DMA Form 1

DEFENSE MINERALS ADMINISTRATION
Control Slip

## CONTROLLED DOCUMENT

DMA Docket No. 3108

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This document has been recorded as

**Exploration Assistance**

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.

Copies to USGS, USBM, AND TO REGION.

Routing Slip

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## DO NOT DETACH

## CONTROLLED DOCUMENT

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

DOCKET COPY

January 15, 1954

NUCLEAR MAGNETIC MINING, INC. (Rec'd 7-3-53)
DMEA-3108 (Thorium)
ST. JOHN'S COUNTY, FLORIDA.

1. Total acres to be explored approx. - 30,000 acres
$\frac{30,000}{640}$ = 46.875 sections of land.

2. On 1000 foot centers would require approx. 1156 holes with 400 offset holes or 1556 holes.

3. Average depth estimated at 40 feet.

4. 1556 x 40 x $1.25/ft. = $77,800.00.

5. Application requests $77,070.00.

6. Applicant estimates 7.5% black sands.

7. Applicant estimates the black sands contain:
Monazite 0.5%, 5% of which is thorium.
Zircon 15.0% Hafnium does not affect price.
Rutile 5.0%
Ilmenite 61.0% (high considering reports)
Balance - staurolite, kyanite, tourmaline, etc.,

8. Carlson figures Applicant would only recover approx. 25% of monazite contained in the black sands.

9. Based on all the above figures from each 100 tons of material mined we should derive the following amount of thorium:
7.5% 100 tons = 7.5 tons black sand
7.5 tons = 15,000 lbs. black sand
.5% monazite would amount to .5% of 15,000 lbs. = 75 lbs. of monazite
5% thorium = 5% of 75 = 3.75 lbs. $ThO_2$
say 4 lbs. thorium and 25% Final mill recovery would then not exceed 1 lb. of thorium in 100 tons of material.

10. Arthur P. Butler, Jr. of U.S.G.S. dated July 16, 1953, reports that recovery of black sands by the National Lead Company 5 miles west of the ocean near Jacksonville,

Fla. averages approx. 4%. Furthermore, said black sands run only about 0.5% monazite on this basis the calculation under paragraph 9 above becomes as follows:

100 tons of sands
4% black sands = 4 tons or 8,000 lbs.
0.5%(monazite) = 0.5% x 8000 lbs. = 40 lbs.
5% (thorium) = 40 x .05 = 2 lbs.
25% plant recovery = 0.5 lb. thorium per 100 tons of material.

11. Estimated value based on following current prices:
Monazite 17¢ /lb. (ranges from 16½¢ to 19¢)
Zirconium est. $42 to $43/long ton c.i.f. Atlantic seaport 65% $ZrO_2$ (1.9¢/lb.)
Ilmenite $18 to $20/long ton 59.5% $TiO_2$ f.o.b. Atlantic seaport (say 1¢/lb.)
Rutile 94% $TiO_2$ conct 5¢ to 6¢/lb.
Thorium

Est. Val:

| | | |
|---|---|---|
| Monazite 40 lbs. @ 17¢/lb. | - | $ 6.80 (6.91% of total) |
| Zirconium 1200 lbs. @ 1.9¢/lb. | | $22.80 |
| Ilmenite 4880 lbs. @ 1 ¢/lb. | | $48.80 |
| Rutile 400 lbs. @ 5 ¢/lb. | | $20.00 |
| Thorium is in the monazite | | $98.40 |

or $98.40 gross value per 100 tons or say @ 80% (high) recovery - $ 78.72 for 100 tons say 79¢/ton recoverable.

12. It was learned (F.L.Knouse) thru James Murray of Lindsay Chemical Co. of East Chicago that they do not pay for thorium content in monazite unless it exceeds 5%. Even supposing they did pay for material running 5%, on the basis of 0.5 lb. recovered thorium from 100 tons of sand and a price of $5.00 for material running 97% $ThO_2$ the value per ton of the thorium content would be:

$$\frac{0.5 \times \$5.00}{100} - \frac{\$2.50}{100} \text{ or } 2\tfrac{1}{2}¢/\text{ton of material}$$

Therefore, the thorium content would represent only 3.16% of the recoverable value of the heavy minerals.

13. In Conclusion:

1. None of the commodities sought are now on the elegible list. However, thorium was on the list at the time of filing the

application.

2. It is very doubtful if thorium resulting from a major operation, would receive any returns at all.

3. However if thorium were paid for it would receive not to exceed 3.16% of the estimated recoverable returns.

4. A commercial proposition might be possible if all the values were proven to be existant and a large plant was installed.

5. Based solely on thorium the application should be denied.

Ernest Wm. Ellis

E. Wm. Ellis

Copies to: Docket file
Administrator's Reading File
Division File

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

RECEIVED
DEC 18 1953

December 17, 1953

Mr. Frank B. Simpson
President and Treasurer
North Cove Minerals
P. O. Box 1876
Raleigh, N. C.

Dear Mr. Simpson:

Your letter dated December 12 to Mr. E. W. Ellis in regard to the development and marketing of zircon has been referred to me for reply.

Zircon, the principal ore-mineral of zirconium and hafnium, is not in short supply and is not included in the list of strategic minerals purchased for the National stockpile or eligible for exploration assistance. The titanium-mineral mining operations in Florida are capable of producing enough zircon, as a byproduct, to satisfy domestic consumption, and could increase production if justified by increased demands.

Regardless of our self-sufficiency, considerable quantities of zircon are imported from Australia. These imports appear to be associated with imports of rutile which mineral is in shorter supply. Zircon from Australia is also imported at a lower price than that currently quoted for zircon. E&MJ Mineral and Metal Markets quote zircon at $42-$43 per long ton, c.i.f., Atlantic seaboard, for 65% $ZrO_2$ concentrates. Since zircon contains 67% $ZrO_2$, this represents a 97% zircon concentrate.

Although the most spectacular use for zircon for the past two years has been in the production of metallic zirconium and hafnium, over 90% of all zircon consumed is used in the ceramic refractory and pottery industries and as foundry sand.

RFGriffith:jj

Copy to: Minerals Division
Rare and Precious Metals Br.
R. F. Griffith
E. W. Ellis, Room 4640
A. A. McKinney, Acting Chief, Mining Div., USBM, Region VII, Knoxville, Tennessee
F I L E S

Enclosed is a list of possible consumers and buyers of zircon. From your location, near Spruce Pine, N. C., I judge that your property is a lode or hard-rock deposit. As such, it is doubtful that you could produce zircon at a cost comparable to the Florida operations which are dredging sand deposits.

Enclosed also, for your information, is Zirconium chapter preprint of the 1951 Minerals Yearbook.

I trust that this information will be of service to you.

Very truly yours,

Signed

R. F. Griffith
Commodity-Industry Analyst
Rare and Precious Metals Branch

Enclosures 2

MF-500

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

# REFERENCE SLIP

DATE 12-16-53

REFERRED TO:

1. Robt. F. Griffith, Rm.3641-A
2.
3.
4.

FOR:

| | |
|---|---|
| ---------- Action | ---------- Recommendation |
| ---------- Approval | ---------- Record |
| ---------- Comment | of ---------- |
| ---------- Conference | ---------- Referring |
| ---------- Consideration | to---------- |
| ---------- Filing | ---------- Reply for signa- |
| ---------- Instructions | ture of ---------- |
| ---------- Investigation | ---------- Rewriting |
| ---------- Initials | ---------- Signature |
| ---------- Mailing | ---------- Suggestions |
| ---------- Previous correspondence | ---------- Your information |

DEC 17 ANS'D

REMARKS: The attached letter is in accordance with our phone conversation this date. A copy of your reply will be appreciated.

Check (X) before the items needing attention.

Wm. Ellis

Rm.4640 *Initials of sender.*
Interior

GPO 16—63815-1

MINES & PLANT
NORTH COVE, N. C.

SHIPPING POINT
ASHFORD, N. C.

OFFICES
801-2 ODD FELLOWS BLDG.
RALEIGH, N. C.
DIAL 8553—3-7112

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
DEC 15 1953

MINERALS

# NORTH COVE MINERALS

RALEIGH, N. C.

DEC 17 AMSD
R.L. Griffith :JJ

FRANK B. SIMPSON
PRESIDENT AND TREASURER
J. C. LETELLIER
PLANT MANAGER

December 12th, 1953

E. W. Ellis
Copper Division
Deaptment of Interior
Washington, D. C.

Dear MR. Ellis:

You may recall that I had the pleasure of meeting you last spring when Mr . Coad and I called on you in interest of the work we were doing at that time on the Gold Hill Copper properties in North Carolina. We are stillworking on the Gold Hill Properties and expect soon to come up with a plan that may develop that into a worth while development.

The real purpose of this letter is to make enquiry as to the proper division of Government to contact for the Development and marketing of " ZIRCON" We have a very sizeable deposit of what seems to be high grade " ZIRCONS " and would like to find out just who in Government could tell us if there is a market for same and whom we should contact.

Any information along this line would be greatly appreciated.

Very Cordially,

Frank B. Simpson

Frank B. Simpson
P.O.BOX 1876
Raleigh, N. Car

S/z

FILE COPY
SURNAME:

Murphy
Ellis
Maclin
Farrabee
Johnson
Delfrodge

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

AUG 2 4 1953

Mr. Charles H. Rudolph, President
Nualsar Magnetic Mining, Inc.
5300 Wriley Road
Washington 16, D. C.

Re: Docket No. DMEA-3168
(Thorium and Hafnium)
St. Johns County, Florida

Dear Mr. Rudolph:

Your application for aid in an exploration project designated as per the above captioned number has been thoroughly reviewed by this Agency.

Projects approved by the Defense Minerals Exploration Administration must, in its judgment, show definite promise of yielding material of acceptable grade, and in quantities that will improve the mineral supply position for National Defense.

A careful study of your proposal, together with all information available from other Government sources, reveals that the probability of disclosing minable ore reserves is not sufficiently promising to justify Government participation.

We regret that under these circumstances your application for exploration aid to the extent of 90% of $77,070.00 must be denied.

If future work at your property reveals evidence which could materially alter this opinion, please be assured we will be glad to consider a new application.

Sincerely yours,

C. O. Mittendorf (for)

Administrator

F.Murphy/db
8-20-53
cc to: Adm. Reading File
Operating Committee
Docket
Messrs: H.L.Keiser, Rm. 3641
A.P.Butler, Jr., Rm. 3206, GSA
Ellis
Murphy
DMEA Field Team, Region VII (2)

HHR
8-24-53

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

August 20, 1953

SUMMARY OF PROPOSED PROJECT

Docket No. DMEA-3108
Applicant: Nuclear Magnetic Mining, Inc.
Charles R. Rudolph, President
Subject: Denial of application
Commodity: ~~Uranium,~~ Thorium, Hafnium
Location of property: St. Johns County, Florida Region VII

Amount of application: $66,059.00 (depending on time required) (to complete work. )
Date of application: July 3, 1953
Outline of Project: Drilling 1156 test holes in beach deposit with jet type drills. Average depth of holes estimated at 40 feet, or a total of 46,240 feet of drilling.

Commodity Members comments:

Bureau of Mines: E. J. Carlson, dated July 7, 1953 recommends denial

Geological Survey: Arthur P. Butler, Jr., dated July 16, 1953 recommends denial

Rare & Misc. Metals Div. Engineer: F. M. Murphy

Comments: We recommend denial, as the quantity of thorium that might possibly be produced from the subject property is negligible. The ilminite, zircon, and rutile minerals in the deposit possibly may be exploitable; however, they are not on our list.

Ernest Wm. Ellis

Ernest Wm. Ellis, Chief
Rare and Misc. Metals Division

STANDARD FORM NO. 64

7/22/53 gla

# Office Memorandum • UNITED STATES GOVERNMENT

TO : E. Wm. Ellis, DMEA Member
Uranium Commodity Committee

DATE: July 16, 1953

FROM : Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

SUBJECT: Review of application DMEA Docket 3108 (thorium, haffnium) Nuclear Magnetic Mining, Inc., applicant, St. Augustine, Fla. Various parcels of land in St. Johns County, Fla.

The application identified in the subject above has been reviewed. I have been unable to ascertain by inquiry of the Bureau of Mines, who in that Bureau also may be reviewing the application there. In view of the uncertainty surrounding Atomic Energy Commission's interest in thorium at the present time, I have not discussed the application with J. O. Hosted.

Proposal

Jet drilling about 1600 holes to depths of 40 to 60 feet and spaced up to 1000 ft. apart.

Comments

No specific information pertaining to the applicant's property are available in the files of the Geological Survey.

U. S. Bureau of Mines drilled large areas of buried black sands in central and northeast Florida (Thoenen, J. R., and Warne, J. D., 1949. Titanium minerals in central and northeastern Florida, U. S. Bureau Mines, Rept. Inv. 4515, 62 pp.); in the favorable areas the sands averaged 1.0 to 2.0 percent heavy minerals, with a few holes exceeding 3.0 percent average. Monazite occurs in only 41 of 103 holes drilled; it is reported as traces in 25 holes, and averages 0.7 percent in the remaining holes (0.4 to 2.1 percent range).

Beach-deposits were mined from 1916 to 1928 near Mineral City, east of Jacksonville. The sands received at the concentration plant averaged 20 percent heavies, of which 2 percent was monazite.

Deposits mined by National Lead Company 5 miles west of the ocean near Jacksonville contain 5 to 11 percent heavy minerals and average approximately 4 percent. Of these heavy minerals only 0.5 percent is monazite.

The applicants state that the beach deposits could be expected to yield 25 percent heavy minerals, and the inland deposits 7.5 percent. It is doubtful if the beach deposits could be mined on a large scale and yield 25 percent heavy minerals because of the discontinuous nature of the black sands. Deposits inland would probably average closer to 5 percent rather than the 7.5 percent stated by the applicant.

Applicant states in one part of the application that the heavy minerals contain 0.5 percent monazite, and in another part 12.5 percent monazite. Available information indicates that the heavy minerals contain 0.5 percent monazite; if the heavy minerals are 4 percent of the total sand, then the total sand contains only 0.02 percent monazite. (.54 lbs / cu. yd.)

Inasmuch as ilminite, zircon, and rutile constitute 70 to 80 percent of the valuable minerals listed in the application, a successful operation would depend on finding those minerals in concentrations and quantity sufficient to permit profitable operations. Monazite would only be a relatively small by-product. Although it might contribute to the value of the product the outcome of the proposed exploration would have to be appraised on the basis of workability of any deposits found for the other minerals. Exploration, therefore, becomes a search for deposits of ilminite, zircon, and rutile under the guise of search for monazite. None of the other minerals nor their component elements are on the list of commodities for which DMEA assistance is now authorized.

Recommendation

In view of the distinctly subordinate amount of monazite relative to other minerals, there is no validity for carrying on the proposed exploration under the guise of exploration for thorium. I recommend that the application be denied.

Arthur P. Butler, Jr.

Copy to E. Wm. Ellis (2)

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D.C.

E. Wm. Ellis, DMEA Member
Uranium Commodity Committee
Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

July 16, 1953

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The applicants state that the beach deposits could be expected to yield 25 percent heavy minerals, and the inland deposits 7.5 percent. It is doubtful if the beach deposits could be mined on a large scale and yield 25 percent heavy minerals because of the discontinuous nature of the black sands. Deposits inland would probably average closer to 5 percent rather than the 7.5 percent stated by the applicant.

Applicant states in one part of the application that the heavy minerals contain 0.5 percent monazite, and in another part 12.5 percent monazite. Available information indicates that the heavy minerals contain 0.5 percent monazite; if the heavy minerals are 4 percent of the total sand, then the total sand contains only 0.02 percent monazite.

Inasmuch as ilminite, zircon, and rutile constitute 70 to 80 percent of the valuable minerals listed in the application, a successful operation would depend on finding those minerals in concentrations and quantity sufficient to permit profitable operations. Monozite would only be a relatively small by-product. Although it might contribute to the value of the product the outcome of the proposed exploration would have to be appraised on the basis of workability of any deposits found for the other minerals. Exploration, therefore, becomes a search for deposits of ilminite, zircon, and rutile under the guise of search for monazite. None of the other minerals nor their component elements are on the list of commodities for which DMA assistance is now authorized.

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Copy to E. M. Ellis (2)

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

July 16, 1953

E. Wm. Ellis, DMEA Member
Uranium Commodity Committee
Arthur F. Butler, Jr., USGS Member, Uranium Commodity Committee

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Copy to E. Wm. Ellis (2)

7/9/53 gla

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JUL - 8 1953

# UNITED STATES
# DEPARTMENT OF THE INTERIOR
## BUREAU OF MINES
WASHINGTON 25, D. C.

July 7, 1953

Memorandum

To: Ernest Wm. Ellis, Chief, Rare and Precious Metals Division, DMEA, Room 4640

From: E. J. Carlson, Commodity-Industry Analyst, Rare and Precious Metals Branch

Subject: Docket No. DMEA-3108, Nuclear Magnetic Mining, Inc., St. Augustine, Florida

The above described docket has been reviewed by this office. There appears to be a slight disagreement in the statements regarding the monazite and black-sand content. On page 2, third paragraph, of "Supplement Sheet to Accompany Form MF-103 --- " there is a statement that the black sands are believed to extend into the area and contain 0.5% monazite. On page 1, fourth paragraph, of "Additional Information to Accompany DMEA Loan Application", it is stated the material being mined by National Lead contains about 0.5% monazite; the feed to mill runs 4% heavy sands which would contain 12.5% monazite, etc.

If this latter statement were true, National Lead in mining 1,100 tons per hour for 24 hours, would mine 26,400 tons which contain 4% black sands or 1,056 tons. If said 1,056 tons of black sands contained 12.5% monazite, then the daily (24-hour) monazite production should be 132 tons. (Monazite production statistics are classified by the AEC; however, such a production of monazite by National Lead would be far from actual production figures.)

The first statement, that the black sands contain 0.5% monazite, is fairly close to what we believe those heavy sands contain in monazite content -- if one considers that the operating companies might only recover 25% of the monazite contained in the black sands. (My examination of the monazite sands, from the enclosed sample, with a 40X hand lens indicates that the monazite is of extremely fine size, and if normal gravity concentration methods were used, an operator could not expect to recover much over 25% of the contained monazite.)

Using above figures gives 5.28 Tons/25% Monazite.

On Form MF-103, item 5, of this application, the first line states that the applicant desires to explore for thorium and hafnium. It is assumed that the thorium would be contained in the monazite and the hafnium in the zircon. However, only a hearsay analysis of the monazite is given, and no analysis of the zircon is mentioned.

This office would be interested to know whether exploration loans are being made, or considered, at this time for either thorium and hafnium or monazite and zircon.

It is recommended that the application be denied for lack of substantiating evidence that either thorium or hafnium exists in minable quantities. The described amounts of rutile and ilmenite should contain many times more value than a possible thorium-hafnium content. It is suggested that the application may receive more consideration if re-submitted on the basis of rutile and ilmenite.

E. J. Carlson

E. J. Carlson

Attachment

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

Department of the Interior
Defense Minerals Administration
RECEIVED
JUL 8 1953

July 7, 1953

Memorandum

To: Ernest Wm. Ellis, Chief, Rare and Precious Metals Division, DMEA, Room 4640

From: E. J. Carlson, Commodity-Industry Analyst, Rare and Precious Metals Branch

Subject: Docket No. DMEA-3108, Nuclear Magnetic Mining, Inc., St. Augustine, Florida

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E. J. Carlson

Attachment

July 3, 1953

Mr. Charles R. Rudolph
5300 Wriley Road
Washington 16, D.C.

Subject: DMEA-3108
Re: Exploration Assistance

My dear Mr. Rudolph:

The receipt of your application dated July 3, 1953, for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-3108 and referred to the Rare & Miscellaneous Metals Division.

Kindly refer to DMEA-3108 in any future correspondence relating to your application.

Sincerely yours,

ROBERT E. ADAMS

Robert E. Adams,
Chief, Operation's Control
and Statistics Division

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

RECEIVED 1953

# APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

*Not to be filled in by applicant*

Docket No. DMEA-3108
Metal or Mineral
Date Received 7/3/53
Estimated Cost
Participation (Government %)

## INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Nuclear Magnetic Mining, Inc., St. Augustine, Florida
Charles R. Rudolph, President, 5300 Wiley Road, Washington 16, D. C.
Tel. OL 2-5250

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract See attached supplements

(*b*) State any mine name by which the property is known. None

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Lessee

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. Copy of Lease Agreement attached.

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4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes. See attached supplements.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades. None

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(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points. See attached supplements.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.
See attached supplements.

5. *The exploration project.*—(a) State the mineral or minerals for which you wish to explore Thorium and Hafnium

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc. See attached supplements.

(*c*) The work will start within 30 days and be completed within 14 months from the date of an exploration project contract.

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[X] Money [X] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

## CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated July 3, 1953

NUCLEAR MAGNETIC MINING, INC.
(Applicant)

By Charles R. Rudolph,
President.

**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—66551-1

MF-103
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## DEFENSE MINERALS EXPLORATION ADMINISTRATION

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16—66551-1

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U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

SUPPLEMENT SHEET TO ACCOMPANY FORM MP-103 APPLICATION FOR AID IN AN EXPLORATION PROJECT SUBMITTED BY THE NUCLEAR MAGNETIC MINING, INCORPORATED, ST. AUGUSTINE, FLORIDA.

FORM MP-103

Item 3(a):

The legal description of the land to be explored is given in detail in the copy of the Prospecting Permit and Lease Agreement accompanying this application and is further delineated in the accompanying map of St. Johns County, Florida. The Agreement was made and executed on June 2, 1953 between Frank E. Upchurch and Ester D. Upchurch and Frank E. Hale and Clara A. Hale, of St. Johns County, parties of the first part, and Nuclear Magnetic Mining, Incorporated, St. Augustine, Florida, party of the second part.

Item 4(a):

There are no existing mine workings or production facilities on this property.

The property is easily accessible by several dirt roads leading off a hard surfaced highway which runs parallel to it. The underbrush and trees are sparse enough to permit heavily tired or tractored vehicles to carry drilling equipment to prospecting areas. Some swamp or marsh land areas may require rafts or pontoon rigs but these areas are small in extent compared to solid ground areas.

