	0.833
Per ton concentrate shipped	5.58

On the basis of 3% Mn recoverable in the concentrate, the cost of concentrate per ton of contained Mn is:

$$\frac{0.82}{0.03} = \$27.80$$

Exclusive of royalties, depletion, taxes, etc.

MINING COST



Volume overburden $= \frac{150}{3}$ (1500 + 1050 + 1500 x 1050) = 50 (2250000 + 1102500 + 1575000)

= 4927500 x 50 = 245380000 cf. or 8780000 cy.

Volume ore = $\frac{150}{3}$ (1050 + 900 + 1050 x 900) = (1102500 + 810000 + 945000) 50

= (2857500) 50 = 142,780,00 cf, or5,285,000 cy.

with sp. gr. 2.7 = 10,650,000 gross tons.

Cost:

Stripping	8,780,000 Cy. @ 40¢	=	3,512,000
Mining	5,285,000 Cy. @ 60¢	=	3,170,000
			6,682,000

Cost per ton = $\frac{6682000}{10650000}$ = $0.622/Ton mined

Stripping ratio = 0.816 Cy./Ton gross

COST OF CONCENTRATION

	Per ton ore mined
Plant amortization, 5 year write-off	0.08
Labor, including maintenance	0.0476
Maintenance & Repair materials	0.016
Utilities	0.0438
	0.1374
Administration & Overhead 50% of labor	0.0238
Per ton ore mined	0.2112
Cost of concentration	
Use	0.21
Or	1.40 per ton concentrate shipped.

ORE DRESSING PLANT

Buildings	$ 200,000
Crushers	68,000
Screens	20,000
Washing trommell	20,000
Log wahsers	40,000
Rod mill	35,000
Conveyers	30,000
Wilfley tables	35,000
Screw classifiers	60,000
Sink-float	100,000
Bins	50,000
Water supply	50,000
Tails disposal	50,000
	$ 758,000
Contingencies	76,000
Engineering	76,000
	$ 910,000
Use	$1,000,000.00

Cost per ton mined $= \frac{1,000,000}{12,500,000} = 0.08$

CONCENTRATING PLANT LABOUR

Foreman	3 @ 25.00 per diem	$ 75.00
Chemist		20.00
Operators	24 @ 15.00	360.00
Maintenance	(2 elect, 2 pipe fitters, 2 mech.)	140.00
		$595.00 per diem

$$\frac{595}{12,500} = \$0.0476/T \text{ mined}$$

CONCENTRATING PLANT MAINTENANCE AND REPAIRS

Crusher replacements	$10,000.00 per an.
Screen replacements	4,000.00
Log washer "	2,000.00
Trommell "	2,500.00
Conveyor	2,500.00
Wilfley table "	3,500.00
Classifiers "	1,000.00
Pump "	10,000.00
Building repairs	1,000.00
Piping replacements	2,500.00
Miscellaneous supplies	1,000.00
	$40,000.00 per an.

Or $0.016 per ton mined

UTILITIES FOR ORE DRESSING PLANT

	HP	
Crushers @	400	
Screens @	40	
Washing trommell	200	
Rod mill	200	
Log washers	100	
Conveyors	150	
Wilfley tables	50	
Screw classifiers	50	
Water supply	125	
Tails disposal pumps	200	
	1515 HP	
		1780
		50 kw
Lighting, etc.		1830

Or 1850 kw

Use figure of 0.01¼ per kw hr or 22.80 per hr

Cost per ton of ore mined = $\frac{22.80}{521}$ = 0.0438 per ton ore mined.