Item 4(c):

The area to be prospected shows promise of having deposits of black sands which contain the mineral values sought. It lies close to and west of a stratum of rich mineral bearing sands 3 to 4 feet in depth and extending north and south along the east coast shore line for the full length of the east boundary of the area to be explored. There is evidence of ancient shore lines, inlets and lagoons which were natural catch basins for similar deposits to those exposed along the present strand line. Furthermore, it is probable the exposed deposits will extend westward or inland into the area under consideration. The ancient lagoons and inlets and the present low areas, some of which are marsh lands and small shallow lakes or ponds are probable areas where deposits might be found at depths of 20, 40 or 60 feet.

The exposed material sampled across the face of the stratum assayed approximately 50% heavy or black sands. In a mining operation by drag-line scraper the ore would probably be diluted about 50% so that an estimated 25% black sand recovery is considered reasonable in this enriched area. Inland, in the area to be prospected, dilution would further reduce this percentage recovery to 5 or 10% depending upon depth of overburden.

It is estimated, therefore, that ore bodies will be encountered in the area to be explored developing about 7½% black sands in a mining operation for feed to a recovery plant preliminary plans for which have been designed.

Should profitable ore bodies be discovered, the area lends itself well to mining by dredge, dragline or mechanical shovel.

The black sands in the exposed area which are believed to extend into the area to be prospected contain approximately 0.5% monazite (of which about 5% is thorium), 15% zircon, 5% rutile, 61% ilmenite, the balance being staurolite, kyanite, tourmaline, etc.

According to the Bureau of Mines, the heavy sands originated in igneous and metamorphic rocks and were stream-borne by rivers and ocean currents into Florida from the Piedmont Region of Georgia and the Carolinas. The black sands are concentrated along the present shore line and occur in ancient or fossil shore lines and sand dunes in the west or upland area. As stated in the foregoing, heavy concentrations of the black sands occur parallel to the west boundary of the area to be prospected and ample evidence in the topography of the inland area would indicate a continuance of this enrichment as well as pockets or basins of ore at depth.

Item 4(d):

The area is easily accessible by roads as shown on the accompanying map.

The hard surfaced highway, A-1-A, provides excellent shipping facilities by truck to the St. Augustine railway station of the Florida East Coast Railway some 10 miles away. Also, barge transportation by ocean seaway is within a short distance for shipping to any Atlantic port.

Residential areas exist in St. Augustine, Jacksonville and along the shore line between the two cities. The area to be prospected lies midway between the two cities which are 38 miles apart.

Item 4(e):

Manpower is plentiful in Florida, both skilled and laborers, at standard rates of pay.

Jacksonville particularly and St. Augustine have modern factories and repair shops and necessary equipment and supplies are available for quick repair jobs. Special equipment can be obtained from the larger industrial cities on the Atlantic coast in a matter of days.

Ample water for mine and mill operations is available from small fresh water lakes and from artesian wells which tap the water at a depth of about 60 feet of sufficient volume and pressure for mine and mill needs.

Power is available from state power lines which are located along highway A-1-A.

Item 5(b):

The St. Johns County map attached shows the leased area outlined. A detailed description of this property is given in the accompanying lease Agreement.

It is proposed to explore the area by drilling with the jet type drill used in other areas in Florida. This equipment can be built or rented. This is a rotary core drill having an oil hydraulic feed action. The drill jet action produces only the material cored by the bit to show the character of the core from the surface to the bottom of the hole.

The area will be surveyed in grid fashion and systematically drilled at equal intervals. Preliminary plans are to drill at 400 foot distances and to shorten the intervals wherever mineralization occurs in order to estimate ore reserves. It is estimated that from 160 to 200 vertical feet of drilling can be done per eight hour shift using a 3-man drill crew. Maximum depth per hole should not exceed 60 feet and will probably average about 40 feet per hole.

Full records will be kept of the drilling and results of assays and other pertinent data. Individual and composite samples will be analysed by first tabling on a small laboratory deister table followed by sink-float tests in sedimentation tubes to determine percentages of heavy sands present. Chemical analyses and microscopic studies will be made as required, as well as high frequency and magnetic separation tests to determine the character of the individual minerals present in the black sand.

Item 5(d):

The Nuclear Magnetic Mining Company is an independent Division of the American Mining and Development Company, Incorporated in the State of Delaware. Its officers are as follows:

| | |
|---|---|
| President | Charles H. Rudolph, 5300 Briley Road, Nash. 16, Tenn. |
| Vice-President | Richard H. Rudolph, Western Oil & Gas Co., Newcastle, Wyoming |
| Secretary | George Sutherland Elmore, 1317 F Street, N. W. Washington 4, D. C. |
| Treasurer | S. Howard Rudolph, Jr., Fulton Building, Atlantic, Iowa. |

The exploration work will be under the direct supervision of a registered professional mining and metallurgical engineer having over 25 years' experience in mining and metallurgical operations, Mr. F. James Owen, Box 518, St. Augustine, Florida.

| Item 6: Estimate of Cost | 300 Days |
|---|---|
| (a) Independent Contracts - | |
| Surveying: 1 month at $50.00/day - total | 1,500.00 |
| (b) Labor, supervision, consultants - | |
| Labor: 1 man at $2.75/hr. or $22.00/day | 6,600.00 |
| 2 men at $1.82/hr or $14.56/day (each) | 7,736.00 |
| Laboratory analyst - tabling & separation | 4,200.00 |
| Supervision - 1/3 of supervisor's time | 5,000.00 |
| Consultants - approx. 10 days at $50.00/day | 500.00 |
| Total | 24,036.00 |
| (c&d) Operating Equipment: | |
| Drilling equipment rental at $50.00/day | 15,000.00 |
| Purchase of used truck for supply & transportation | 1,000.00 |
| Auxilliary equipment - shovels, tools, drills, etc. | 1,000.00 |
| Tractor-scraper rental for clearing brush and for minor country road repair, etc. | 2,000.00 |
| Total | 19,000.00 |
| (e) Rehabilitation & Repairs - | |
| None | - |
| (f) Testing laboratory building rental | 600.00 |
| Laboratory jaister table and supplies | 1,000.00 |
| Total | 1,600.00 |
| (g) Miscellaneous - | |
| Repairs & maintenance of equipment, estimated | 3,000.00 |
| Analytical work - chemical and dry separation at $45.00 per sample, estimated number of samples to be tested in this manner - 100 | 4,500.00 |
| Workman's Compensation - 2% of payroll | 471.00 |
| Employer's liability - -ditto- | 471.00 |
| Payroll taxes - -ditto- | 471.00 |
| Total | 8,913.00 |

RECAP.

| | | |
|---|---|---|
| Item (a) | 1,500.00 | |
| " (b) | 24,036.00 | |
| " (c & d) | 19,000.00 | |
| " (e) | -- | |
| " (f) | 1,600.00 | |
| " (g) | 8,913.00 | |
| Total | 55,049.00 | |
| (h) Contingencies & working capital - 20% | 11,010.00 | |
| GRAND TOTAL | 66,059.00 | (12 months) |
| | 77,070.00 | (14 months) |

MF-103
(Revised April 1952)

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Rec'd 7/6/53 JEH

7/9/53

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FORM MP-103

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The legal description of the land to be explored is given in detail in the copy of the Prospecting Permit and Lease Agreement accompanying this application and is further delineated in the accompanying map of St. Johns County, Florida. The Agreement was made and executed on June 2, 1953 between Frank D. Upchurch and Ester D. Upchurch and Frank E. Hale and Clara A. Hale, of St. Johns County, parties of the first part, and Nuclear Magnetic Mining, Incorporated, St. Augustine, Florida, party of the second part.

Item 4(a):

There are no existing mine workings or production facilities on this property.

The property is easily accessible by several dirt roads leading off a hard surfaced highway which runs parallel to it. The underbrush and trees are sparse enough to permit heavily tired or tractored vehicles to carry drilling equipment to prospecting areas. Some swamp or marsh land areas may require rafts or pontoon rigs but these areas are small in extent compared to solid ground areas.

Item 4(c):

The area to be prospected shows promise of having deposits of black sands which contain the mineral values sought. It lies close to and west of a stratum of rich mineral bearing sands 3 to 4 feet in depth and extending north and south along the east coast shore line for the full length of the east boundary of the area to be explored. There is evidence of ancient shore lines, inlets and lagoons which were natural catch basins for similar deposits to those exposed along the present strand line. Furthermore, it is probable the exposed deposits will extend westward or inland into the area under consideration. The ancient lagoons and inlets and the present low areas, some of which are marsh lands and small shallow lakes or ponds are probable areas where deposits might be found at depths of 20, 40 or 60 feet.

The exposed material sampled across the face of the stratum assayed approximately 50% heavy or black sands. In a mining operation by drag-line scraper the ore would probably be diluted about 50% so that an estimated 25% black sand recovery is considered reasonable in this enriched area. Inland, in the area to be prospected, dilution would further reduce this percentage recovery to 5 or 10% depending upon depth of overburden.

It is estimated, therefore, that ore bodies will be encountered in the area to be explored developing about 7½% black sands in a mining operation for feed to a recovery plant preliminary plans for which have been designed.

Should profitable ore bodies be discovered, the area lends itself well to mining by dredge, dragline or mechanical shovel.

The black sands in the exposed area which are believed to extend into the area to be prospected contain approximately 0.5% monazite. (of which about 5% is thorium), 15% zircon, (5% rutile, 61% ilmenite,) the balance being staurolite, kyanite, tourmaline, etc.

According to the Bureau of Mines, the heavy sands originated in igneous and metamorphic rocks and were stream-borne by rivers and ocean currents into Florida from the Piedmont Region of Georgia and the Carolinas. The black sands are concentrated along the present shore line and occur in ancient or fossil shore lines and sand dunes in the west or upland area. As stated in the foregoing, heavy concentrations of the black sands occur parallel to the west boundary of the area to be prospected and ample evidence in the topography of the inland area would indicate a continuance of this enrichment as well as pockets or basins of ore at depth.

Item 4(d):

The area is easily accessible by roads as shown on the accompanying map.

The hard surfaced highway, A-1-A, provides excellent shipping facilities by truck to the St. Augustine railway station of the Florida East Coast Railway some 10 miles away. Also, barge transportation by ocean seaway is within a short distance for shipping to any Atlantic port.

Residential areas exist in St. Augustine, Jacksonville and along the shore line between the two cities. The area to be prospected lies midway between the two cities which are 38 miles apart.

Item 4(e):

Manpower is plentiful in Florida, both skilled and laborers, at standard rates of pay.

Jacksonville particularly and St. Augustine have modern factories and repair shops and necessary equipment and supplies are available for quick repair jobs. Special equipment can be obtained from the larger industrial cities on the Atlantic coast in a matter of days.

Ample water for mine and mill operations is available from small fresh water lakes and from artesian wells which tap the water at a depth of about 60 feet of sufficient volume and pressure for mine and mill needs.

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Item 5(b):

The St. Johns County map attached shows the leased area outlined. A detailed description of this property is given in the accompanying lease Agreement.

It is proposed to explore the area by drilling with the jet type drill used in other areas in Florida. This equipment can be built or rented. This is a rotary core drill having an oil hydraulic feed action. The drill jet action produces only the material cored by the bit to show the character of the core from the surface to the bottom of the hole.

The area will be surveyed in grid fashion and systematically drilled at equal intervals. Preliminary plans are to drill at 400 foot distances and to shorten the intervals wherever mineralization occurs in order to estimate ore reserves. It is estimated that from 160 to 200 vertical feet of drilling can be done per eight hour shift using a 3-man drill crew. Maximum depth per hole should not exceed 60 feet and will probably average about 40 feet per hole.

Full records will be kept of the drilling and results of assays and other pertinent data. Individual and composite samples will be analyzed by first tabling on a small laboratory Deister table followed by sink-float tests in sedimentation tubes to determine percentages of heavy sands present. Chemical analyses and microscopic studies will be made as required, as well as high frequency and magnetic separation tests to determine the character of the individual minerals present in the black sand.

Item 5(d):

The Nuclear Magnetic Mining Company is an independent division of the American Mining and Development Company, Incorporated in the State of Delaware. Its officers are as follows:

| | |
|---|---|
| President | Charles E. Rudolph, 5300 Briley Road, Wash. 16, D.C. |
| Vice-President | Richard D. Rudolph, Western Oil & Gas Co., Newcastle, Wyoming |
| Secretary | George Sutherland Elmore, 1317 F Street, N. W. Washington 4, D. C. |
| Treasurer | S. Howard Rudolph, Jr., Fulton Building, Atlantic, Iowa. |

The exploration work will be under the direct supervision of a registered professional mining and metallurgical engineer having over 25 years' experience in mining and metallurgical operations, Mr. F. James Owen, Box 519, St. Augustine, Florida.

| Item 6: Estimate of Cost | 300 Days |
|---|---|
| (a) Independent Contracts - | |
| Surveying: 1 month at $50.00/day - total | 1,500.00 |
| (b) Labor, supervision, consultants - | |
| Labor: 1 man at $2.75/hr. or $22.00/day | 6,600.00 |
| 2 men at $1.82/hr or $14.56/day (each) | 7,736.00 |
| Laboratory analyst - tabling & separation | 4,200.00 |
| Supervision - 1/3 of supervisor's time | 5,000.00 |
| Consultants - approx. 10 days at $50.00/day | 500.00 |
| Total | 24,036.00 |
| (c&d) Operating Equipment: | |
| Drilling equipment rental at $50.00/day | 15,000.00 |
| Purchase of used truck for supply & transportation | 1,000.00 |
| Auxilliary equipment - shovels, tools, drills, etc. | 1,000.00 |
| Tractor-scraper rental for clearing brush and for minor country road repair, etc. | 2,000.00 |
| Total | 19,000.00 |
| (e) Rehabilitation & Repairs - | |
| None | - |
| (f) Testing laboratory building rental | 600.00 |
| Laboratory Deister table and supplies | 1,000.00 |
| Total | 1,600.00 |
| (g) Miscellaneous - | |
| Repairs & maintenance of equipment, estimated | 3,000.00 |
| Analytical work - chemical and dry separation at $45.00 per sample, estimated number of samples to be tested in this manner - 100 | 4,500.00 |
| Workman's Compensation - 2% of payroll | 471.00 |
| Employer's liability - -ditto- | 471.00 |
| Payroll taxes - -ditto- | 471.00 |
| Total | 8,913.00 |

RECAP.

| | |
|---|---|
| Item (a) | $ 1,500.00 |
| " (b) | 24,036.00 |
| " (c & d) | 19,000.00 |
| " (e) | --- |
| " (f) | 1,600.00 |
| " (g) | 8,913.00 |
| Total | 55,049.00 |
| Contingencies & working capital - 20% | 11,010.00 |
| GRAND TOTAL | $66,059.00 (12 months) |
| | 77,070.00 (14 months) |

## Additional Information to Accompany DMPA Form-Application

### Drilling.

In the previously submitted application it was proposed, as a preliminary exploration program, to drill at 400 foot space intervals.

In the accompanying "Calculation of Drilling Costs Based on Cost Per Foot", 1000 foot intervals are assumed for preliminary grid pattern drilling with secondary holes drilled wherever mineralization occurs in order to estimate reserves. It is difficult to give exact space intervals and total number of holes that will eventually be required to do a thorough exploration job. It is believed, however, because of the nature of the lease holdings as shown on the map, the estimate as previously submitted together with the accompanying cost per foot estimate is reasonably accurate within the realm of forecasting the amount of drilling to be done.

Regarding test holes by auger drilling, it is felt this would not prove satisfactory. Rather, the topography of the land, the evidence of ancient shore lines, inlets, lagoons, sand dunes, etc, is such that, geologically, there is good reason to assume deposits, either in layers or pockets, similar to that which extends the full length of the present shore line, will be encountered in the exploration.

### Monazite and Thorium.

Samples of heavy sands taken from the beach land areas in St. Johns County are known to contain monazite. It is known that the material being mined by National Lead Company, just a few miles north of the area to be prospected, contains about 0.5% monazite. Since this company mines some 1100 tons per hour, the feed to the recovery mill contains only about 4% heavy sands which would contain about 12.5% monazite. In a small mining operation such as we propose to do, selective mining will be possible and relatively more profitable. It is reasonable to assume a recovery of 7½% heavy sands as previously mentioned in the application. Assuming that the heavy sands contain 12.5% monazite, the production of monazite should be proportionately greater and the amount produced would depend upon the tons mined per day.

0.5% monazite in heavies not in total sand

NO! RB.

X

The amount of thorium associated with the monazite is estimated to average about 9% (thorium oxide). It also contains about 0.6% uranium oxide according to assays made on a sample of monazite, found in St. Johns County, by the Atomic Energy Commission in 1949. The sample was highly radioactive by Geiger counter tests. The samples of black or heavy sands which lie on the present shore line and mentioned in the application are also radioactive showing evidence of the presence of thorium bearing monazite.

## Calculation of Drilling Costs

### Based on Cost Per Foot

Total number of acres to be explored..... 30,000 approx.

| | | |
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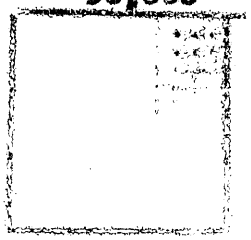
| 1 acre - | | 43,560 square feet |
| - | approx. | 208.2 feet per side |
| 30,000 acres- | " | 173.2 acres per side if area is square. |
| - | " | 208.2 X 173.2 or 36,060 feet per side of area. |

36,060'



← 1,000' centers

If exploratory drilling is made at 1,000 ft. centers, there will be approximately:

$\frac{36,060}{1,000}$ or 36 holes lengthwise ( actually 34 ) and 34 holes transversely, or a total of 34 X 34 or 1156 holes.

Assuming the average depth of each hole is 40 feet, and the cost per foot is $1.25 (which is a figure obtained by a study of other drilling costs established by actual practice in this type of drilling) then, the cost of each hole is 40 X $1.25 or $50.00

Cost of 1156 holes is 1156 X $50.00 or..... $ 57,800.00

Since it will be necessary to shorten the distances between holes where profitable mineralization occurs in order to delineate the reserves, an extra number of holes will be required.

The previously submitted cost, or..... $ 77,070.00
will provide for this extra expense in the amount of $ 19,270.00

This extra amount will pay for the drilling of approximately $\frac{19,270}{50}$ or 400 extra holes for this purpose.

## Explanation of Costs.

### Item 6(a)-Surveying.

It will be necessary from time to time to survey certain sections of land under lease agreement which lie adjacent to privately owned sections.

While the land under the lease agreement is fully described in the lease as it is recorded in the land registry office, there will be occasions when missing markers or monuments will have to be reestablished so as to prevent encroachment on private property. Provision has, therefore, been made for the engaging of land surveyors for this purpose. It is estimated not more than 30 days in all at broken intervals will be required for this work.

Actual surveying of hole locations will be done by the drill crew who will be provided with a surveyor's chain and a compass.

ADDRESS REPLY TO:
Raw Materials Operations
U.S. Atomic Energy Commission
P.O. Box 30, Ansonia Station
New York 23, New York

UNITED STATES
ATOMIC ENERGY COMMISSION
Raw Materials Operations
New York Office

AND REFER TO:
RME:RDN

May 11, 1949

Harry H. Vaughan
Major General, U. S. Army (Res)
Military Aide to the President
The White House
Washington, D. C.

Subject: PORTMAN MINERAL COMPANY

Dear General Vaughan:

Reference is made to your letter of May 3rd referring to our letters of December 10, 1948 and March 18, 1949 to Mr. D. E. Porter and requesting information on the Atomic Energy Commission's policy toward certain deposits which contain uranium and thorium owned by the Portman Mineral Company in Florida.

Our examination of the sample submitted by Mr. Porter showed that it consisted primarily of the mineral monazite, a rare earth phosphate containing, in this case, approximately 5% thorium oxide and approximately 0.60% uranium oxide. Monazite is currently imported into the United States from Brazil for processing by commercial firms primarily for its rare earths content which is used in the manufacture of high intensity carbon arcs for the motion picture industry, refractories, polishing compounds and certain chemical reagents. A portion of the thorium content of the monazite is also employed commercially in the manufacture of gas mantles and has certain other minor uses. There is a present demand for monazite which exceeds the available supply and, therefore, Mr. Porter should have no difficulty in disposing of his production to one of the companies in the rare earths industry. As indicated in the attached copy of a press release recently issued by the Commission, we are not presently procuring thorium ores, but are meeting such requirements as we have for thorium through purchase of excess thorium salts from the monazite processing companies.

Although the sample submitted by Mr. Porter contains about twice the usual amount of uranium found in most monazite and the uranium content is somewhat higher than that of domestic uranium ores now being mined in Colorado and Utah, the metallurgical difficulties involved

Major General Harry H. Vaughan
May 6, 1949

in recovering the uranium from the monazite due to its refractory nature and the relatively small tonnages available appear to be too great at this time to warrant consideration of these deposits by the Commission as a source for uranium. The recoverable uranium from the maximum monazite production which Mr. Porter indicated was possible from his deposits would amount to less than 5 tons of uranium oxide per year, and the cost of recovery on the basis of our present knowledge would be many times our currently guaranteed prices for uranium salts. The Commission's domestic uranium circular No. 1 is enclosed for your information in regard to our present price policy. We do have underway a research program directed toward the eventual solution of the problem of recovery of uranium from the monazite processed by the rare earths industry, but at the present time this industry cannot recover uranium at a cost which the Commission would be justified in paying for the small amount available and, therefore, no value can be attached to the uranium content in Mr. Porter's monazite ores.

We, therefore, feel that the best possible disposition by Mr. Porter of the production from his deposits would be to the rare earth industry. We understand that the present price for monazite is in the neighborhood of $150 to $200 a ton, and we feel sure that should production be possible at these prices Mr. Porter will have no difficulty in disposing of any amount that he can produce.

We hope the above provides a satisfactory explanation to you, Senator Fraser and Mr. Porter of the problem involved in this case and indicated the most promising course of action for Mr. Porter. If we may provide any additional information for your consideration, we will be only too happy to do so.

Very truly yours,

Robert D. Nininger
Assistant to the Manager

Enclosures(2)
1. Press Release re Thorium (in trip.)
2. Circular No. 1 (in trip.)

Raw Materials Operations
U.S. Atomic Energy Commission
P.O. Box 30, Ansonia Station
New York 23, New York

No. 10 [illegible]
Raw Materials Operations
New York Office

[illegible]

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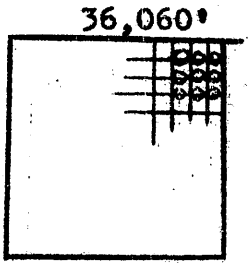


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Mr. Kolb

We will accept any information that has possibility that higher ones further process your application.

a) Have any test pit or equivalent been taken on your own property. (Beach)

b). Is a sample of Monazite enclosed with application from your property. → yes, beach.

c) Estimate of Monazite and other industrial sands to be marketed - ?

5% → d) % of monazite in blacksand (contents)

5% → e) % Thorium in Monazite ( " " )

.06 f) % Uranium " " ( " " )

g) (% Hafnium) ——— or (Zircon) 2% Hf

15% of Black sands from Rodolf

? Jet sampling.

E&M.J. May 1952 - Page 82

Dupont.

Starke Fla - 40 miles S.W. Jacksonville

109 acres of pure Zircon.

beds depth 20 to 70' - Avg. 35'

2 to 10% heavy sands. (no segregation of values in any large area)

$TiO_2$ - 28 to 33% of blacksand

of every ton of material dredged 2% is titanium mineral, of which 70% is recovered

500 Tons/24 hrs

expect 50 tons minerals.

SUPPLEMENT SHEET TO ACCOMPANY FORM MF-103 APPLICATION FOR AID IN AN EXPLORATION PROJECT SUBMITTED BY THE NUCLEAR MAGNETIC MINING, INCORPORATED, ST. AUGUSTINE, FLORIDA.

FORM MF-103

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It is proposed to explore the area by drilling with the jet type drill used in other areas in Florida. This equipment can be built or rented. This is a rotary core drill having an oil hydraulic feed action. The drill jet action produces only the material cored by the bit to show the character of the core from the surface to the bottom of the hole.

The area will be surveyed in grid fashion and systematically drilled at equal intervals. Preliminary plans are to drill at 400 foot distances and to shorten the intervals wherever mineralization occurs in order to estimate ore reserves. It is estimated that from 160 to 200 vertical feet of drilling can be done per eight hour shift using a 3-man drill crew. Maximum depth per hole should not exceed 60 feet and will probably average about 40 feet per hole.

Full records will be kept of the drilling and results of assays and other pertinent data. Individual and composite samples will be analyzed by first tabling on a small laboratory Deister table followed by sink-float tests in sedimentation tubes to determine percentages of heavy sands present. Chemical analyses and microscopic studies will be made as required, as well as high frequency and magnetic separation tests to determine the character of the individual minerals present in the black sand.

Item 5(d):

The Nuclear Magnetic Mining Company is an independent division of the American Mining and Development Company, Incorporated in the State of Delaware. Its officers are as follows:

| | |
|---|---|
| President | Charles R. Rudolph, 5300 Wriley Road, Wash. 16,D.C. |
| Vice-President | Richard D. Rudolph, Western Oil & Gas Co., Newcastle, Wyoming |
| Secretary | George Sutherland Elmore, 1317 F Street, N. W. Washington 4, D. C. |
| Treasurer | S. Howard Rudolph, Jr., Fulton Building, Atlantic, Iowa. |

The exploration work will be under the direct supervision of a registered professional mining and metallurgical engineer having over 25 years' experience in mining and metallurgical operations, Mr. F. James Owen, Box 519, St. Augustine, Florida.

| Item 6: Estimate of Cost | 300 Days |
|---|---|
| (a) Independent Contracts - | |
| Surveying: 1 month at $50.00/day - total | $ 1,500.00 |
| (b) Labor, supervision, consultants - | |
| Labor: 1 man at $2.75/hr. or $22.00/day | 6,600.00 |
| 2 men at $1.82/hr or $14.56/day (each) | 7,736.00 |
| Laboratory analyst - tabling & separation | 4,200.00 |
| Supervision - 1/3 of supervisor's time | 5,000.00 |
| Consultants - approx. 10 days at $50.00/day | 500.00 |
| Total | 24,036.00 |
| (c&d) Operating Equipment: | |
| Drilling equipment rental at $50.00/day | 15,000.00 |
| Purchase of used truck for supply & transportation | 1,000.00 |
| Auxilliary equipment - shovels, tools, drills, etc. | 1,000.00 |
| Tractor-scraper rental for clearing brush and for minor country road repair, etc. | 2,000.00 |
| Total | 19,000.00 |
| (e) Rehabilitation & Repairs - | |
| None | - |
| (f) Testing laboratory building rental | 600.00 |
| Laboratory Deister table and supplies | 1,000.00 |
| Total | 1,600.00 |
| (g) Miscellaneous - | |
| Repairs & maintenance of equipment, estimated | 3,000.00 |
| Analytical work - chemical and dry separation at $45.00 per sample, estimated number of samples to be tested in this manner - 100 | 4,500.00 |
| Workman's Compensation - 2% of payroll | 471.00 |
| Employer's liability - -ditto- | 471.00 |
| Payroll taxes - -ditto- | 471.00 |
| Total | $ 8,913.00 |

RECAP.

| | | |
|---|---|---|
| Item (a) | $ 1,500.00 | |
| " (b) | 24,036.00 | |
| " (c & d) | 19,000.00 | |
| " (e) | -- | |
| " (f) | 1,600.00 | |
| " (g) | 8,913.00 | |
| Total | 55,049.00 | |
| (h) Contingencies & working capital - 20% | 11,010.00 | |
| GRAND TOTAL | $66,059.00 | (12 months) |
| | $77,070.00 | (14 months) |

ADDRESS REPLY TO:
Raw Materials Operations
U.S. Atomic Energy Commission
P.O. Box 30, Ansonia Station
New York 23, New York

UNITED STATES
ATOMIC ENERGY COMMISSION
Raw Materials Operations
New York Office

AND REFER TO:
RME:RDN

May 11, 1949

Harry H. Vaughan
Major General, U. S. Army (Res)
Military Aide to the President
The White House
Washington, D. C.

Subject: PORTMAN MINERAL COMPANY

Dear General Vaughan:

Reference is made to your letter of May 3rd referring to our letters of December 10, 1948 and March 18, 1949 to Mr. D. E. Porter and requesting information on the Atomic Energy Commission's policy toward certain deposits which contain uranium and thorium owned by the Portman Mineral Company in Florida.

Our examination of the sample submitted by Mr. Porter showed that it consisted primarily of the mineral monazite, a rare earth phosphate containing, in this case, approximately 5% thorium oxide and approximately 0.60% uranium oxide. Monazite is currently imported into the United States from Brazil for processing by commercial firms primarily for its rare earths content which is used in the manufacture of high intensity carbon arcs for the motion picture industry, refractories, polishing compounds and certain chemical reagents. A portion of the thorium content of the monazite is also employed commercially in the manufacture of gas mantles and has certain other minor uses. There is a present demand for monazite which exceeds the available supply and, therefore, Mr. Porter should have no difficulty in disposing of his production to one of the companies in the rare earths industry. As indicated in the attached copy of a press release recently issued by the Commission, we are not presently procuring thorium ores, but are meeting such requirements as we have for thorium through purchase of excess thorium salts from the monazite processing companies.

Although the sample submitted by Mr. Porter contains about twice the usual amount of uranium found in most monazite and the uranium content is somewhat higher than that of domestic uranium ores now being mined in Colorado and Utah, the metallurgical difficulties involved

Major General Harry H. Vaughan
May 6, 1949

in recovering the uranium from the monazite due to its refractory nature and the relatively small tonnages available appear to be too great at this time to warrant consideration of these deposits by the Commission as a source for uranium. The recoverable uranium from the maximum monazite production which Mr. Porter indicated was possible from his deposits would amount to less than 5 tons of uranium oxide per year, and the cost of recovery on the basis of our present knowledge would be many times our currently guaranteed prices for uranium salts. The Commission's domestic uranium circular No. 1 is enclosed for your information in regard to our present price policy. We do have underway a research program directed toward the eventual solution of the problem of recovery of uranium from the monazite processed by the rare earths industry, but at the present time this industry cannot recover uranium at a cost which the Commission would be justified in paying for the small amount available and, therefore, no value can be attached to the uranium content in Mr. Porter's monazite ores.

We, therefore, feel that the best possible disposition by Mr. Porter of the production from his deposits would be to the rare earth industry. We understand that the present price for monazite is in the neighborhood of $150 to $200 a ton, and we feel sure that should production be possible at these prices Mr. Porter will have no difficulty in disposing of any amount that he can produce.

We hope the above provides a satisfactory explanation to you, Senator Fraser and Mr. Porter of the problem involved in this case and indicated the most promising course of action for Mr. Porter. If we may provide any additional information for your consideration, we will be only too happy to do so.

Very truly yours,

Robert D. Nininger
Assistant to the Manager

Enclosures(2)
1. Press Release re Thorium (in trip.)
2. Circular No. 1 (in trip.)

[illegible]
[illegible] Atomic Energy Commission
[illegible] Box [illegible], Ansonia Station
New York [illegible], New York

[illegible]

[illegible] [illegible], 1.4[illegible]

Harry H. Vaughan
Major General, U. S. Army (Ret.)
Military Aide to the President
The White House
Washington, D. C.

Subject: [illegible]

Dear General Vaughan:

Reference is made to your letter of [illegible] referring to our letters of December 13, 1948 and March 1, 1949 to Mr. [illegible] Porter and requesting information on the Atomic Energy Commission's policy to and our aim do quite which contain uranium and thorium ores by the Porter Mineral Company in Florida.

Our consideration of the sample submitted by Mr. Porter showed that the available priority of the Mineral Corporation, a new entity possibly containing, in this case, a [illegible] of Florida monazite and a [illegible] for [illegible] Monazite is our only important ore in the United States that [illegible] for processing by commercial firms primarily for the rare earth content which is used in the manufacture of high temperature carbon arcs for the motion picture industry, refractories, [illegible] and our aim chemical reagents. A portion of the thorium content of the monazite is used in lamp mantles, especially in the manufacture of gas mantles and in our aim at our inner space. There is a permanent demand for monazite which exceeds the available supply and, therefore, Mr. Porter should have no difficulty in disposing of his production to one of the companies in the rare earths business. As he is aware, in the allocation of a quota related recently issued by the Commission, we are not presently requiring thorium ores, but we retain our requirements and have for thorium through purchase of excess thorium nitrate from the monazite processing companies.

Although the sample submitted by Mr. Porter contains about [illegible] the usual amount of uranium and thorium ore and the uranium content is considerably higher than that of most of the uranium ores being mined in Colorado and Utah, the available tons (little more than) [illegible]

Major General Harry [illegible] Vaughan
May 6, 1[illegible]

In recovering the uranium from the monazite due to the refractory nature and the relatively small tonnage available appear to be too great at this time to warrant consideration of these ores for by the Commission as a source for uranium. The recoverable uranium from the monazite production which Dr. Porter indicated was possible from his research would amount to less than 5 tons of uranium oxide per year, and the cost of recovery on the basis of our present knowledge would be many times our currently guaranteed prices for [illegible]. The Commission's decision is uranium circular No. 1 is enclosed for your information in regard to our present price policy. We have informally a research program [illegible] the economic condition of the problem of recovery of uranium from the monazite processed by the rare earth industry, but at the present time this industry cannot recover uranium at a cost which the Commission would be justified in paying for the small amount available and, therefore, no value can be attached to the uranium content in Dr. Porter's monazite ores.

In, however, the [illegible] the proposition by Dr. Porter of the production from [illegible] would be to the [illegible] industry. We understand that the present price for monazite is in the neighborhood of $[illegible] to $[illegible] a ton, and we feel sure that should production be possible at these prices Dr. Porter will have no difficulty in disposing of your share [illegible].

In view of the above, [illegible] any explanation you may have or any other Dr. Porter of the problems involved in this [illegible] indicated the [illegible] the course of action for Dr. Porter. If [illegible] any additional information for your consideration, it will be only too happy to do so.

Very truly yours,

Robert A. Hinsinger
Assistant to the Director

Enclosure(s):
1. Press Release re Shipping (in file.)
2. Circular No. 1 (in file.)

## Additional Information to Accompany DMEA Loan Application

### Drilling.

In the previously submitted application it was proposed, as a preliminary exploration program, to drill at 400 foot space intervals.

In the accompanying "Calculation of Drilling Costs Based on Cost Per Foot", 1000 foot intervals are assumed for preliminary grid pattern drilling with secondary holes drilled wherever mineralization occurs in order to estimate reserves. It is difficult to give exact space intervals and total number of holes that will eventually be required to do a thorough exploration job. It is believed, however, because of the nature of the lease holdings as shown on the map, the estimate as previously submitted together with the accomanying cost per foot estimate is reasonably accurate within the realm of forecasting the amount of drilling to be done.

Regarding test holes by auger drilling, it is felt this would not prove satisfactory. Rather, the topography of the land, the evidence of ancient shore lines, inlets, lagoons, sand dunes, etc, is such that, geologically, there is good reason to assume deposits, either in layers or pockets, similar to that which extends the full length of the present shore line, will be encountered in the exploration.

### Monazite and Thorium.

Samples of heavy sands taken from the beach land areas in St. Johns County are known to contain monazite. It is known that the material being mined by National Lead Company, just a few miles north of the area to be prospected, contains about 0.5% monazite. Since this company mines some 1100 tons per hour, the feed to the recovery mill contains only about 4% heavy sands which would contain about 12.5% monazite. In a small mining operation such as we propose to do, selective mining will be possible and relatively more profitable. ? It is reasonable to assume a recovery of 7½% heavy sands as previously mentioned in the application. Assuming that the heavy sands contain 12.5% monazite, the production of monazite should be proportionately greater and the amount produced would depend upon the tons mined per day.

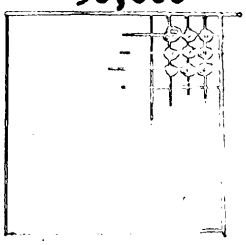
The amount of thorium associated with the monazite is estimated to average about 5%(thorium oxide). It also contains about 0.6% uranium oxide according to assays made on a sample of monazite, found in St. Johns County, by the Atomic Energy Commission in 1949. The sample was highly radioactive by Geiger counter tests. The samples of black or heavy sands which lie on the present shore line and mentioned in the application are also radioactive showing evidence of the presence of thorium bearing monazite.

## Calculation of Drilling Costs
## Based on Cost Per Foot

Total number of acres to be explored..... 30,000 approx.

| | | |
|---|---|---|
| 1 acre - | | 43,560 square feet |
| - | approx. | 208.2 feet per side |
| 30,000 acres- | " | 173.2 acres per side if area is square. |
| - | " | 208.2 X 173.2 or 36,060 feet per side of area. |

36,060'



← 1,000' centers

If exploratory drilling is made at 1,000 Ft. centers, there will be approximately:

$\frac{36,060}{1,000}$ or 36 holes lengthwise ( actually 34 ) and 34 holes transversely, or a total of 34 X 34 or 1156 holes.

Assuming the average depth of each hole is 40 feet, and the cost per foot is $1.25(which is a figure obtained by a study of other drilling costs established by actual practice in this type of drilling) then, the cost of each hole is 40 X $1.25 or $50.00

Cost of 1156 holes is 1156 X $50.00 or..... $ 57,800.00

Since it will be necessary to shorten the distances between holes where profitable mineralization occurs in order to delineate the reserves, an extra number of holes will be required.

The previously submitted cost, or..... $ 77,070.00
will provide for this extra expense in the amount of $ 19,270.00

This extra amount will pay for the drilling of approximately $\frac{19,270}{50}$ or 400 extra holes for this purpose.

## Explanation of Costs.

### Item 6(a)-Surveying.

It will be necessary from time to time to survey certain sections of land under lease agreement which lie adjacent to privately owned sections.

While the land under the lease agreement is fully described in the lease as it is recorded in the land registry office, there will be occasions when missing markers or monuments will have to be reestablished so as to prevent encroachment on private property. Provision has, therefore, been made for the engaging of land surverors for this purpose. It is estimated not more than 30 days in all at broken intervals will be required for this work.

Actual surveying of hole locations will be done by the drill crew who will be provided with a surveyor's chain and a compass.

PROSPECTING PERMIT AND LEASE AGREEMENT

THIS INDENTURE, Made and executed in duplicate this 2nd day of June, 1953, by and between FRANK D. UPCHURCH AND ESTER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, of St. Johns County, Florida, parties of the first part, and NUCLEAR-MAGNETIC MINING, INCORPORATED, a Florida corporation with its principal place of business in St. Augustine, Florida, party of the second part,

WHEREAS, FRANK D. UPCHURCH and FRANK E. HALE, two of the parties of the first part, are owners in fee simple of lands, portions of which are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 5 SOUTH, RANGE 27 EAST:

Lot 1, Section 34.

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

All unsurveyed parts of Sections 17 and 18. Subject to all deeds and easements now held by the United States of America in connection with the construction and maintenance of an intra-coastal waterway from Jacksonville, Florida, to Miami, Florida, and subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida, to Wilfred Beswick under deed #16382, recorded in Deed Book 25, Page 120, public records of St. Johns County, Florida.

IN TOWNSHIP 4 SOUTH, RANGE 29 EAST:

Lot 4, Section 14,

Lot 3, Section 23,

Lot 6 and all the parts of Lots 1, 4, 5, and 7 of Section 15 lying southerly and easterly of State Road 306,

Unsurveyed Section 23,

Unsurveyed Section 26,

Unsurveyed parts of Sections 27 and 34 lying east of Florida Intracoastal Waterway,

Unsurveyed Section 35,

Unsurveyed Section 36,

N. Sanchez Grant or Section 52,

Section 46, except 25 acres sold to Barkoskie, 9 acres sold to J. Mickler, 18 acres sold to F. J. Mickler, 8 acres sold to Oesterriecher and 42 acres sold to Mabry,

F. P. Sanchez Grant or Section 53,

Davis Floyd Grant or Section 56, containing 832.98 acres, more or less, subject to an undivided one-fourth interest now or formerly owned by H. Kimball Benedict in 415 acres described as follows: All of Davis Floyd Grant or Section 56, less the north 150 acres, the south 247.98 acres, and 20 acres of the remaining 435 acres, said 20 acres being the same parcel of land excepted in deed recorded in Deed Book 67, Page 536, public records of St. Johns County, Florida,

Section 72, except 2 acres sold to Barkoskie,

F. P. Sanchez Grant or Section 73,

Section 74, except 14.5 acres sold to Mabry, 28 acres sold to Farson and 10 acres sold to McDaniel.

IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:

Unsurveyed part of Section 1,

Lots 1 and 2 and unsurveyed part of Section 2,

Unsurveyed part of Section 3 lying east of Florida Intracoastal Waterway,

Unsurveyed part of Section 10 lying east of Florida Intracoastal Waterway,

Lots 6 and 9 and unsurveyed part of Section 11,

Lot 3 and unsurveyed part of Section 12,

Lots 2 and 3 and unsurveyed part of Section 13,

All of Section 14, surveyed and unsurveyed,

All unsurveyed part of Section 15 lying east of Florida Intracoastal Waterway,

Unsurveyed Section 23,

Part of unsurveyed Section 24 lying west of Guano River, same being a tract of marsh land bounded on the north by unsurveyed Section 13, bounded on the east by the waters of Guano River, bounded on the south by unsurveyed Section 25 and bounded on the west partly by Grant to G. Marunelli (Section 50), partly by Grant to A. Atkinson, or Cocifacio (Section 51) and partly by Grant to Pedro Cocifacio (Section 52). Subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 154, Page 59, public records of St. Johns County, Florida,

Section 26, said land being a tract of marsh land with a few widely scattered small islands in same, said tract of land being bounded on the north by unsurveyed Section 23, bounded on the west by unsurveyed Section 27 for a distance of about 100 feet near the northwest corner of said Section 26, and bounded on the west south of said point by the waters of North River

sometimes known as Tolomato River, bounded on the south partly by the waters of said North River aforementioned, and partly by unsurveyed Section 35, and bounded on the east partly by Section 46 or the Grant to Mariano Berta and partly by unsurveyed Section 25. Subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 154, Page 59, public records of St. Johns County, Florida,

Unsurveyed Section 25,

Unsurveyed Section 27,

Lot 1 and those parts of Lots 2 and 3 lying east of Florida East Coast Railway, Section 30,

Unsurveyed part of Section 35,

D. Floyd Grant or Section 37,

John Floyd Grant or Section 38,

J. P. DeBurgo Grant or Section 50,

F. P. Sanchez Grant or Section 67,

G. I. F. Clark Grant or Section 68,

Atkinson or Cocifacio Grant or Section 51,

Pedro Cocifacio Grant or Section 52,

Lot 3 of Section 2, and Lots 1, 2, 3, 4, 5, 7, and 8 of Section 11. Subject to reservations in deed dated February 12, 1944 from the Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 148, Page 119, public records of St. Johns County, Florida.

<u>IN TOWNSHIP 6 SOUTH, RANGE 29 EAST:</u>

Unsurveyed part of Section 1,

Unsurveyed part of Section 11,

Unsurveyed part of Section 13,.

IN TOWNSHIP 7 SOUTH, RANGE 29 EAST:

N½ of Fractional Section 14, except the east 610 feet thereof,

Lots 1 and 4 of Section 35 lying and being north and west of Dixie Highway. Said Dixie Highway being the brick road from St. Augustine to Hastings, Florida,

Peter Seville Grant or Section 38,

Embara Grant or Section 42.

IN TOWNSHIP 6 SOUTH, RANGE 30 EAST:

Unsurveyed Section 7.

IN TOWNSHIP 7 SOUTH, RANGE 30 EAST

E½ of NW¼ and NE¼ of SW¼ of Section 28,

and portions of which lands are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

The unsurveyed parts of Sections 5 and 8 and all that part of unsurveyed Sections 6 and 7 lying east of the Florida Intracoastal Waterway. Subject and inferior to all deeds and easements now held by the United Stated of America in connection with the construction and maintenance of an intracoastal waterway from Jacksonville, Florida to Miami, Florida, and also subject and inferior to reservations contained in deed from the Trustees of the Internal Improvement Fund of the State of Florida to Wilfred Beswick under deed #16382, recorded in Deed Book 93, Page 676, public records of Duval County, Florida, and to reservations contained in deed #16278 from the Trustees of the Internal Improvement Fund of the State of Florida to I. Brenner recorded in Deed

Book 65, Page 398, public records of Duval County, Florida.

ALL OF THE ABOVE DESCRIBED LANDS CONTAINING 12,376.87 ACRES, MORE OR LESS,

WHEREAS, FRANK D. UPCHURCH and FRANK E. HALE, two of the parties of the first part, are the owners of the title to all of the oil, gas and other minerals and mineral rights, whether metallic or non-metallic, in and under the lands hereinafter described, with the perpetual right of ingress and egress to and from said lands for the purpose of drilling, exploring and mining and in every way operating for such oil, gas and other minerals and mineral rights and removing the same, portions of which lands are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 6 SOUTH, RANGE 27 EAST:

W½ of SE¼ of Section 23,

Government Lot 1, Section 26,

S½ of Government Lot 4, Section 35.

IN TOWNSHIP 5 SOUTH, RANGE 28 EAST:

W½ of NE¼ of SW¼ of Section 3,

SW¼, except part subdivided as Hilden, of Section 12,

E½ of Section 12,

NE ¼ of Section 13, except portion subdivided as Hilden,

NE¼ of Section 16.

IN TOWNSHIP 8 SOUTH, RANGE 28 EAST:

Lots 9, 10, 14, and 15 of Section 19,

NW¼ of NE¼, NW¼ of SE¼, SE¼ of NW¼, S½ of NE ¼ of NW¼ and W½ of SW¼ of NE¼ of Section 20,

SW¼ of NW¼ and W½ of SW¼ of Section 20.

IN TOWNSHIP 9 SOUTH, RANGE 28 EAST:

E½ of E½ of Section 12.

IN TOWNSHIP 4 SOUTH, RANGE 29 EAST:

Part of Lot 13 of Section 29 lying south and east of State Road 306,

Part of Section 31 lying south and east of State Road 306,

All of Section 55, except part conveyed to W. F. Mickler, by deed dated April 2, 1938 and recorded in Deed Book 116, Page 471, public records of St. Johns County, Florida, and except part conveyed to W. Alfred Mickler by deed dated April 2, 1938 and recorded in Deed Book 116, Page 474, public records of St. Johns County, Florida, and except part conveyed to James R. Stockton by deed dated April 22, 1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida, and except part conveyed to E. P. Kirkland by deed dated March 14, 1945 and recorded in Deed Book 149, Page 467, public records of St. Johns County, Florida,

All of Section 57,

All of Section 58,

All of Section 59,

All of Section 60,

All of Section 61,

All of Section 62,

All of Section 63,

All of Section 64,

All unsurveyed parts of Sections 27 and 34 lying west of the Intracoastal Waterway right of way, except part of Section 27 conveyed to James R. Stockton by deed dated April 22,

1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida,

Part of unsurveyed Section 28 lying south of the south line of land conveyed to James R. Stockton by deed dated April 22, 1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida.

IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:

Lot 1 of Section 3,

All of Section 4,

Government Lot 3 and part of Government Lot 1 lying east of the west line of Section 63 (F. P. Sanchez Grant) if said west line were projected north 8 degrees west to the north township line, all in Fractional Section 5,

All of Section 7,

All of Section 8,

All of Fractional Section 9,

All of Section 16,

All of Section 17,

All of Section 18,

Lots 1, 2, 3, 6, 7, 8, 9, and Lot 5 (except parts lying within the right of way of Florida East Coast Railway and the right of way of United States Highway Number 1) and also 10 acres in the northeast corner of Government Lot 4, more particularly described as follows: Beginning at the northeast corner of sais Government Lot 4, run thence southerly along the east line of said Government Lot, 660 feet to a stake, run thence northwesterly parallel to the north line of said Government Lot, 660 feet to a stake, run thence northerly parallel to the east line of said Government Lot, 660 feet to the north line of said Government Lot, run thence easterly along the north line of said Government Lot, 660 feet to the point of beginning, all in Section 19,

All of Section 20,

All of Section 21,

All of Section 39,

All of Roque Leonardi Grant or Section 61, except land conveyed to W. R. Stokely by deed recorded in Deed Book 43, Page 207, public records of St. Johns County, Florida, and except part conveyed to Carrie Tyner by deed recorded in Deed Book 76, Page 192, public records of St. Johns County, Florida, and also except part conveyed to Truman Solana by deed recorded in Deed Book 76, Page 245, public records of St. Johns County, Florida,

All of Section 62,

All of Section 63,

All of Section 64,

All of Section 65,

All of Section 66,

All unsurveyed portion of Section 3, lying west of Intracoastal Waterway right of way,

All unsurveyed part of Section 10 lying west of Intracoastal Waterway right of way,

All of Section 15, surveyed and unsurveyed, lying west of Intracoastal Waterway right of way,

All of parts of Lots 2 and 3 of Section 30 lying west of Florida East Coast Railway Company's right of way,

All of Fractional Section 33 except rights of way of railroad and roads and highways.

IN TOWNSHIP 6 SOUTH, RANGE 29 EAST:

All of Fractional Section 10,

Lots 1, 2, and 3 of Section 15,

Part of Pablo Sabate Grant or Section 50 lying west of Florida East Coast Railway Company's right of way, except the following premises included in the above description: Beginning at a point in the westerly right of way limit of the Florida

East Coast Railway, 2040 feet southerly from said Railway Company's mile post 28 on its main line from Jacksonvill to Key West; thence westerly at right angles to said westerly right of way limit, 100 feet; thence southerly at right angles 100 feet westerly from and parallel to said westerly right of way limit, 400 feet; thence easterly at right angles 100 feet to a point in said westerly right of way limit; thence northerly at right angles and along said westerly right of way limit 400 feet to the point of beginning, containing .92 acres, more or less and being part of the Pable Sabate Grant, Section 50,

Lots 7 and 10 of Section 20,

Lots 12 and 13 of Section 21,

Lots 6, 11 and 12 of Section 28,

All of Fractional Section 23,

Lots 1, 2, 3 and 7 of Section 26,

Lots 1, 2, 7, 8 and 9, except 10 acres in east part of Lot 8, of Section 27,

Lot 1 of Section 34.

IN TOWNSHIP 7 SOUTH, RANGE 29 EAST:

All of Section 20, except the E½ of the NE¼,

Government Lot 2, the N½ of the SW¼ and the SE¼ of the SW¼ of Section 28,

Lots 3 and 6 of Section 33.

IN TOWNSHIP 8 SOUTH, RANGE 30 EAST:

Lots 1, 2 and 3 of Section 17,

Lot 10 of Section 19,

NE¼ of SE¼ and N½ of SW¼, except Florida East Coast Railway Company's right of way, Section 29,

Lots 5, 8, 11 and 12 of Section 19,

Lots 2 and 3 and the parts of Lots 4 and 5 east of the Old Moultrie Road of Section 30, excepting 2 acres, more

or less, conveyed to Rt. Rev. Wm. Kenny, Bishop, by quit claim deed dated December 23, 1905, and recorded in Deed Book 10, Page 438, public records of St. Johns County, Florida; also excepting the right of way of U. S. Highway Number 1 as now located; also excepting easement for drainage ditch described in deed from Heth Canfield to Clay Bottom Farm Company, dated April 23, 1910 and recorded in Deed Book 15, Page 248, public records of St. Johns County, Florida, and excepting any land within 600 feet, more or less, of the right of way of U. S. Highway Number 1 as now located;

NE$\frac{1}{4}$; E$\frac{1}{2}$ of NW$\frac{1}{4}$ and S$\frac{1}{2}$ of Section 32, except part conveyed to State Road Department of Florida by deed dated April 8, 1941 and recorded in Deed Book 129, Page 434, public records of St. Johns County, Florida.

IN TOWNSHIP 9 SOUTH, RANGE 30 EAST:

NW$\frac{1}{4}$ of SW$\frac{1}{4}$ of Section 8,

Lots 2, 3, 4, 5, 9, 10, 11, 12 and 13 of Section 15,

Grant to Mestre or Section 40.

IN TOWNSHIP 10 SOUTH, RANGE 30 EAST:

Part of SE$\frac{1}{4}$ of NW$\frac{1}{4}$ of Section 7 lying north of Pellicer Creek,

and portions of shich lands are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

Parts of unsurveyed Sections 6 and 7 lying west of Florida Intracoastal Waterway. Subject to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida, recorded in Deed Book 93, Page 676, public records of Duval County, Florida.

ALL OF THE ABOVE DESCRIBED LANDS CONTAINING 16,565.32 ACRES, MORE OR LESS.

NOW, THEREFORE, THIS INDENTURE WITNESSETH:

That in consideration of $1.00 and other good and valuable considerations, to them in hand paid, the receipt whereof is hereby acknowledged, parties of the first part hereby grant to party of the second part, and its assigns, insofar as it is legally possible for them to do so, the right to go upon said premises at any and all times by itself, its agents, laborers and assigns with beasts and vehicles, loaded and unloaded, and to erect thereon the suitable paraphernalia necessary for the purpose of drilling, digging and prospecting for minerals and metals, except oil and gas.

Party of the second part, and its assigns, by reason of the consideration herein set forth, shall be allowed insofar as it is legally possible for parties of the first part to permit, to use the water flowing on said premises, the same to be used so as not to interfere with obtaining sufficient water for domestic purposes.

Party of the second part, insofar as it is legally possible for parties of the first part to permit, shall have the free and uninterrupted use of all roads now built and in use on said described premises, and further that party of the second part, and assigns, may erect necessary sluice ways, pipe line, telephone or cable, as may be deemed necessary to the proper carrying out of its mining operations.

Party of the second part shall have said privilege to drill, dig and prospect upon said lands for a period of 14 months from the date of this instrument.

Party of the second part agrees to apply for an exploration loan from the Defense Minerals Exploration Administration in an amount suitable for prospecting and exploring said lands and all of it in search of economic mineral deposits, except oil and gas. Said application will be mailed to the proper authority within 30 days from the date of this instrument. In the event said application for a loan is denied or so modified and revised by the Government as to be unacceptable to said party of the second part, this agreement may be terminated by said party of the second part. In the event that a satisfactory exploration loan is made to said party of the second part, exploration work shall begin on said lands within 30 days from the effective date of the exploration contract with the Defense Minerals Exploration Administration, and proceed without interruption until completed except for stoppage by force majure.

Party of the second part agrees to allow parties of the first part, or their representatives, to enter upon and into all parts of all workings at any time for the purpose of inspection; and to keep accurate and true records of all exploratory and to provide copies of all such records for the parties of the first part, and to allow them, or their representatives, to inspect same at any time during office hours.

Party of the second part shall post and maintain proper legal notices located in conspicuous places on said lands for the purpose of informing all persons or parties, concerned that

the parties of the first part are not liable for any obligations, debts, liabilities or the like of the party of the second part.

In the event of failure of party of the second part to comply with the terms and provisions of this instrument, parties of the first part may cancel same within 60 days after legally notifying party of the second part in writing that this agreement will be cancelled unless party of the second part cures and corrects such failures within 60 days from the date of such notice. Said notice of intent to cancel shall specify the specific term or terms which have not been fulfilled by party of the second part. The delivery of such notice by United States registered mail shall be deemed sufficient.

In the event of termination of this instrument prior to the aforestated life thereof, party of the second part shall be allowed 60 days within which to remove all machinery and equipment within said 60 days, the same shall be and become the property of said parties of the first part.

This agreement shall remain in full force and the period of this grant shall extend for a term of 14 months from the date hereof unless sooner surrendered, cancelled or forfeited as provided herein.

Party of the second part shall begin exploratory work on said lands and shall have a drill thereon in operation within 30 days from the effective date of the exploration contract with the Defense Minerals Exploration Administration, and shall carry on prospecting by drilling, and work continuously during the life of this contract. It is further agreed that if said party of the second part shall perform all of the conditions of this contract

in good faith and shall at any time develop minerals or metals upon said premises in sufficient quantities to make the mining and marketing thereof profitable, then the parties of the first part will properly execute and deliver a mining lease upon so much of the above described premises as party of the second part has developed minerals or metals to make the mining and marketing thereof profitable, for a period of 10 years from the date of the conclusion of this contract at a royalty of $1.50 per long ton, or 4 per cent. of the gross market price for all minerals and metals mined from said lands, whichever is greater. It being understood that said royalty shall be on the market price of the concentrated minerals, and shall not extend to the market price of any refined minerals which party of the second part may desire to so refine. In addition during the terms of said lease, party of the second part will pay all real estate and/or mining or mineral taxes on such of said lands as have not been released from the operation of said mining lease, and party of the second part shall pay as minimum rental or royalty the sum of 25 cents per acre per year for such of said lands as it retains for mining purposes, but in no event shall said minimum yearly rental or royalty be less than $5,000.00. No minimum rental or royalty paid shall be a credit on account of the payment of rental or royalty in any succeeding year. Said lease shall contain all the terms and conditions on the form hereto attached and marked Exhibit "A" and made a part of this contract and shall not apply to oil and gas, or minerals or metals occuring deeper than 100 feet below sea level.

IT IS FURTHER MUTUALLY AGREED that if party of the second part shall so elect to construct a plant, separation unit or otherwise desires a plant site on any portion of the above described lands owned in fee simple by parties of the first part, they agree to sell and convey to party of the second part 10 acres of land to be selected by party of the second part at a price to be agreed upon, subject, however, to the retention by parties of the first part of all mineral rights on same, which mineral rights shall be subject to the

provisions of said lease.

Upon the termination of this permit, party of the second part agrees to forthwith make, execute and deliver to parties of the first part a release, or other document, necessary or desirable discharging any of the above described lands upon which minerals or metals have not been developed in sufficient quantities to make the mining and marketing thereof profitable.

IN WITNESS WHEREOF, parties of the first part have hereunto set their hands and seals, and party of the second part has caused these presents to be executed in its name by its President, and its corporate seal to be hereunto affixed attested by its Secretary, all on the day and year first above written.

/s/ Frank D. Upchurch (SEAL)
Frank D. Upchurch

/s/ Ester D. Upchurch (SEAL)
Ester D. Upchurch

/s/ Frank E. Hale (SEAL)
Frank E. Hale

/s/ Clara A. Hale (SEAL)
Clara A. Hale
( Parties of the First Part)

Signed, sealed and delivered
in the presence of:

/s/ Mary B. Vain

/s/ Susanna Payler
As to Parties of the First Part

NUCLEAR-MAGNETIC MINING, INCORPORATED
(Party of the Second Part)

(Seal)

/s/ By Charles R. Rudolph
Its President

ATTEST:

/s/ George S. Clemon
Its Secretary

Signed, sealed and delivered
in the presence of:

/s/ A. W. Johnson

As to Party of the Second Part.

STATE OF FLORIDA

ST. JOHNS COUNTY:

I HEREBY CERTIFY that on this day before me, the undersigned officer, personally appeared FRANK D. UPCHURCH and ESTER D. UPCHURCH, his wife, and FRANK E HALE and CLARA A. HALE, his wife, to me well and personally known and known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged that they executed the same freely and voluntarily for the uses and purposes therein expressed.

I FURTHER CERTIFY that the said ESTHER D. UPCHURCH, known to me to be the wife of the said FRANK D. UPCHURCH, and the said CLARA A. HALE, known to me to be the wife of the said FRANK E. HALE, on separate and private examinations taken and made by and before me separately and apart from their said husbands acknowledged to and before me that they executed the foregoing instrument freely and voluntarily and without any compulsion, constraint, apprehension or fear of or from their said husbands.

WITNESS my hand and official seal this 2nd day of June, 1953.

(Seal)

/s/ Mary B. Yarn
Notary Public of the State of Florida
at Large

My commission expires September 12, 1953

DISTRICT OF COLUMBIA:

BEFORE ME, personally appeared CHARLES R. RUDOLPH And GEORGE SUTHERLAND ELMORE, to me well known and known to me to be the President and Secretary respectively of NUCLEAR-MAGNETIC MINING, INCORPORATED, the corporation named in the foregoing instrument, and known to me to be the persons who as such officers of said corporation executed the same; and then and there the said CHARLES R. RUDOLPH and the said GEORGE SUTHERLAND ELMORE, did acknowledge before me that said instrument is the free act and deed of said corporation by them respectively executed as such officers for the purposes therein expressed; that the seal thereunto attached is the corporate seal by them in like capacity affixed; all under authority in them duly vested by the Board of Directors of said corporation.

WITNESS my hand and official seal this 9th day of June, 1953.

/s/ Anna W. Johnson
Notary Public of District of Columbia.

My commission expires Dec. 15, 1955

(seal)

THIS AGREEMENT OF LEASE, Made and executed in duplicate this _____ day of _____ 195___, by and between FRANK D. UPCHURCH and ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, all of St. Johns County, Florida, hereinafter called "Lessors", and NUCLEAR-MAGNETIC MINING, INCORPORATED, a Florida corporation, with its principal place of business in St. Augustine, Florida, hereinafter called "Lessee",

WITNESSETH, that Lessors for and in consideration of the rents, royalties, covenants and agreements hereinafter set forth to be paid, kept and performed by Lessee, have leased, let and demised and by these presents do lease, let and demise unto Lessee the following described lands and premises, portions of which are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

(Lands described in foregoing Permit)

and portions of which are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

(Lands described in the foregoing Permit)

TO HAVE AND TO HOLD the above described premises for the purpose of mining any and all minerals and metals (except petroleum and gas), occuring in or under said lands not more than 100 feet below sea level from the _____ day of _____, 195___ to the _____ day of _____, 196___, being a term of 10 years unless sooner forfeited or terminated through the violation of any of the covenants and conditions herein contained with no power to assign this Lease or any part thereof, or to sublet the whole or any part of said leased premises without the written consent of Lessors first had and obtained.

Lessee in consideration of the premises has covenanted, contracted and agreed, and by these presents does covenant, contract and agree to and with Lessors, their heirs, legal representatives and assigns, as follows:

1. To enter upon said leased lands and premises and to work the same in mine fashion in manner necessary to good and econominal mining so as to take out the greatest amount of ore possible with due regard to the development and preservation of said mine or mining lands and premises as a workable mining property, and to the special covenants herein contained.

2. To timber said workings at all points where proper in accordance with good mining practices and to repair all old timbering wherever it becomes necessary.

3. To allow Lessors, their agents or representatives, from time to time to enter upon and descend into all parts of said leased lands and premises for the purpose of inspection, surveys or taking samples therefrom and to render to said Lessors proper assistance in making said inspection, surveys or examination.

4. Lessors reserve the property and right of property in and to all ores extracted from said lands and premises during the period of this Lease, and Lessee covenants and agrees to pay and allow Lessors as royalty upon all ores mined, shipped or sold from said leased lands and premises in any manner during the term of this Lease as follows, to-wit: The sum of $1.50 per long term or 4 per cent. which ever is greater on such minerals and metals produced. However, it is understood that said royalty shall be on the market price of the concentrated minerals and

metals only and shall not extend to the market price of any refined minerals and metals which Lessee may desire to so refine or treat. It is further understood that Lessee shall pay to Lessors as minimum rental or royalty each year for the term of this Lease, the sum of 25 cents per acre for all of said lands and premises on which Lessee has certified to Lessors the discovery of minerals or metals; provided in no event shall said rental or royalty for each year during the term of this Lease be less than $5,00.00. The first of said minimum rental or royalty payments shall be made at or before the execution and delivery of this Lease and on the same day of each consecutive year thereafter. Lessee shall render Lessors monthly statements of royalties due and shall pay any royalty in excess of said minimum rental or royalty monthly. No minimum rental or royalty paid shall be a credit on account of the payment of rental or royalty in any succeeding year.

5. Lessee, shall, and does hereby, assume all responsibility in case of accident to any of its employees, or to any person in or about said property, and does agree to save and keep Lessors harmless of any injury of damage to persons or property in concection with all operations under this Lease.

6. All taxes assessed against said lands and premises, whether real estate and/or mining taxes, shall be paid by Lessee, provided such taxes are levied against property of Lessors and not otherwise.

7. All bills and expenses incurred by Lessee, or those in privity with it, shall be promptly paid by Lessee and by such prompt payment said Lessee shall prevent the filing of any and all liens of miners, mechanics, laborers, materialmen or contractors against said demised premises, and, if by reason of the failure of Lessee to pay all bills and expenses any lien or liens, shall be filed against said lands and premises, Lessors may forthwith pay off and discharge the same, and Lessee holds itself bound to pay to

Lessors all sums so advanced or paid to clear said premises from liens which may be filed as aforesaid, and Lessors may, at their election, declare a forfeiture of this Lease; provided, however, nothing contained herein shall be construed as obligating Lessors to pay any such lien or liens, or to become liable for the payment of any such lien or liens.

8. Lessee covenants that no person not in privity with the parties hereto shall be allowed to hold possession of said lands and premises, or any part thereof, under any pretext whatever without the express consent of Lessors.

9. If within the 10 year term hereby created, Lessee shall abide with and performall things specified herein and comply with all terms of this Lease, then and in consideration thereof, Lessee shall have an exclusive option and right to have this Lease and the term created hereby, extended and prolonged for an additional term of 15 years from the expiration of the term hereby created, at an increased minimum rental or royalty of 25 cents per acre per year or the sum of $5,000.00, making the minimum annual rental or royalty for such additional 15 year term 50 cents per acre per year or the sum of $10,000.00, whichever is greater. In all other respects the Lease for such additional 15 year term shall be upon the same terms and conditions, covenants and agreements contained in this Lease.

10. In the event of failure by Lessee to comply with the terms and provisions of this instrument, Lessors may cancel same within 60 days after legally notifying Lessee in writing that the agreement will be cancelled unless said Lessee cures and corrects such failures within 60 days from the date of notice. Said notice of intent to cancel shall specify the specific term or terms which have not been fulfilled by Lessee. Said notice may be served by United

States registered mail.

11. In the event of termination of this Lease, prior to the aforestated life thereof, Lessee shall have 60 days in which to remove all machinery and equipment from said lands and premises. Any machinery and equipment not removed from said premises within said 60 day period shall become the property of Lessors, and Lessee expressly covenants and agrees to make, execute and deliver to Lessors a release, or other document, necessary or desirable cancelling this Lease.

12. Lessee hereby expressly covenants and agrees that if default shall be made in the payment of the rental or royalty as herein required and such default continues for more than 30 days, then said Lessee shall become a tenant at sufferance, hereby waiving all right of notice and Lessors shall be entitled immediately to re-enter and retake possession of the demised premises, anything hereinabove contained to the contrary notwithstanding

13. Time is of the essence of this agreement, and each and every clause of this indenture, and all the covenants and conditions herein contained, expressed or implied, shall extend to the successors, heirs, executors, administrators and lawful assigns of all the parties hereto.

14. Any failure of Lessors to exercise their option to terminate this Lease because of any breach of its terms and covenants shall not constitute a waiver of the right to exercise the same at any other time.

IN WITNESS WHEREOF, Lessors have hereunto set their hands and seals and Lessee has caused these presents to be executed in its name by its President, and its corporate seal to be here-

unto affixed attested by its Secretary, all on the day and year last above written.

_____(SEAL)
Frank D. Upchurch

_____(SEAL)
Esther D. Upchurch

_____(SEAL)
Frank E. Hale

_____(SEAL)
Clara A. Hale
(Lessors)

Signed, sealed and delivered

in the presence of:

_____

_____

NUCLEAR-MAGNETIC MINING, INCORPORATED
(Lessee)

By_____
Its President

ATTEST:

_____
Its Secretary

Signed, sealed and delivered

in the presence of:

_____

_____

STATE OF FLORIDA

ST. JOHNS COUNTY:

I HEREBY CERTIFY that on this day before me, the undersigned officer, personally appeared FRANK D. UPCHURCH and ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, to me well and personally known and known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged that they executed the same freely and voluntarily for the uses and purposes therein expressed.

I FURTHER CERTIFY that the said ESTHER D. UPCHURCH, known to me to be the wife of the said FRANK D. UPCHURCH, and the said CLARA A. HALE, known to me to be the wife of the said FRANK E. HALE, on separate and private examinations taken and made by and before me separately and apart from their said husbands acknowledged to and before me that they executed the foregoing instrument freely and voluntarily and without any compulsion, constraint, apprehension or fear of or from their said husbands.

WITNESS my hand and official seal this _____ day of _____ 195___.

_____

Notary Public of the State of Florida

at Large

My commission expires _____

DISTRICT OF COLUMBIA:

BEFORE ME, personally appeared CHARLES R. RUDOLPH and GEORGE SUTHERLAND ELMORE, to me well known and known to me to be the President and Secretary respectively of NUCLEAR-MAGNETIC MINING, INCORPORATED, the corporation named in the foregoing instrument, and known to me to be the persons described in and who as such officers of said corporation executed the same; and then and there the said CHARLES R. RUDOLPH and the said GEORGE SUTHERLAND ELMORE, did acknowledge before me that said instrument if the free act and deed of said corporation by them respectively executed as such officers for the purposes therein expressed; that the seal thereunto attached is the corporate seal by them in like capacity affixed; all under authority in them duly vested by the Board of Directors of said corporation.

WITNESS my hand and official seal this ____ day of _____, 195___.

_____
Notary Public of District of Columbia

My commission expires _____

PROSPECTING PERMIT AND LEASE AGREEMENT

THIS INDENTURE, Made and executed in duplicate this 2nd day of June, 1953, by and between FRANK D. UPCHURCH and ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, of St. Johns County, Florida, parties of the first part, and NUCLEAR-MAGNETIC MINING, INCORPORATED, a Florida corporation with its principal place of business in St. Augustine, Florida, party of the second part,

WHEREAS, FRANK D. UPCHURCH and FRANK E. HALE, two of the parties of the first part, are owners in fee simple of lands, portions of which are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 5 SOUTH, RANGE 27 EAST:

Lot 1, Section 34.

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

All unsurveyed parts of Sections 17 and 18. Subject to all deeds and easements now held by the United States of America in connection with the construction and maintenance of an intra-coastal waterway from Jacksonville, Florida, to Miami, Florida, and subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida, to Wilfred Beswick under deed #16382, recorded in Deed Book 25, Page 120, public records of St. Johns County, Florida.

IN TOWNSHIP 4 SOUTH, RANGE 29 EAST:

Lot 4, Section 14,

Lot 3, Section 23,

Lot 6 and all the parts of Lots 1, 4, 5, and 7 of Section 15 lying southerly and easterly of State Road 306,

Unsurveyed Section 23,

Unsurveyed Section 26,

Unsurveyed parts of Sections 27 and 34 lying east of Florida Intracoastal Waterway,

Unsurveyed Section 35,

Unsurveyed Section 36,

N. Sanchez Grant or Section 52,

Section 46, except 25 acres sold to Barkoskie, 9 acres sold to J. Mickler, 18 acres sold to F. J. Mickler, 8 acres sold to Oesterriecher and 42 acres sold to Mabry,

F. P. Sanchez Grant or Section 53,

Davis Floyd Grant or Section 56, containing 832.98 acres, more or less, subject to an undivided one-fourth interest now or formerly owned by H. Kimball Benedict in 415 acres described as follows: All of Davis Floyd Grant or Section 56, less the north 150 acres, the south 247.98 acres, and 20 acres of the remaining 435 acres, said 20 acres being the same parcel of land excepted in deed recorded in Deed Book 67, Page 536, public records of St. Johns County, Florida,

Section 72, except 2 acres sold to Barkoskie,

F. P. Sanchez Grant or Section 73,

Section 74, except 14.5 acres sold to Mabry, 28 acres sold to Farson and 10 acres sold to McDaniel.

IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:

Unsurveyed part of Section 1,

Lots 1 and 2 and unsurveyed part of Section 2,

Unsurveyed part of Section 3 lying east of Florida Intracoastal Waterway,

Unsurveyed part of Section 10 lying east of Florida Intracoastal Waterway,

Lots 6 and 9 and unsurveyed part of Section 11,

Lot 3 and unsurveyed part of Section 12,

Lots 2 and 3 and unsurveyed part of Section 13,

All of Section 14, surveyed and unsurveyed,

All unsurveyed part of Section 15 lying east of Florida Intracoastal Waterway,

Unsurveyed Section 23,

Part of unsurveyed Section 24 lying west of Guano River, same being a tract of marsh land bounded on the north by unsurveyed Section 13, bounded on the east by the waters of Guano River, bounded on the south by unsurveyed Section 25 and bounded on the west partly by Grant to G. Marunelli (Section 50), partly by Grant to A. Atkinson, or Cocifacio (Section 51) and partly by Grant to Pedro Cocifacio (Section 52). Subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 154, Page 59, public records of St. Johns County, Florida,

Section 26, said land being a tract of marsh land with a few widely scattered small islands in same, said tract of land being bounded on the north by unsurveyed Section 23, bounded on the west by unsurveyed Section 27 for a distance of about 100 feet near the northwest corner of said Section 26, and bounded on the west south of said point by the waters of North River

sometimes known as Tolomato River, bounded on the south partly by the waters of said North River aforementioned, and partly by unsurveyed Section 35, and bounded on the east partly by Section 46 or the Grant to Mariano Berta and partly by unsurveyed Section 25. Subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 154, Page 59, public records of St. Johns County, Florida,

Unsurveyed Section 25,

Unsurveyed Section 27,

Lot 1 and those parts of Lots 2 and 3 lying east of Florida East Coast Railway, Section 30,

Unsurveyed part of Section 35,

D. Floyd Grant or Section 37,

John Floyd Grant or Section 38,

J. P. DeBurgo Grant or Section 50,

F. P. Sanchez Grant or Section 67,

G. I. F. Clark Grant or Section 68,

Atkinson or Cocifacio Grant of Section 51,

Pedro Cocifacio Grant or Section 52,

Lot 3 of Section 2, and Lots 1, 2, 3, 4, 5, 7 and 8 of Section 11. Subject to reservations in deed dated February 12, 1944 from the Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 148, Page 119, public records of St. Johns County, Florida.

<u>IN TOWNSHIP 6 SOUTH, RANGE 29 EAST:</u>

Unsurveyed part of Section 1,

Unsurveyed part of Section 11,

Unsurveyed part of Section 13.

IN TOWNSHIP 7 SOUTH, RANGE 29 EAST:

N½ of Fractional Section 14, except the east 610 feet thereof,

Lots 1 and 4 of Section 35 lying and being north and west of Dixie Highway. Said Dixie Highway being the brick road from St. Augustin to Hastings, Florida,

Peter Seville Grant of Section 38,

Embara Grant or Section 42.

IN TOWNSHIP 6 SOUTH, RANGE 30 EAST:

E½ of NW¼ and NE¼ of SW¼ of Section 28,

and portions of which lands are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

The unsurveyed parts of Sections 5 and 8 and all that part of unsurveyed Sections 6 and 7 lying east of the Florida Intracoastal Waterway. Subject and inferior to all deeds and easements now held by the United States of America in connection with the construction and maintenance of an intracoastal waterway from Jacksonville, Florida to Miami Florida, and also subject and inferior to reservations contained in deed from the Trustees of the Internal Improvement Fund of the State of Florida to Wilfred Beswick under deed #16382, recorded in Deed Book 93, Page 676, public records of Duval County, Florida, and to reservations contained in deed #16278 from the Trustees of the Internal Improvement Fund of the State of Florida to I. Brenner recorded in Deed

Book 65, Page 398, public records of Duval County, Florida.

ALL OF THE ABOVE DESCRIBED LANDS CONTAINING 12,376.87 ACRES, MORE OR LESS,

WHEREAS, FRANK D. UPCHURCH and FRANK E. HALE, two of the parties of the first part, are the owners of the title to all of the oil, gas and other minerals and mineral rights, whether metallic or non-metallic, in and under the lands hereinafter described, with the perpetual right of ingress and egress to and from said lands for the purpose of drilling, exploring and mining and in every way operating for such oil, gas and other minerals and mineral rights and removing the same, portions of which lands are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 6 SOUTH, RANGE 27 EAST:

W½ of SE¼ of Section 23,

Government Lot 1, Section 26,

S½ of Government Lot 4, Section 35.

IN TOWNSHIP 5 SOUTH, RANGE 28 EAST:

W½ of NE¼ of SW¼ of Section 3,

SW¼, except part subdivided as Hilden, of Section 12, ✓

E½ of Section 12, ✓

NE¼ of Section 13, except portion subdivided as ✓ Hilden,

NE¼ of Section 16. ✓

IN TOWNSHIP 8 SOUTH, RANGE 28 EAST:

Lots 9, 10, 14, and 15 of Section 19,

NW¼ of NE¼, NW¼ of SE¼, SE¼ of NW¼, S½ of NE¼ of NW¼ and W½ of SW¼ of NE¼ of Section 20,

SW¼ of NW¼ and W½ of SW¼ of section 20.

IN TOWNSHIP 9 SOUTH, RANGE 28 EAST:

E½ of E½ of Section 12.

IN TOWNSHIP 4 SOUTH, RANGE 29 EAST:

Part of Lot 13 of Section 29 lying south and east of State Road 306,

Part of Section 31 lying south and east of State Road 306,

Part of Section 32 lying south and east of State Road 306,

All of Section 55, except part conveyed to W. F. Mickler, by deed dated April 2, 1938 and recorded in Deed Book 116, Page 471, public records of St. Johns County, Florida, and except part conveyed to W. Alfred Mickler by deed dated April 2, 1938 and recorded in Deed Book 116, Page 474, public records of St. Johns County, Florida, and except part conveyed to James R. Stockton by deed dated April 22, 1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida, and except part conveyed to E. P. Kirkland by deed dated March 14, 1945 and recorded in Deed Book 149, Page 467, public records of St. Johns County, Florida,

All of Section 57,

All of Section 58,

All of Section 59,

All of Section 60,

All of Section 61,

All of Section 62,

All of Section 63,

All of Section 64,

All unsurveyed parts of Sections 27 and 34 lying west of the Intracoastal Waterway right of way, except part of Section 27 conveyed to James R. Stockton by deed dated April 22,

1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida,

Part of unsurveyed Section 28 lying south of the south line of land conveyed to James R. Stockton by deed dated April 22, 1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida.

IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:

Lot 1 of Section 3,

All of Section 4,

Government Lot 3 and part of Government Lot 1 lying east of the west line of Section 63 (F. P. Sanchez Grant) if said west line were projected north 8 degrees west to the north township line, all in Fractional Section 5,

All of Section 7,

All of Section 8,

All of Fractional Section 9,

All of Section 16,

All of Section 17,

All of Section 18,

Lots 1, 2, 3, 6, 7, 8, 9 and Lot 5 (except parts lying within the right of way of Florida East Coast Railway and the right of way of United States Highway Number 1) and also 10 acres in the northeast corner of Government Lot 4, more particularly described as follows: Beginning at the northeast corner of said Government Lot 4, run thence southerly along the east line of said Government Lot, 660 feet to a stake, run thence northwesterly parallel to the north line of said Government Lot, 660 feet to a stake, run thence northerly parallel to the east line of said Government Lot, 660 feet to the north line of said Government Lot, run thence easterly along the north line of said Government Lot, 660 feet to the point of beginning, all in Section 19,

All of Section 20,

All of Section 21,

All of Section 39,

All of the Roque Leonardi Grant or Section 61, except land conveyed to W. R. Stokely by deed recorded in Deed Book 43, Page 207, public records of St. Johns County, Florida, and except part conveyed to Carrie Tyner by deed recorded in Deed Book 76, Page 192, public records of St. Johns County, Florida, and also except part conveyed to Truman Solana by deed recorded in Deed Book 76, Page 245, public records of St. Johns County, Florida,

All of Section 62,

All of Section 63,

All of Section 64,

All of Section 65,

All of Section 66,

All unsurveyed portion of Section 3, lying west of Intracoastal Waterway right of way,

All unsurveyed part of Section 10 lying west of Intracoastal Waterway right of way,

All of Section 15, surveyed and unsurveyed, lying west of Intracoastal Waterway right of way,

All of parts of Lots 2 and 3 of Section 30 lying west of Florida East Coast Railway Company's right of way,

All of Fractional Section 33 except rights of way of railroad and roads and highways.

IN TOWNSHIP 6 SOUTH, RANGE 29 EAST:

All of Fractional Section 10,

Lots 1, 2 and 3 of Section 15,

Part of Pablo Sabate Grant of Section 50 lying west of Florida East Coast Railway Company's right of way, except the following premises included in the above description: Beginning at a point in the westerly right of way limit of the Florida

East Coast Railway, 2040 feet southerly from said Railway Company't mile post 28 on its main line from Jacksonvill to Key West; thence westerly at right angles to said westerly right of way limit, 100 feet; thence southerly at right angles 100 feet westerly from and parallel to said westerly right of way limit, 400 feet; thence easterly at right angles 100 feet to a point in said westerly right of way limit; thence northerly at right angles and along said westerly right of way limit 400 feet to the point of beginning, containing .92 acres, more or less and being part of the Pable Sabate Grant, Section 50,

Lots 7 and 10 of Section 20,

Lots 12 and 13 of Section 21,

Lots 6, 11 and 12 of Section 28,

All of Fractional Section 23,

Lots 1, 2, 3 and 7 of Section 26,

Lots 1, 2, 7, 8 and 9, except 10 acres in east part of Lot 8, of Section 27,

Lot 1 of Section 34.

IN TOWNSHIP 7 SOUTH, RANGE 29 EAST:

All of Section 20, except the E½ of NE¼,

Government Lot 2, the N½ of the SW¼ and the SE¼ of the SW¼ of Section 28,

Lots 3 and 6 of Section 33.

IN TOWNSHIP 8 SOUTH, RANGE 30 EAST:

Lots 1, 2 and 3 of Section 17,

Lot 10 of Section 19,

NE¼ of SE¼ and N½ of SW¼, except Florida East Coast Railway Company's right of way, Section 29,

Lots 5, 8, 11 and 12 of Section 19,

Lots 2 and 3 and the parts of Lots 4 and 5 east of the Old Moultrie Road of Section 30, excepting 2 acres, more

or less, conveyed to R. Rev. Wm. Kenny, Bishop, by quit claim deed dated December 23, 1905, and recorded in Deed Book 10, Page 438, public records of St. Johns County, Florida; also excepting the right of way of U. S. Highway Number 1 as now located; also excepting easement for drainage ditch described in deed from Heth Canfield to Clay Bottom Farm Company, Dated April 23, 1910 and recorded in Deed Book 15, Page 248, public records of St. Johns County, Florida, and excepting any land within 600 feet, more or less, of the right of way of U. S. Highway Number 1 as now located;

NE$\frac{1}{4}$; E$\frac{1}{2}$ of NW$\frac{1}{4}$ and S$\frac{1}{2}$ of Section 32, except part conveyed to State Road Department of Florida by deed dated April 8, 1941 and recorded in Deed Book 129, Page 434, public records of St. Johns County, Florida.

IN TOWNSHIP 9 SOUTH, RANGE 30 EAST:

NW$\frac{1}{4}$ of SW$\frac{1}{4}$ of Section 8,

Lots 2, 3, 4, 5, 9, 10, 11, 12 and 13 of Section 15,

Grant to Mestre or Section 40.

IN TOWNSHIP 10 SOUTH, RANGE 30 EAST:

Part of SE$\frac{1}{4}$ of NW$\frac{1}{4}$ of Section 7 lying north of Pellicer Creek,

and portions of which lands are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

Parts of unsurveyed Sections 6 and 7 lying west of Florida Intracoastal Waterway. Subject to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida, recorded in Deed Book 93, Page 676, public records of Duval County, Florida.

ALL OF THE ABOVE DESCRIBED LANDS CONTAINING 16, 565. 32 ACRES, MORE OR LESS.

NOW, THEREFORE, THIS INDENTURE WITNESSETH:

That in consideration of $1.00 and other good and valuable considerations, to them in hand paid, the receipt whereof is hereby acknowledged, parties of the first part hereby grant to party of the second part, and its assigns, insofar as it is legally possible for them to do so, the right to go upon said premises at any and all times by itself, its agents, laborers and assigns with beasts vehicles, loaded and unloaded, and to erect thereon the suitable paraphernalia necessary for the purpose of drilling, digging and prospecting for minerals and metals, except oil and gas.

Party of the second part, and its assigns, by reason of the consideration herein set forth, shall be allowed insofar as it is legally possible for parties of the first part to permit, to use the water flowing on said premises, the same tobe used so as not to interfere with obtaining sufficient water for domestic purposes.

Party of the second part, insofar as it is legally possible for parties of the first part to permit, shall have the free and uninterrupted use of all roads now built and in use on said described premises, and further that party of the second part, and assigns, may erect necessary sluice way, pipe line, telephone or cable, as may be deemed necessary to the proper carrying out of its mining operations.

Party of the second part shall have said privilege to drill, dig and prospect upon said lands for a period of 14 months from the date of this instrument.

Party of the second part agrees to apply for an exploration loan from the Defense Minerals Exploration Administration in an amount suitable for prospecting and exploring said lands and all of it in search of economic mineral deposits, except oil and gas. Said application will be mailed to the proper authority within 30 days from the date of this instrument. In the event said application for a loan is denied or so modified and revised by the Government as to be unacceptable to said party of the second part, this agreement may be terminated by said party of the second part. In the event that a satisfactory exploration loan is made to said party of the second part, exploration work shall begin on said lands within 30 days from the effective date of the exploration contract with the Defense Minerals Exploration Administration, and proceed without interruption until completed except for stoppage by force majure.

Party of the second part agrees to allow parties of the first part, or their representatives, to enter upon and into all parts of all workings at any time for the purpose of inspection; and to keep accurate and true records of all exploratory and to provide copies of all such records for the parties of the first part, and to allow them, or their representatives, to inspect same at any time during office hours.

Party of the second part shall post and maintain proper legal notices located in conspicuous places on said lands for the purpose of informing all persons or parties, concerned that

the parties of the first part are not liable for any obligations, debts liabilities or the like of the party of the second part.

In the event of failure of party of the second part to comply with the terms and provisions of this instrument, parties of the first part may cancel same within 60 days after legally notifying party of the second part in writing that this agreement will be cancelled unless party of the second part cures and corrects such failures within 60 days from the date of such notice. Said notice of intent to cancel shall specify the specific term or terms which have not been fulfilled by party of the second part. The delivery of such notice by United States registered mail shall be deemed sufficient.

In the event of termination of this instrument prior to the aforestated life thereof, party of the second part shall be allowed 60 days within which to remove all machinery and equipment from the said lands. Failure to remove such machinery and equipment within 60 days, the same shall be and become the property of said parties of the first part.

This agreement shall remain in full force and the period of this grant shall extend for a term of 14 months from the date hereof unless sooner surrendered, cancelled or forfeited as provided herein.

Party of the second part shall begin exploratory work on said lands and shall have a drill thereon in operation within 30 days from the effective date of the exploration contract with the Defense Minerals Exploration Administration, and shall carry on prospecting by drilling, and work continuously during the life of this contract. It is further agreed that if said party of the second part shall perform all of the conditions of this contract

in good faith and shall at any time develop minerals or metals upon said premises in sufficient quantities to make the mining and marketing thereof profitable, then the parties of the first part will properly execute and deliver a mining lease upon so much of the above described premises as party of the second part has developed minerals or metals to make the mining and marketing thereof profitable, for a period of 10 years from the date of the conclusion of this contract at a royalty of $1.50 per long ton, or 4 per cent. of the gross market price for all minerals and metals mined from said lands, whichever is greater. It being understood that said royalty shall be on the market price of the concentrated minerals, and shall not extend to the market price of any refined minerals which party of the second part may desire to so refine. In addition during the terms of said lease, party of the second part will pay all real estate and/or mining or mineral taxes on such of said lands as have not been released from the operation of said mining lease, and party of the second part shall pay as minimum rental or royalty the sum of 25 cents per acre per year for such of said lands as it retains for mining purposes, but in no event shall said minimum yearly rental or royalty be less than $5,000.00. No minimum rental or royalty paid shall be a credit on account of the payment of rental or royalty in any succeeding year. Said lease shall contain all the terms and conditions on the form hereto attached and marked Exhibit "A" and made a part of this contract and shall not apply to oil and gas, or minerals or metals occuring deeper than 100 feet below sea level.

IT IS FURTHER MUTUALLY AGREED that if party of the second part shall so elect to construct a plant, separation unit or otherwise desires a plant site on any portion of the above described lands owned in fee simple by parties of the first part, they agree to sell and convey to party of the second part 10 acres of land to be selected by party of the second part at a price to be agreed upon, subject, however, to the retention by parties of the first part of all mineral rights on same, which mineral rights shall be subject to the

provisions of said lease.

Upon the termination ofthis permit, party of the second part agrees to forthwith make, execute and deliver to parties of the first part a release, or other document, necessary or desirable discharging any of the above described lands upon which minerals or metals have not been developed in sufficient quantities to make the mining and marketing thereof profitable.

IN WITNESS WHEREOF, parties of the first part have hereunto set their hands and seals, and party of the second part has caused these presents to be executed in its name by its President, and its corporate seal to be hereunto affixed attested by its Secretary, all on the day and year first above written.

/s/ Frank D. Upchurch (SEAL)
Frank D. Upchurch

/s/ Esther D. Upchurch (SEAL)
Esther D. Upchurch

/s/ Frank E. Hale (SEAL)
Frank E. Hale

/s/ Clara A. Hale (SEAL)
Clara A. Hale
(Parties of the First Part)

Signed, sealed and delivered
in the presence of :

/s/ Mary B. Vann

/s/ Susanne Taylor
As to Parties of the First Part

NUCLEAR-MAGNETIC MINING, INCORPORATED
(Party of the Second Part)

(SEAL)

/s/ By Charles R. Rudolph
Its President

ATTEST:

/s/ George S. Clemens
Its Secretary

Signed, Sealed and delivered
in the presence of:

/s/ A. W. Johnson

As to Party of the Second Part.

STATE OF FLORIDA

ST. JOHNS COUNTY:

I HEREBY CERTIFY That on this day before me, the undersigned officer, personally appeared FRANK D. UPCHURCH and ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, to me well and personally known and known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged that they executed the same freely and voluntarily for the uses and purposes therein expressed.

I FURTHER CERTIFY that the said ESTHER D. UPCHURCH, known tomme to be the wife of the said FRANK D. UPCHURCH, and the said CLARA A. HALE, known to me to be the wife of the said FRANK E. HALE, on separate and private examinations taken and made by and before me separately and apart from their said husbands acknowledged to and before me that they executed the foregoing instrument freely and voluntarily and without any compulsion, constraint, apprehension or fear of or from their said husbands.

WITNESS my hand and official seal this 2nd day of June, 1953.

/s/ Mary B. Wesu
Notary Public of the State of Florida
at Large

(SEAL)

My commission expires September 12, 1953

DISTRICT OF COLUMBIA:

BEFORE ME, personally appeared CHARLES R. RUDOLPH and GEORGE SUTHERLAND ELMORE, to me well known and known to me to be the President and Secretary respectively of NUCLEAR-MAGNETIC MINING, INCORPORATED, the corporation named in the foregoing instrument, and known to me to be the persons who as such officers of said corporation executed the same; and then and there the said CHARLES R. RUDOLPH and the said GEORGE SUTHERLAND ELMORE, did acknowledge before me that said instrument is the free act and deed of said corporation by them respectively executed as such officers for the purposes therein expressed; that the seal thereunto attached is the corporate seal by them in like capacity affixed; all under authority in them duly vested by the Board of Directors of said corporation.

WITNESS my hand and official seal this 9th day of June, 1953.

(SEAL)

/s/ Anna W. Johnson
Notary Public of Distric of Columbia

My commission expires Dec 15, 1955

THIS AGREEMENT OF LEASE, Made and executed in duplicate this _____ day of _____ 195___, by and between FRANK D. UPCHURCH AND ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, all of St. Johns County, Florida, hereinafter called "Lessors", and NUCLEAR-MAGNETIC MINING, INCORPORATED, a Florida corporation, with its principal place of business in St. Augustine, Florida, hereinafter called "Lessee",

WITNESSETH, that Lessors for and in consideration of the rents, royalties, covenants and agreements hereinafter set forth to be paid, kept and performed by Lessee, have leased, let and demised and by these presents do lease, let and demise unto Lessee the following described lands and premises, portions of which are situate, lyihg and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

(Lands described in foregoing Permit)

and portions of which are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

(Lands described in the foregoing Permit)

TO HAVE AND TO HOLD the above described premises for the purpose of mining any and all minerals and metals (except petroleum and gas), occuring in or under said lands not more than 100 feet below sea level from the ____ day of _____, 195____ to the ____ day of _____, 196____, being a term of 10 years unless sooner forfeited or terminated through the violation of any of the covenants and conditions herein contained with no power to assign this Lease or any part thereof, or to sublet the whole or any part of said leased premises without the written consent of Lessors first had and obtained.

Lessee in consideration of the premises has covenanted, contracted and agreed, and by these presents does covenant, contract and agree to and with Lessors, their heirs, legal representatives and assigns, as follows:

1. To enter upon said leased lands and premises and to work the same in mine fashion in manner necessary to good and economical mining to as to take out the greatest amount of ore possible with due regard to the development and preservation of said mine or mining lands and premises as a workable mining property, and to the special covenants herein contained.

2. To timber said workings at all points where proper in accordance with good mining practices and to repair all old timbering wherever it becomes necessary.

3. To allow Lessors, their agents or representatives, from time to time to enter upon and descend into all parts of said leased lands and premises for the purpose of inspection, surveys or taking samples therefrom and to render to said Lessors proper assistance in making said inspection, surveys or examination.

4. Lessors reserve the property and right of property in and to all ores extracted from said lands and premises during the period of this Lease, and Lessee covenants and agrees to pay and allow Lessors an royalty upon all ores mined, shipped or sold from said leased lands and premises in any manner during the term of this Lease as follows, to-wit: The sum of $1.50 per long term or 4 per cent. whichever is greater on such minerals and metals produced. However, it is understood that said royalty shall be on the market price of the concentrated minerals and

metals only and shall not extend to the market price of any refined minerals and metals which Lessee may desire to so refine or treat. It is further understood that Lessee shall pay to Lessors ~~and~~ as minimum rental or royalty each year for the term of this Lease, the sum of 25 cents per acre for all of said lands and premises on which Lessee has certified to Lessors the discovery of minerals or metals; provided in no event shall said rental or royalty for each year during the term of this Lease be less than $5,000.00. The first of said minimum rental or royalty payments shall be made at or before the execution and delivery of this Lease and on the same day of each consecutive year thereafter. Lessee shall render Lessors monthly statements of royalties due and shall pay any royalty in excess of said minimum rental or royalty monthly. No minimum rental or royalty paid shall be a credit on account of the payment of rental or royalty in any succeeding year.

5. Lessee, shall, and does hereby, assume all responsibility in case of accident to any of its employees, or to any person in or about said property, and does agree to save and keep Lessors harmless of any injury or damage to persons or property in connection with all operations under this Lease.

6. All taxes assessed against said lands and premises, whether real estate and/or mining taxes, shall be paid by Lessee, provided such taxes are levied against property of Lessors and not otherwise.

7. All bills and expenses incurred by Lessee, or those in privity with it, shall be promptly paid by Lessee and by such prompt payment said Lessee shall prevent the filing of any and all liens of miners, mechanics, laborers, materialmen or contractors against said demised premises, and, if by reason of the failure of Lessee to pay all bills and expenses and lien or liens, shall be filed against said lands and premises, Lessors may forthwith pay off and discharge the same, and Lessee holds itself bound to pay to

Lessors all sums so advanced or paid to clear said premises from liens which may be filed as aforesaid, and Lessors may, at their election, declare a forfeiture of this Lease; provided, however, nothing contained herein shall be construed as obligating lessors to pay any such lien or liens, or to become liable for the payment of an such lien or liens.

8. Lessee covenants that no person not in privity with the parties hereto shall be allowed to hold possession os said lands and premides, or any part thereof, under any pretext whatever without the express consent of Lessors.

9. If within the 10 year term hereby created, Lessee shall abide with and perform all things specified herein and comply with all terms of this Lease, then and in consideration thereof, Lessee shall have an exclusive option and right to have this Lease and the term created hereby, extended and prolonged for an additional term of 15 years from the expiration of the term hereby created, at an increased minimum rental or royalty of 25 cents per acre per year or the sum of $5,000.00, making the minimum annual rental or royalty for such additional 15 year term 50 cents per acre per year or the sum of $10,000.00, whichever is greater. In all other respects the Lease for such additional 15 year term shall be upon the same terms and conditions, covenants and agreements contained in this Lease.

10. In the event of failure by Lessee to comply with the terms and provisions of this instrument, Lessors may cancel same within 60 days after legally notifying Lessee in writing that the agreement will be cancelled unless said Lessee cures and corrects such failures within 60 days from the date of notice. Said notice of intent to cancel shall specify the specific term or terms which have not been fulfilled by Lessee. Said notice may be served by United

States registered mail.

11. In the event of termination of this Lease, prior to the aforestated life thereof, Lessee shall have 60 days in which to remove all machinery and equipment from said lands and premises. Any machinery and equipment not removed from said premises within said 60 day period shall become the property of Lessors, and Lessee expressly covenants and agrees to make, execute and deliver to Lessors a release, or other document, necessary or desirable cancelling this Lease.

12. Lessee hereby expressly covenants and agrees that if default shall be made in the payment of the rental or royalty as herein required and such default continues for more than 30 days, then said Lessee shall become a tenant at sufferance, hereby waiving all right of notice and Lessors shall be entitled immediately to re-enter and retake possession of the demised premises, anything hereinabove contained to the contrary notwithstanding

13. Time is of the essence of this agreement, and each and every clause of this indenture, and all the covenants and conditions herein contained, expressed or implied, shall extend to the successors, heirs, executors, administrators and lawful assigns of all the parties hereto.

14. Any failure of Lessors to exercise their option to terminate this Lease because of any breach of its terms and covenants shall not constitute a waiver of the right to exercise the same at any other time.

IN WITNESS WHEREOF, Lessors have hereunto set their hands and seals and Lessee has caused these presents to be executed in its name by its President, and its corporate seal to be here-

unto affixed attested by its Secretary, all on the day and year last above written.

_____(SEAL)
Frank D. Upchurch

_____(SEAL)
Esther D. Upchurch

_____(SEAL)
Frank E. Hale

_____(SEAL)
Clara A. Hale
(Lessors)

Signed, sealed and delivered
in the presence of:

_____

_____

NUCLEAR-MAGNETIC MINING, INCORPORATED
(Lessee)

By_____
Its President

ATTEST:

_____
Its Secretary

Signed, sealed and delivered
in the presence of:

_____

_____

STATE OF FLORIDA

ST. JOHNS COUNTY:

I HEREBY CERTIFY that on this day before me, the undersigned officer, personally appeared FRANK D. UPCHURCH and ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, to me well and personally known and known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged that they executed the same freely and voluntarily for the uses and purposes therein expressed.

I FURTHER CERTIFY THAT the said ESTHER D. UPCHURCH, known to me to be the wife of the said FRANK D. UPCHURCH, and the said CLARA A. HALE, known to me to be the wife of the said FRANK E. HALE, on separate and private examinations taken and made by and before me separately and apart from their said husbands acknowledged to and before me that they executed the foregoing instrument freely and voluntarily and without any compulsion, constraint, apprehension or fear of or from their said husbands.

WITNESS my hand and official seal this _____ day of _____ 195___.

_____

Notary Public of the State of Florida

at Large

My commission expires _____

DISTRICT OF COLUMBIA:

BEFORE ME, personally appeared CHARLES R. RUDOLPH and GEORGE SUTHERLAND ELMORE, to me well known and known to me to be the President and Secretary respectively of NUCLEAR-MAGNETIC MINING, INCORPORATED, the corporation named in the foregoing instrument, and known to me to be the persons described in and who as such officers of said corporation executed the same; and then and there the said CHARLES R. RUDOLPH and the said GEORGE SUTHERLAND ELMORE, did acknowledge before me that said instrument is the free act and deed of said corporation by them respectively executed as such officers for the purposes therein expressed; that the seal thereunto attached is the corporate seal by them in like capacity affixed; all under authority in them duly vested by the Board of Directors of said corporation.

WITNESS my hand and official seal this ____ day of _____, 195___.

_____
Notary Public of District of Columbia

My commission expires _____

## [illegible] AND [illegible] AGREEMENT

THIS INDENTURE, made and executed in duplicate this 2nd day of June, 1955, by and between FRANK D. [illegible] AND [illegible] D. [illegible], his wife, and FRANK B. HALE and CLARA A. HALE, his wife, of St. Johns County, Florida, parties of the first part, and [illegible], INCORPORATED, a Florida corporation with its principal place of business in St. Augustine, Florida, party of the second part,

WHEREAS, FRANK D. [illegible] and FRANK B. HALE, two of the parties of the first part, are owners in fee simple of lands, portions of which are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 5 SOUTH, RANGE 27 EAST:

Lot 1, Section 34.

IN TOWNSHIP 3 SOUTH, RANGE 29 EAST:

All unsurveyed parts of Sections 17 and 18. Subject to all deeds and easements now held by the United States of America in connection with the construction and maintenance of an intra-coastal waterway from Jacksonville, Florida, to Miami, Florida, and subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida, to Wilfred Rosedale under deed #16382, recorded in Deed Book 25, Page 120, public records of St. Johns County, Florida.

IN TOWNSHIP 4 SOUTH, RANGE 29 EAST:

Lot 4, Section 14,

Lot 3, Section 23,

Lot 6 and all the parts of Lots 1, 4, 5, and 7 of Section 15 lying southerly and easterly of State Road 306,

Unsurveyed Section 23,

Unsurveyed Section 26,

Unsurveyed parts of Sections 27 and 34 lying east of Florida Intracoastal Waterway,

Unsurveyed Section 35,

Unsurveyed Section 36,

N. Sanchez Grant or Section 52,

Section 46, except 25 acres sold to Barkoskie, 9 acres sold to J. Mickler, 18 acres sold to F. J. Mickler, 8 acres sold to Oesterriecher and 42 acres sold to Mabry,

F. P. Sanchez Grant or Section 53,

Davis Floyd Grant or Section 56, containing 832.98 acres, more or less, subject to an undivided one-fourth interest now or formerly owned by H. Kimball Benedict in 415 acres described as follows: All of Davis Floyd Grant or Section 56, less the north 150 acres, the south 247.98 acres, and 20 acres of the remaining 435 acres, said 20 acres being the same parcel of land excepted in deed recorded in Deed Book 67, Page 536, public records of St. Johns County, Florida,

Section 72, except 2 acres sold to Barkoskie,

F. P. Sanchez Grant or Section 73,

Section 74, except 14.5 acres sold to Mabry, 20 acres sold to Farson and 10 acres sold to McDaniel.

IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:

Unsurveyed part of Section 1,

Lots 1 and 2 and unsurveyed part of Section 2,

Unsurveyed part of Section 3 lying east of Florida Intracoastal Waterway,

Unsurveyed part of Section 10 lying east of Florida Intracoastal Waterway,

Lots 6 and 9 and unsurveyed part of Section 11,

Lot 3 and unsurveyed part of Section 12,

Lots 2 and 3 and unsurveyed part of Section 13,

All of Section 14, surveyed and unsurveyed,

All unsurveyed part of Section 15 lying east of Florida Intracoastal Waterway,

Unsurveyed Section 23,

Part of unsurveyed Section 24 lying west of Guana River, same being a tract of marsh land bounded on the north by unsurveyed Section 13, bounded on the east by the waters of Guana River, bounded on the south by unsurveyed Section 25 and bounded on the west partly by Grant to G. Marmolli (Section 50), partly by Grant to A. Atkinson, or Cocifacio (Section 51) and partly by Grant to Pedro Cocifacio (Section 52). Subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida to Frank A. Hale, recorded in Deed Book 194, Page 99, public records of St. Johns County, Florida,

Section 26, said land being a tract of marsh land with a few widely scattered small islands in same, said tract of land being bounded on the north by unsurveyed Section 23, bounded on the west by unsurveyed Section 27 for a distance of about 100 feet near the northwest corner of said Section 26, and bounded on the west south of said point by the waters of North River

sometimes known as Tolomato River, bounded on the south partly by the waters of said North River aforementioned, and partly by unsurveyed Section 36, and bounded on the east partly by Section 46 or the Grant to Mariano Berta and partly by unsurveyed Section 25. Subject and inferior to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 194, page 59, public records of St. Johns County, Florida,

Unsurveyed Section 25,

Unsurveyed Section 27,

Lot 1 and those parts of Lots 2 and 3 lying east of Florida East Coast Railway, Section 30,

Unsurveyed part of Section 33,

A. Floyd Grant or Section 37,

John Floyd Grant or Section 38,

J. P. DeHurgo Grant or Section 50,

P. P. Sanchez Grant or Section 67,

S. I. P. Clark Grant or Section 68,

Atkinson or Gocifacio Grant or Section 51,

Pedro Gocifacio Grant or Section 52,

Lot 3 of Section 2, and Lots 1, 2, 3, 4, 5, 7, and 8 of Section 11. Subject to reservations in deed dated February 12, 1944 from the Trustees of the Internal Improvement Fund of the State of Florida to Frank E. Hale, recorded in Deed Book 140, page 119, public records of St. Johns County, Florida.

<u>IN TOWNSHIP 6 SOUTH, RANGE 29 EAST:</u>

Unsurveyed part of Section 1,

Unsurveyed part of Section 11,

Unsurveyed part of Section 13,

IN TOWNSHIP 7 SOUTH, RANGE 29 EAST:

S½ of Fractional Section 14, except the east 610 feet thereof,

Lots 1 and 4 of Section 33 lying and being north and west of Dixie Highway. Said Dixie Highway being the brick road from St. Augustine to Hastings, Florida,

Peter Doville Grant or Section 38,

Inbam Grant or Section 42.

IN TOWNSHIP 6 SOUTH, RANGE 30 EAST:

Unsurveyed Section 7.

IN TOWNSHIP 7 SOUTH, RANGE 30 EAST

S½ of NW¼ and NE¼ of SW¼ of Section 25,

and portions of which lands are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:

The unsurveyed parts of Sections 5 and 8 and all that part of unsurveyed Sections 6 and 7 lying east of the Florida Intracoastal Waterway. Subject and inferior to all deeds and easements now held by the United States of America in connection with the construction and maintenance of an intracoastal waterway from Jacksonville, Florida to Miami, Florida, and also subject and inferior to reservations contained in deed from the Trustees of the Internal Improvement Fund of the State of Florida to Wilfred Beswick under Deed #16302, recorded in Deed Book 93, Page 676, public records of Duval County, Florida, and to reservations contained in deed #16270 from the Trustees of the Internal Improvement Fund of the State of Florida to I. Brenner recorded in Deed

Book [illegible], Page [illegible], public records of Duval County, Florida.

[illegible] OF THE ABOVE DESCRIBED [illegible] CONTAINING

12,376.7 ACRES, [illegible],

[illegible], [illegible] and [illegible],

two of the parties of the first part, are the owners of the title to all of the oil, gas and other minerals and mineral rights, whether metallic or non-metallic, in and under the lands hereinafter described, with the perpetual right of ingress and egress to and from said lands for the purpose of drilling, exploring and mining and in every way operating for such oil, gas and other minerals and mineral rights and removing the same, portions of which lands are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

<u>IN TOWNSHIP 6 SOUTH, RANGE 27 EAST:</u>

S½ of SE¼ of Section 23,

Government Lot 1, Section 26,

½ of Government Lot 4, Section 30.

<u>IN TOWNSHIP 5 SOUTH, RANGE 2 EAST:</u>

S½ of NE¼ of SW¼ of Section 3,

SW¼, except part subdivided as Hilden, of Section 12,

S½ of Section 12,

NW¼ of Section 13, except portion subdivided as Hilden,

NE¼ of Section 16.

<u>IN TOWNSHIP 8 SOUTH, RANGE 28 EAST:</u>

Lots 9, 10, 14, and 15 of Section 19,

NW¼ of NE¼, N½ of SE¼, SE¼ of NW¼, S½ of NE ¼ of NW¼ and S½ of SW¼ of NW¼ of Section 20,

[illegible] of NW¼ and S½ of SW¼ of Section 20.

IN TOWNSHIP 9 SOUTH, RANGE 28 EAST:

E½ of E½ of Section 12.

IN TOWNSHIP 4 SOUTH, RANGE 29 EAST:

Part of Lot 13 of Section 29 lying south and east of State Road 306,

Part of Section 31 lying south and east of State Road 306,

All of Section 55, except part conveyed to W. F. Mickler, by deed dated April 2, 1938 and recorded in Deed Book 116, Page 471, public records of St. Johns County, Florida, and except part conveyed to W. Alfred Mickler by deed dated April 2, 1938 and recorded in Deed Book 116, Page 474, public records of St. Johns County, Florida, and except part conveyed to James R. Stockton by deed dated April 22, 1943 and recorded in Deed Book 138, Page 274, public records of St. Johns County, Florida, and except part conveyed to E. F. Kirkland by deed dated March 14, 1945 and recorded in Deed Book 149, Page 467, public records of St. Johns County, Florida,

All of Section 57,

All of Section 58,

All of Section 59,

All of Section 60,

All of Section 61,

All of Section 62,

All of Section 63,

All of Section 64,

All unsurveyed parts of Sections 27 and 34 lying west of the Intracoastal Waterway right of way, except part of Section 27 conveyed to James R. Stockton by deed dated April 22,

1943 and recorded in Deed Book 150, Page 274, public records of St. Johns County, Florida,

Part of unsurveyed Section 28 lying south of the south line of land conveyed to James R. Stockton by deed dated April 22, 1943 and recorded in Deed Book 150, Page 274, public records of St. Johns County, Florida.

<u>IN TOWNSHIP 5 SOUTH, RANGE 29 EAST:</u>

Lot 1 of Section 3,

All of Section 4,

Government Lot 3 and part of Government Lot 1 lying east of the west line of Section 63 (F. L. Sanchez Grant) if said west line were projected north 8 degrees west to the north township line, all in Fractional Section 5,

All of Section 7,

All of Section 8,

All of Fractional Section 9,

All of Section 16,

All of Section 17,

All of Section 18,

Lots 1, 2, 3, 6, 7, 8, 9, and Lot 5 (except parts lying within the right of way of Florida East Coast Railway and the right of way of United States Highway Number 1) and also 10 acres in the northeast corner of Government Lot 4, more particularly described as follows: Beginning at the northeast corner of said Government Lot 4, run thence southerly along the east line of said Government Lot, 660 feet to a stake, run thence northwesterly parallel to the north line of said Government Lot, 660 feet to a stake, run thence northerly parallel to the east line of said Government Lot, 660 feet to the north line of said Government Lot, run thence easterly along the north line of said Government Lot, 660 feet to the point of beginning, all in Section 19,

All of Section 20,

All of Section 21,

All of Section 30,

All of Roque Leonardi Grant or Section 61, except land conveyed to W. R. Stokely by deed recorded in Deed Book 43, page 207, public records of St. Johns County, Florida, and except part conveyed to Carrie Tyner by deed recorded in Deed Book 76, page 192, public records of St. Johns County, Florida, and also except part conveyed to Truman Solomon by deed recorded in Deed Book 76, page 249, public records of St. Johns County, Florida,

All of Section 62,

All of Section 63,

All of Section 64,

All of Section 65,

All of Section 66,

All unsurveyed portion of Section 3, lying west of Intracoastal Waterway right of way,

All unsurveyed part of Section 10 lying west of Intracoastal Waterway right of way,

All of Section 15, surveyed and unsurveyed, lying west of Intracoastal Waterway right of way,

All of parts of Lots 2 and 3 of Section 30 lying west of Florida East Coast Railway Company's right of way,

All of Fractional Section 33 except rights of way of railroad and roads and highways.

<u>IN TOWNSHIP 6 SOUTH, RANGE 29 EAST:</u>

All of Fractional Section 10,

Lots 1, 2, and 3 of Section 15,

Part of Pablo Sebate Grant or Section 50 lying west of Florida East Coast Railway Company's right of way, except the following premises included in the above description: Beginning at a point in the westerly right of way limit of the Florida

East Coast Railway, 2940 feet southerly from said Railway Company's mile post 28 on its main line from Jacksonvill to Key West; thence westerly at right angles to said westerly right of way limit, 100 feet; thence southerly at right angles 100 feet westerly from and parallel to said westerly right of way limit, 400 feet; thence easterly at right angles 100 feet to a point in said westerly right of way limit; thence northerly at right angles and along said westerly right of way limit 400 feet to the point of beginning, containing .92 acres, more or less and being part of the Pable Sabato Grant, Section 30,

Lots 7 and 10 of Section 20,

Lots 12 and 13 of Section 21,

Lots 6, 11 and 12 of Section 22,

All of Fractional Section 23,

Lots 1, 2, 3 and 7 of Section 26,

Lots 1, 2, 7, 8 and 9, except 10 acres in west part of Lot 8, of Section 27,

Lot 1 of Section 34.

<u>IN TOWNSHIP 7 SOUTH, RANGE 29 EAST:</u>

All of Section 20, except the N½ of the NW¼,

Government Lot 2, the N½ of the SW¼ and the SE¼ of the SW¼ of Section 28,

Lots 3 and 6 of Section 35.

<u>IN TOWNSHIP 8 SOUTH, RANGE 30 EAST:</u>

Lots 1, 2 and 3 of Section 17,

Lot 10 of Section 19,

NE¼ of NE¼ and N½ of SE¼, except Florida East Coast Railway Company's right of way, Section 29,

Lots 9, 8, 11 and 12 of Section 19,

Lots 2 and 3 and the parts of Lots 4 and 5 east of the Old Boulevie Road of Section 30, excepting 2 acres, more

or less, conveyed to Rt. Rev. [illegible] Kenny, Bishop, by quit claim deed dated December [illegible], 1905, and recorded in Deed Book 10, page [illegible], public records of St. Johns County, Florida; also excepting the right of way of U. S. Military Number 1 as now located; also excepting such out for drainage which described in deed from Heth Chatfield to Clay Hollow Farm Company, dated April [illegible], 1910 and recorded in Deed Book 19, Page 240, public records of St. Johns County, Florida, and excepting any land within 600 feet, more or less, of the right of way of U. S. Military Number 1 as now located;

[illegible] of the and [illegible] of Section 32, except part conveyed to State Road Department of Florida by deed dated April 8, 1941 and recorded in Deed Book 12[illegible], page [illegible], public records of St. Johns County, Florida.

[illegible]

[illegible] of [illegible] of Section 2,

Lots 2, 3, 4, 5, 9, 10, 11, 12 and 13 of Section 15,

[illegible] to Township or Section 40.

[illegible]

[illegible] of [illegible] of Section 7 lying north of Hollicoor Creek,

and portions of which [illegible] situate, lying and being in Duval County, Florida, and more particularly described as follows, to-wit:

[illegible]

[illegible] of unsurveyed Sections 6 and 7 lying east of Florida Intracoastal Waterway. Subject to reservations contained in deed from Trustees of the Internal Improvement Fund of the State of Florida, recorded in Deed Book [illegible], page 675, public records of Duval County, Florida.

ALL OF THE ABOVE DESCRIBED LANDS CONTAINING 16,265.32 ACRES, MORE OR LESS.

NOW, THEREFORE, THIS INDENTURE WITNESSETH:

That in consideration of $1.00 and other good and valuable considerations, to them in hand paid, the receipt thereof is hereby acknowledged, parties of the first part hereby grant to party of the second part, and its assigns, insofar as it is legally possible for them to do so, the right to go upon said premises at any and all times by itself, its agents, laborers and servants with beasts and vehicles, loaded and unloaded, and to erect thereon the suitable paraphernalia necessary for the purpose of drilling, digging and prospecting for minerals and metals, except oil and gas.

Party of the second part, and its assigns, by reason of the consideration herein set forth, shall be allowed insofar as it is legally possible for parties of the first part to permit, to use the water flowing on said premises, the same to be used so as not to interfere with obtaining sufficient water for domestic purposes.

Party of the second part, insofar as it is legally possible for parties of the first part to permit, shall have the free and uninterrupted use of all roads now built and in use on said described premises, and further that party of the second part, and assigns, may erect necessary sluice ways, pipe line, telephone or cable, as may be deemed necessary to the proper carrying out of its mining operations.

Party of the second part shall have said privilege to drill, dig and prospect upon said lands for a period of 14 months from the date of this instrument.

Party of the second part agrees to apply for an exploration loan from the Defense Minerals Exploration Administration in an amount suitable for prospecting and exploring said lands and all of it in search of strategic mineral deposits, except oil and gas. Said application will be mailed to the proper authority within 30 days from the date of this instrument. In the event said application for a loan is denied or so modified and revised by the Government as to be unacceptable to said party of the second part, this agreement may be terminated by said party of the second part. In the event that a satisfactory exploration loan is made to said party of the second part, exploration work shall begin on said lands within 30 days from the effective date of the exploration contract with the Defense Minerals Exploration Administration, and proceed without interruption until completed except for stoppage by force majure.

Party of the second part agrees to allow parties of the first part, or their representatives, to enter upon and into all parts of all workings at any time for the purpose of inspection; and to keep accurate and true records of all exploratory and to provide copies of all such records for the parties of the first part, and to allow them, or their representatives, to inspect same at any time during office hours.

Party of the second part shall post and maintain proper legal notices located in conspicuous places on said lands for the purpose of informing all persons or parties, concerned that

the parties of the first part are not liable for any obligations, debts, liabilities or the like of the party of the second part.

In the event of failure of party of the second part to comply with the terms and provisions of this instrument, parties of the first part may cancel same within 60 days after legally notifying party of the second part in writing that this agreement will be cancelled unless party of the second part cures and corrects such failures within 60 days from the date of such notice. Said notice of intent to cancel shall specify the specific term or terms which have not been fulfilled by party of the second part. The delivery of such notice by United States registered mail shall be deemed sufficient.

In the event of termination of this instrument prior to the aforesaid life thereof, party of the second part shall be allowed 60 days within which to remove all machinery and equipment within said 60 days, the same shall be and become the property of said parties of the first part.

This agreement shall remain in full force and the period of this grant shall extend for a term of 14 months from the date hereof unless sooner surrendered, cancelled or forfeited as provided herein.

Party of the second part shall begin exploratory work on said lands and shall have a drill thereon in operation within 30 days from the effective date of the exploration contract with the Defense Minerals Exploration Administration, and shall carry on prospecting by drilling, and work continuously during the life of this contract. It is further agreed that if said party of the second part shall perform all of the conditions of this contract

in good faith and shall at any time develop minerals or metals upon said premises in sufficient quantities to make the mining and marketing thereof profitable, then the parties of the first part will properly execute and deliver a mining lease upon so much of the above described premises as party of the second part has developed minerals or metals to make the mining and marketing thereof profitable, for a period of 10 years from the date of the conclusion of this contract at a royalty of $1.50 per long ton, or 4 per cent. of the gross market price for all minerals and metals mined from said lands, whichever is greater, It being understood that said royalty shall be on the market price of the concentrated minerals, and shall not extend to the market price of any refined minerals which party of the second part may desire to so refine. In addition during the terms of said lease, party of the second part will pay all real estate and/or mining or mineral taxes on such of said lands as have not been released from the operation of said mining lease, and party of the second part shall pay as minimum rental or royalty the sum of 25 cents per acre per year for such of said lands as it retains for mining purposes, but in no event shall said minimum yearly rental or royalty be less than $5,000.00. No minimum rental or royalty paid shall be a credit on account of the payment of rental or royalty in any succeeding year. Said lease shall contain all the terms and conditions on the form hereto attached and marked Exhibit "A" and made a part of this contract and shall not apply to oil and gas, or minerals or metals occuring deeper than 100 feet below sea level.

IT IS FURTHER MUTUALLY AGREED that if party of the second part shall so elect to construct a plant, separation unit or otherwise desires a plant site on any portion of the above described lands owned in fee simple by parties of the first part, they agree to sell and convey to party of the second part 10 acres of land to be selected by party of the second part at a price to be agreed upon, subject, however, to the retention by parties of the first part of all mineral rights on same, which mineral rights shall be subject to the

provisions of said lease.

Upon the termination of this permit, party of the second part agrees to forthwith make, execute and deliver to parties of the first part a release, or other document, necessary or desirable discharging any of the above described lands upon which minerals or metals have not been developed in sufficient quantities to make the mining and marketing thereof profitable.

IN WITNESS WHEREOF, parties of the first part have hereunto set their hands and seals, and party of the second part has caused these presents to be executed in its name by its President, and its corporate seal to be hereunto affixed attested by its Secretary, all on the day and year first above written.

/s/ Frank D. Upchurch (SEAL)
Frank D. Upchurch

/s/ Ester D. Upchurch (SEAL)
Ester D. Upchurch

/s/ Frank E. Hale (SEAL)
Frank E. Hale

/s/ Clara A. Hale (SEAL)
Clara A. Hale
( Parties of the First Part)

Signed, sealed and delivered
in the presence of:

/s/ Mary B. Vass

/s/ Arnison Vaxer
As to Parties of the First Part

NUCLEAR-MAGNETIC MINING, INCORPORATED
(Party of the Second Part)

/s/ By Charles C. Rudolph
Its President

ATTEST:

/s/ George S. Clemen
Its Secretary

Signed, sealed and delivered
in the presence of:

/s/ A. W. Johnson

As to Party of the Second Part.

STATE OF FLORIDA

ST. JOHNS COUNTY:

I HEREBY CERTIFY that on this day before me, the undersigned officer, personally appeared FRANK D. UPCHURCH and ESTER D. UPCHURCH, his wife, and FRANK E HALE and CLARA A. HALE, his wife, to me well and personally known and known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged that they executed the same freely and voluntarily for the uses and purposes therein expressed.

I FURTHER CERTIFY that the said ESTER D. UPCHURCH, known to me to be the wife of the said FRANK D. UPCHURCH, and the said CLARA A. HALE, known to me to be the wife of the said FRANK E. HALE, on separate and private examinations taken and made by and before me separately and apart from their said husbands acknowledged to and before me that they executed the foregoing instrument freely and voluntarily and without any compulsion, constraint, apprehension or fear of or from their said husbands.

WITNESS my hand and official seal this 2nd day of June, 1953.

(Seal)

/s/ Mary B. Yarn
Notary Public of the State of Florida
at Large

My commission expires September 12, 1953

DISTRICT OF COLUMBIA:

BEFORE ME, personally appeared CHARLES R. RUDOLPH and GEORGE SUTHERLAND ELMORE, to me well known and known to me to be the President and Secretary respectively of MOLLEAR-MAGNETIC MINING, INCORPORATED, the corporation named in the foregoing instrument, and known to me to be the persons who as such officers of said corporation executed the same; and then and there the said CHARLES R. RUDOLPH and the said GEORGE SUTHERLAND ELMORE, did acknowledge before me that said instrument is the free act and deed of said corporation by them respectively executed as such officers for the purposes therein expressed; that the seal thereunto attached is the corporate seal by them in like capacity affixed; all under authority in them duly vested by the Board of Directors of said corporation.

WITNESS my hand and official seal this 9th day of June, 1953.

/s/ Anna W. Johnson
Notary Public of District of Columbia.

My commission expires Dec 15, 1955

(seal)

THIS AGREEMENT OF LEASE, Made and executed in duplicate this _____ day of _____ 195___, by and between FRANK D. UPCHURCH and ESTHER D. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, all of St. Johns County, Florida, hereinafter called "Lessors", and NUCLEAR-MAGNETIC MINING, INCORPORATED, a Florida corporation, with its principal place of business in St. Augustine, Florida, hereinafter called "Lessee;"

WITNESSETH, that Lessors for and in consideration of the rents, royalties, covenants and agreements hereinafter set forth to be paid, kept and performed by Lessee, have leased, let and demised and by these presents do lease, let and demise unto Lessee the following described lands and premises, portions of which are situate, lying and being in St. Johns County, Florida, and are particularly described as follows, to-wit:

(Lands described in foregoing Permit)

and portions of which are situate, lying and being in Duval County, Florida, and are particularly described as follows, to-wit:

(Lands described in the foregoing Permit)

TO HAVE AND TO HOLD the above described premises for the purpose of mining any and all minerals and metals (except petroleum and gas), occuring in or under said lands not more than 100 feet below sea level from the _____ day of _____, 195___ to the _____ day of _____, 196___, being a term of 10 years unless sooner forfeited or terminated through the violation of any of the covenants and conditions herein contained with no power to assign this Lease or any part thereof, or to sublet the whole or any part of said leased premises without the written consent of Lessors first had and obtained.

Lessee in consideration of the premises has covenanted, contracted and agreed, and by these presents does covenant, contract and agree to and with Lessors, their heirs, legal representatives and assigns, as follows:

1. To enter upon said leased lands and premises and to work the same in mine fashion in manner necessary to good and economical mining so as to take out the greatest amount of ore possible with due regard to the development and preservation of said mine or mining lands and premises as a workable mining property, and to the special covenants herein contained.

2. To timber said workings at all points where proper in accordance with good mining practices and to repair all old timbering wherever it becomes necessary.

3. To allow Lessors, their agents or representatives, from time to time to enter upon and descend into all parts of said leased lands and premises for the purpose of inspection, surveys or taking samples therefrom and to render to said Lessors proper assistance in making said inspection, surveys or examination.

4. Lessors reserve the property and right of property in and to all ores extracted from said lands and premises during the period of this Lease, and Lessee covenants and agrees to pay and allow Lessors as royalty upon all ores mined, shipped or sold from said leased lands and premises in any manner during the term of this Lease as follows, to-wit: The sum of $1.50 per long term or 4 per cent. which ever is greater on such minerals and metals produced. However, it is understood that said royalty shall be on the market price of the concentrated minerals and

metals only and shall not extend to the market price of any refined minerals and metals which Lessee may desire to so refine or treat. It is further understood that Lessee shall pay to Lessors as minimum rental or royalty each year for the term of this Lease, the sum of 25 cents per acre for all of said lands and premises on which Lessee has certified to Lessors the discovery of minerals or metals; provided in no event shall said rental or royalty for each year during the term of this Lease be less than $5,00.00. The first of said minimum rental or royalty payments shall be made at or before the execution and delivery of this Lease and on the same day of each consecutive year thereafter. Lessee shall render Lessors monthly statements of royalties due and shall pay any royalty in excess of said minimum rental or royalty monthly. No minimum rental or royalty paid shall be a credit on account of the payment of rental or royalty in any succeeding year.

5. Lessee, shall, and does hereby, assume all responsibility in case of accident to any of its employees, or to any person in or about said property, and does agree to save and keep Lessors harmless of any injury of damage to persons or property in connection with all operations under this Lease.

6. All taxes assessed against said lands and premises, whether real estate and/or mining taxes, shall be paid by Lessee, provided such taxes are levied against property of Lessors and not otherwise.

7. All bills and expenses incurred by Lessee, or those in privity with it, shall be promptly paid by Lessee and by such prompt payment said Lessee shall prevent the filing of any and all liens of miners, mechanics, laborers, materialmen or contractors against said demised premises, and, if by reason of the failure of Lessee to pay all bills and expenses any lien or liens, shall be filed against said lands and premises, Lessors may forthwith pay off and discharge the same, and Lessee holds itself bound to pay to

Lessors all sums so advanced or paid to clear said premises from liens which may be filed as aforesaid, and Lessors may, at their election, declare a forfeiture of this Lease; provided, however, nothing contained herein shall be construed as obligating Lessors to pay any such lien or liens, or to become liable for the payment of any such lien or liens.

8. Lessee covenants that no person not in privity with the parties hereto shall be allowed to hold possession of said lands and premises, or any part thereof, under any pretext whatever without the express consent of Lessors.

9. If within the 10 year term hereby created, Lessee shall abide with and perform all things specified herein and comply with all terms of this Lease, then and in consideration thereof, Lessee shall have an exclusive option and right to have this Lease and the term created hereby, extended and prolonged for an additional term of 15 years from the expiration of the term hereby created, at an increased minimum rental or royalty of 25 cents per acre per year or the sum of $5,000.00, making the minimum annual rental or royalty for such additional 15 year term 50 cents per acre per year or the sum of $10,000.00, whichever is greater. In all other respects the Lease for such additional 15 year term shall be upon the same terms and conditions, covenants and agreements contained in this Lease.

10. In the event of failure by Lessee to comply with the terms and provisions of this instrument, Lessors may cancel same within 60 days after legally notifying Lessee in writing that the agreement will be cancelled unless said Lessee cures and corrects such failures within 60 days from the date of notice. Said notice of intent to cancel shall specify the specific term or terms which have not been fulfilled by Lessee. Said notice may be served by United

States registered mail.

11. In the event of termination of this Lease, prior to the anticipated life thereof, Lessee shall have 60 days in which to remove all machinery and equipment from said lands and premises. Any machinery and equipment not removed from said premises within said 60 day period shall become the property of Lessors, and Lessee expressly covenants and agrees to make, execute and deliver to Lessors a release, or other document, necessary or desirable cancelling this Lease.

12. Lessee hereby expressly covenants and agrees that if default shall be made in the payment of the rental or royalty as herein required and such default continues for more than 30 days, then said Lessee shall become a tenant at sufferance, hereby waiving all right of notice and Lessors shall be entitled immediately to re-enter and retake possession of the demised premises, anything hereinabove contained to the contrary notwithstanding.

13. Time is of the essence of this agreement, and each and every clause of this indenture, and all the covenants and conditions herein contained, expressed or implied, shall extend to the successors, heirs, executors, administrators and lawful assigns of all the parties hereto.

14. Any failure of Lessors to exercise their option to terminate this Lease because of any breach of its terms and covenants shall not constitute a waiver of the right to exercise the same at any other time.

IN WITNESS WHEREOF, Lessors have hereunto set their hands and seals and Lessee has caused these presents to be executed in its name by its President, and its corporate seal to be here-

unto affixed attested by its Secretary, all on the day and year last above written.

_____ (SEAL)
Frank D. Upchurch

_____ (SEAL)
Esther D. Upchurch

_____ (SEAL)
Frank E. Hale

_____ (SEAL)
Clara A. Hale
(Lessors)

Signed, sealed and delivered
in the presence of:

_____

_____

NUCLEAR-MAGNETIC MINING, INCORPORATED
(Lessee)

By_____
Its President

ATTEST:

_____
Its Secretary

Signed, sealed and delivered
in the presence of:

_____

_____

STATE OF FLORIDA

ST. JOHNS COUNTY:

I HEREBY CERTIFY that on this day before me, the undersigned officer, personally appeared FRANK D. UPCHURCH and ESTHER M. UPCHURCH, his wife, and FRANK E. HALE and CLARA A. HALE, his wife, to me well and personally known and known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged that they executed the same freely and voluntarily for the uses and purposes therein expressed.

I FURTHER CERTIFY that the said ESTHER D. UPCHURCH, known to me to be the wife of the said FRANK D. UPCHURCH, and the said CLARA A. HALE, known to me to be the wife of the said FRANK E. HALE, on separate and private examinations taken and made by and before me separately and apart from their said husbands acknowledged to and before me that they executed the foregoing instrument freely and voluntarily and without any compulsion, constraint, apprehension or fear of or from their said husbands.

WITNESS my hand and official seal this _____ day of _____ 195___.

_____

Notary Public of the State of Florida

at Large

My commission expires _____

DISTRICT OF COLUMBIA:

BEFORE ME, personally appeared CHARLES R. RUDOLPH and GEORGE SUTHERLAND BIRDSALL, to me well known and known to me to be the President and Secretary respectively of NUCLEAR-MAGNETIC DRILLING, INCORPORATED, the corporation named in the foregoing instrument, and known to me to be the persons described in and who as such officers of said corporation executed the same; and then and there the said CHARLES R. RUDOLPH and the said GEORGE SUTHERLAND BIRDSALL, did acknowledge before me that said instrument if the free act and deed of said corporation by them respectively executed as such officers for the purposes therein expressed; that the seal thereunto attached is the corporate seal by them in like capacity affixed; all under authority in them duly vested by the Board of Directors of said corporation.

WITNESS my hand and official seal this ____ day of _____, 195___.

_____
Notary Public of District of Columbia

My commission expires _____

# REPORT NO. 2

## Report on Visit to Melbourne and Vero Beach

F. James Owen
March 25, 1953

# Report on Visit to Melbourne & Vero Beach

At the telephone request of C. R. Rudolph, made on Tuesday, March 10, 1953, a visit to the area was made on Saturday, March 14 to Monday, March 16, 1953.

The purpose of the visit was (1) to discuss the development of the mining and concentrating project for the recovery of valuable mineral products from the beach sand lease-holdings, sub-leased from Mr. Walter B. Fraser, as described in the lease agreement as well as from upland property on which the writer recommended options to lease be secured without delay for prospecting and developing and (2) to examine and investigate the mining and concentrating operations and equipment of the Florida Ore Processing Company and Hobart Brothers at Melbourne and Vero Beach, Florida.

**Background:**

The location of the beach sand holdings are fully described in the "Lease Agreement" between the state of Florida and Senator Fraser. More details of the location are given in the writer's "Report on The Potential Possibilities of Profitably Mining and Milling the Mineralized Beach Sands," written after a week's inspection of the property beginning on November 19, 1952.

The writer's report also describes the geology and mineralization, history of present and past operations and production of valuable minerals from the beach sands and ancient fossil-beach deposits.

A sample empirical calculation of ore reserves and possible recoveries was also given for an area between low and high tides extending around Bird Island for a distance of 15,000 feet.

Caution was stressed that certain upland areas as described in the report should very definitely be optioned for mining on a bonus basis or outright purchase

before investing in the building of concentrator plants. Furthermore, it was recommended that these areas be extensively prospected before any great expenditure was made on the beach sand mining and concentrating.

It cannot be too strongly emphasized here that the upland areas present the most promise for extended, profitable mining and the rights to explore and develop them should most certainly be secured now.

The foregoing preamble is given as an introduction to the following account of, and reasons for, this report which describes the visit and investigations made at this time.

In the details which follow a description of two mining and on-the-spot wet concentration operations will be described first and the dry concentrator will be taken up later. Messrs. Richard and Charles Rudolph accompanied the writer during the examination.

Details of Investigation:

1. Mining and Wet Concentration - Melbourne Beach

At a point some 10 to 12 miles north of Sebastian Bay (which is south of the town of Melbourne) a mining and an on-the-spot wet concentration operation was examined. The operation is apparently a joint project of the Florida Ore Processing Company and Mobart Brothers.

The location of the workings is just above the strand line and mining is done between high tide mark (strand line) at the base of the sand dunes and inwards toward the sand dune banks. Here, heavy mineralization was seen with layers of black sand from 2 inches thick to 12 to 18 inches thick.

The mining is done by bulldozers. On the south, some 400 feet of excavation was seen and on the north about 500 feet. The width of the cut from

the strand line away from the sea was about 50 feet. Starting at the south end the material was pushed towards an incline some 50 feet long, and 3 to 4 feet wide. At the top end of the incline is a rough wood hopper and chute. The top of the hopper is about 6 feet high. Similarly, a swath beginning at the north end was made finishing in an incline and chute facing the other chute and at a distance north of it of about 50 feet. Thus, the excavations began at the north and south working toward the middle chutes.

The concentrating plant, while somewhat crude, is apparently the original pilot plant and prototype of the Hobart Separator seen later in more modern design at Vero Beach. The beach sands drop from the chute onto a vibrating plate-screen where shell, pebbles and other debris are discarded as oversize material. The undersize drops to a sump where water from a 4-inch artesian water line is supplied. A 4-inch intake, gasoline motor powered, Maddox iron pump, having a 3-inch outlet, pumps this material to the concentrator.

The concentrator is set on a sand dune a distance of about 40 feet inland, or west of the south chute and sump, at a base elevation of about 10 feet. The sand is pumped through a vertical center pipe, 4 inches in diameter to a height of about 10 feet. Concentric with this pipe at about 8 feet from its inlet is a 10 or 12 inch diameter pipe - cylinder into which the 4-inch pipe opens. The cylinder is 5 inches long and opens to a center 4-inch vertical vent. The sands entering the cylinder, or quiet zone, fan out and 24, 1-inch outlets at the perifery of the cylinder carry the sands through hose pipes to the head end of each of 24 segments framed around the pipe. The circular frame is stationary and supports the pan or tray segments which are made of sheet steel. Each segment is about 8 inches wide at the outer perifery and are about 3 feet long. The small end is about 1½ inches wide. The sides of the pans are about 1½ inches deep. Surrounding

the 4-inch pipe is another concentric cylinder about 10 inches wide and 4 inches deep but it has no inlet from the pipe. It is welded to the pipe about 1 foot below the upper cylinder. Covering this lower cylinder is a cone shaped plate, or disc, supported in such a way that a circular opening ½ to 1 inch from the 4-inch pipe is maintained and another circular opening about 1 inch is maintained between the perifery of the disc and the perifery of the lower cylinder. Each tray-segment ends at the perifery of the cylinder so that as the sands are washed down from the head of the trays towards the center the light sands, or waste material, are carried over the first outside-opening to the bottom end of the disc and into the cylinder. An outlet from the cylinder permits the waste sand to enter a circular hopper, 2 feet in diameter at the top and 3 feet deep to the cone which is 20 inches deep and about 3 to 4 inches at the bottom outlet, from which it is pumped by a 3-inch gasoline motor powered pump through a rubber hose thence to a waste area at the head end of the mining excavation.

The heavy sands lagging behind on the trays dribble into the outside opening at the tip of the small end of the trays. Concentric with the cylinder is a circular compartment, or launder, about 1 to 1½ inches wide and 10 inches deep. The heavy sands drop into this launder from which outlets allow the heavy sands to be washed into another circular steel hopper or tank which is 4 feet in diameter, 20 inches deep vertical sides with a 20-inch inverted cone hopper having a 3-inch bottom outlet. The heavy sands are pumped from this hopper to a second set of trays, or cleaner trays, set in a semi-circle similar to the first set, or "rougher" trays, but there are only 12 in number and smaller. These trays are 4 inches wide at the top, 3 feet long ending in a 1-inch opening. Otherwise, the arrangement is identical with the "rougher" trays and separation of the light from the heavier

sands is made the same way. The heavy sand product is pumped to a suspended circular hopper from which it discharges through a bottom 4-inch pipe to a truck loading station. The lighter, or middling sands, are conveyed by gravity from a circular hopper of the same shape and design as the waste hopper to the sump at the bottom of the mine chute to be recirculated or, they may be recirculated directly by valve arrangements through the "rougher" concentrating trays.

Auxiliary equipment consists of 3 and 4-inch circulating iron pumps powered by gasoline engines, a pump and reservoir tanks to pump the artesian water a distance of some 500 feet, etc.

The whole plant is set on skids to which are attached axles and small, wide (5-inch) rubber tired wheels. It can be moved from place to place as required.

2. Mining and Concentrating - Wabasso

Hobart Brothers mining and concentrating operations at Wabasso, near Vero Beach and some 30 miles south of Melbourne, is an inland operation.

Two tracts within half a mile of each other are being worked just west of the Florida East Coast Railway. The first one visited was at "Rutile Corner". Here, bulldozing operations consisted of first, removing the top 2 feet of surface soil and vegetation and, then scraping the enriched under layers to inclines for loading into trucks. The second tract was worked in the same manner. At this location there is a one story, new office building, about 30 feet by 50 feet, of frame and sheet iron construction. Some 300 to 400 feet from the office building is the new wet concentrating plant of similar pattern but of much larger and far better design. The operation is identical with that of the prototype and would be ideal for our purposes providing:

1. Cost of the wet concentrator is not prohibitive.
2. Capacity is satisfactory.
3. Recovery is efficient.
4. Operation is economically sound and metallurgically efficient.

3. Dry Concentrating Plant - Melbourne

The dry concentrating plant is located 4 miles south of Melbourne at Palm Bay, on the Indian River. It is apparently the old Ris plant which was purchased by Hanck and operated under the name of the Florida Ore Processing Company.

The plant consists of a single unit building having a floor area of approximately 50 feet by 100 feet from which an L-structure extends at right angles to it starting about 60 feet back from the front entrance. This L-structure is about 25 feet wide and 75 feet long. The main building side walls are about 12 feet high to a distance of about 50 feet and rise about 22 feet high the remaining 50 feet towards the rear. The L-structure extends from the east wall. The side walls are about 12 feet. The whole building is a wood-frame structure with corrugated siding and roof coverings. The roofs are V-shaped.

Assuming the river runs north and south the building runs north and south lengthwise and the L-structure runs east and west extending from the east wall of the main building.

The road to the plant leads off a main highway which runs parallel to the building; i.e., north and south and is about 75 feet from it.

The equipment consists of a feeding tower or hoppers at the rear of the building, five Deister concentrating tables located in the rear section where the higher side walls are, also in this area is the magnetic separation equipment and in the front half, or lower side wall section, are the electrostatic separators and finished product storage room. The L-structure houses the dryer and screw conveyors.

The general flow scheme is as follows: Concentrates from the wet operation are trucked from Melbourne Beach, 20 miles away and from Wabasso, 30 miles,

and are dumped down an incline on the bank from the main highway. These rough concentrates pass through a plate vibrating screen into a sump from which they are pumped into the feeder-tower or hoppers. The sands from these hoppers are fed to the concentrating tables the tailings from which are pumped to the bank of the river and the concentrates are carried by screw conveyor to the head of the rotary dryer at the extreme east end of the L-structure. The dry concentrates emerge from the inner, or west, end of the dryer. They are elevated to Carpco High Tension Separators. Concentrates from this step are sent to magnetic separators where finished products of ilmenite and rutile as well as zircon, garnet and staurolite are separated. The last two products find a market in the abrasive industry. Finished products are weighed and packed in 50-pound paper or cloth bags for the market.

Principal equipment items are:

1. Screens.

2. Deister concentrating tables - standard size.

3. Two screw conveyors, each about 80 feet long with revolving spirals about 10 inches in diameter running in an open semi-circular trough.

4. Rotary dryer 2 feet to 2½ feet in diameter and about 75 feet long having a fall of about ½ inch to the foot. It is supported on trunnions set on concrete pillars about 4 to 5 feet high. An oil burner at the discharge end supplies the heat and the dryer is vented through an 8-inch stove pipe.

5. Carpco 4 way electro-high tension separator. (Electrostatic Separator).

6. Magnetic separators of a design unknown, perhaps a Ring.

7. Pumps, vertical bucket elevators and sloping drag elevators, weighing machinery, etc.

The whole plant shows signs of alterations from time to time and is antiquated in design.

According to unreliable information obtained, the plant handles 50 tons of wet concentrates per day, producing 15 tons of end-products which sell for an average of $80 per ton. This would mean, perhaps, that about 800 tons of beach and upland sands were mined per day assuming a 4 to 1 separation by the wet concentrators at the mining sites.

It must be remembered these figures are not at all reliable and may easily be quite erroneous. They were obtained from the plant watchman who was the only individual present, it being Sunday.

He stated the plant operates 6 days a week, two shifts per day and employs 7 men a shift. The mining operation would perhaps employ 5 to 7 men also.

Conclusions:

The foregoing description of operations and plants are recorded for informational purpose and as a guide towards designing a mining operation and concentrator plant in the most modern and economically sound manner possible.

F. James Owen
March 19, 1953

# REPORT NO. 3

## Preliminary Plans for Milling and Mining Florida Beach Sands for Recovery of Ilmenite, Rutile, Zircon and Other Minerals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F. James Owen
March 25, 1953

## Preliminary Plans for Mining and Milling Florida Beach Sands for the Recovery of Ilmenite, Rutile, Zircon and Other Minerals

**INTRODUCTION:**

The American Mining and Development Company, a corporation organized and existing under the laws of the State of Delaware, acquired on November 27, 1953, a sub-lease of the Lease Agreement between the State of Florida and Mr. Walter S. Fraser of the city of St. Augustine, Florida.

The Lease Agreement provides the right to mine and take all minerals, except petroleum and natural gas, from tideland areas in Duval, St. Johns, Flagler and Volusia Counties, Florida, as described and limited more particularly in the Lease Agreement.

Further, permission is granted to enter into and upon said areas and territory with necessary equipment to mine the property.

The original lease demands a royalty of $1.00 per long ton, or a sum equal to 3% of the gross sales, whichever is greater, of all minerals provided the Lessee pay to the State of Florida $25.00 per month as and for minimum royalties during the term of the lease which is 5 years and any extension thereof whether or not such minerals are taken out.

Certain provisos are imposed: (1) navigation of waters shall not be interferred with; (2) mining must not be done where private property or any public beach is damaged, nor any upland property; (3) riparian rights of land owners along the ocean shore must be respected and in the event the Lessee obtains leases and permits from these owners of any property described in and covered by the lease, the Lessee shall apportion the tonnage processed from said land between the bank and low water mark, equally between the Trustees of the lease and each riparian owner; (4) the lease may be cancelled if operations are detrimental to property owners and public generally and such damage is not corrected after 90 days notice by the Trustees,

such cancellation will apply only to area the Trustees shall find such damage is detrimental; (5) the Lessee shall be responsible for all damages caused by any of the operations; (6) accounting and payment of royalties must be made each month for minerals taken in any one month and not later than the last day of the succeeding month, the Trustees agree to accept the date and reports of work sheets as a basis of monthly royalty settlements; (7) an Indemnity Bond of $10,000 shall be delivered to the Trustees as evidence of good faith; (8) Trustees may cancel the lease after 30 days written notice if the Lessee fails to carry out terms and conditions of the contract subject to compliance within the 30 days; (9) Trustees may examine books, warehouses and shipments and area at any time; (10) Lessee may terminate lease upon 30-day written notice of intention; (11) Lessee must build a refining plant in Florida within one year at a cost of not less than $25,000; (12) if agreement is fully carried out, Lessee shall have the option after expiration date of lease to extend it for 10 years at the minimum royalty price based on present market prices but if market value has increased at that time then royalty would advance in proportion and thus established shall remain in force for 10 years.

The lease acquired by the American Mining and Development Company from Fraser on November 27, 1952 is the same except that the assignee agrees to pay Fraser a royalty of $2.00 per long ton, or a sum equal to 6% of the gross sales whichever is the greater, until such time as Assignee has paid assignor $10,000 after which the royalty becomes $1.00 per long ton or 3% of gross sales whichever is greater.

The Assignee agreed to commence mining before March 1, 1953 or assignation becomes void.

Since mining operations were not started on March 1, 1953 an extension of time was granted to Fraser by the State of Florida and in turn by Fraser to the Assignee.

The property was examined for the American Mining and Development Company by a consulting engineer during a week's investigation beginning November 19, 1953. A report of this examination was written and titled, "Report on the Potential Possibilities of Profitably Mining the Mineralized Beach Sands Located as Described in the Lease Agreement Between the State of Florida and Mr. Walter B. Fraser." (Report No. 1).

While certain tideland areas were reported as being heavily mineralized caution was stressed by the engineer that certain upland areas adjoining the lease area should be optional immediately before spending any more money on the enterprise because this upland area presented the best mining possibilities for a sustained commercial operation. Furthermore, it was stressed that if the upland options were acquired by other interests the confining of operations to the tidelands would prevent expansion and development into a substantially sound enterprise. It was further stressed that if the upland options were obtained systematic exploration should be commenced at once to prove-up the mineral reserves. This could perhaps be done through government financial aid.

On February 5, 1953, the same consulting engineer who examined and reported on the property in November, 1952, was commissioned by Mr. C. R. Rudolph to draw up preliminary plans and plant designs to treat the beach sands.

A visit to examine the operations of the Florida Ore Processing Company and Hobart Brothers at Melbourne, Melbourne Beach and Wabasso near Vero Beach was made in company with Messrs. Richard and Charles Rudolph on Sunday, March 15, 1953, and discussions regarding the project took place on Saturday March 14 and Monday, March 16, 1953. A report has been written describing the visit, titled, "Report on Visit to Melbourne and Vero Beach," dated March 19, 1953. In this report a detailed description of the mining, operations, wet separation and dry separation plants is given. (See Report No. 2).

The foregoing introduction is given in detail in order to record the developments leading up to the decisions of the American Mining and Development Company to proceed with the mining and milling project. The development of preliminary plans to carry out the project and the preliminary plant designs are given in the following with drawings and sketches.

## MINING

According to the terms of the Lease Agreement, only that area between low and high tide and extending from Duval County on the north to Volusia County on the south can be mined at this time.

It has been very strongly recommended that certain upland areas running north and south between Villano Beach on the south in St. Johns County to Ponte Vedra Beach some 20 miles north and running east and west between high tide mark, or strand line, to Highway A-1-A should be optioned immediately as well as the area running north and south on the west side of highway A-1-A from St. Augustine to Palm Valley on the north and bounded on the west by the North River. Also, it was recommended that all of Bird Island be optioned if possible.

The area between the strand line and Highway A-1-A mentioned in the preceeding paragraph offers the best immediate opportunity for economical high-grading at the points of heaviest enrichment as described in the report of the engineer's survey made in November 1952. (Report No. 1).

Until such times as the recommended areas are optioned mining developments must be confined to the tideland areas only. If and when the recommended operations to mine are obtained simultaneous developments can be carried out on the tidelands and uplands.

Considerations as to the mining operations are given in the following, therefore, to the tideland areas only.

**Ore Reserves:**

Since, in the brief survey made in November, time did not permit of making extensive investigations for ore reserves, only that tideland area encircling Bird Island was estimated and that only roughly.

It was estimated that about 333,333 short tons or 300,000 long tons of mineralized sands containing about 10% heavy sands, or 30,000 long tons, existed in the tideland area assuming zero depth at low tide and 2 feet depth at the strand

line the area being approximately 200 x 15,000 feet.

The estimated values in the heavy sands using today's prices for ilmenite, rutile, zircon and monazite and neglecting such minerals as garnet and staurolite and, based on assumed assays, was given at $32.60 per short ton or $36.50 per long ton.

Thus, estimated ore reserve values on Bird Island tideland would be 30,000 x $36.50 or $1,095,000 gross.

It would take months of intensive survey and prospecting to arrive at an estimate of all the reserves in the tideland lease holdings and also to drill prospecting holes to determine the depth of economic mineralization.

Mining Operations:

Mining the tideland area will be much more difficult than mining the upland area because of the tide. Operations must be carried out in such a manner that mined areas will not be continually covered with sand washed in by the tide and diluting the mineralization. Several methods present themselves.

1. Dragline operations with the derrick stationed on the upland sand dunes or even near the strand line.

2. Similiarly using a clam-shell instead of a dragline.

3. Dozers, working at low or medium tide.

It is strongly recommended that since such heavy mechanical equipment is costly and maintenance costs and shops would be high such mining operations be "farmed-out" to contractors having such equipment.

It is quite possible the mined material can be given an on-the-spot wet concentration if such separating equipment as the Hobart Portable Separator is available.

Processing Ore at Mining Site:

If a Hobart Portable Separator such as described in Report No. 2 of

March 19, 1953, can be purchased it would seem to be the best equipment to use for crude wet-concentration of the beach sands at the mining site.

The crude separation would consist of screening out shell, rocks and debris and then running the screened sand through the separator. Without knowing the full details of the efficiency of the Hobart Separator, for the purpose of this preliminary planning, it may be assumed that a ratio of concentration of 3:1 is obtained; that is, for every 3 tons mined, 1 ton of crude heavy sands is obtained. This product would then be shipped to a stationary combined wet and dry separator plant.

Transportation would be in large trucks, 5 to 15-ton capacity. Again, because of the cost of such heavy equipment and maintenance without having expensive machine shop equipment, transportation could be "farmed-out" to trucking contractors on a tonnage-mile basis.

## MILLING

**Main Concentration Plant:**

The main concentration plant would consist of a wet concentrator plant for treating the crude concentrates from the mine site and a dry plant for separating out the individual marketable products.

The plant location would if at all possible be selected with the following considerations in mind:

1. Hill side to take every advantage of gravity flow.
2. Utility power availability.
3. Fresh water, either from wells or public supply.
4. Railway and/or public highway transportation.
5. Freedom to operate without interferring with private or public property or domain.
6. Tailing disposal.

The building would be constructed in such manner as to be extendable by sections for future expansion. The plant site would be large enough to permit this.

It should have cement flooring throughout with sloping floors to collecting sumps for spillage and cleaning purposes. The structure should preferably be of steel with corrugated sheet siding and of sufficient interior height to allow for adequate head room.

Altogether the building should be engineered according to the best plant practice and standards. The preliminary design suggested is shown in drawings attached hereto.

Auxiliary building facilities other than the main concentrating sections should include a change room, washing and toilet facilities for the employees, a small laboratory and foreman's office with washing and toilet facilities and a main

office for the office staff and for records, etc. This latter need not be elaborate but of sufficiently modern design as to receive visitors and business representatives.

Wet Concentration Section:

The wet concentration or cleaner operation would be located in one section of the plant away from the dry concentration section.

The equipment would include:

1. Screens to rescreen rough mine concentrates.
2. Feed bins for the screened material.
3. Distributors to spirals.
4. First Stage Humphrey spirals and pumps.
5. Second Stage Humphrey spirals and pumps.
6. Outside storage space or bins for second stage concentrates to permit as much natural drying of the concentrates as possible before sending them to the dryer. This may also be accomplished in a dewatering cone.

Dry Concentration Section:

The dry section would be located in another section of the plant away from the wet operation.

The equipment would include:

1. Suitable equipment to convey the naturally dried "wet" concentrates to the dryer.
2. Rotary dryer.
3. Vibrating conveyors or bucket elevators.
4. Carpco high tension electrostatic separators.
5. Magnetic separators.
6. Weighing and sacking equipment.

Finished Product Storage:

Another section of the plant would be of sufficient size for ample storage space for bagged finished products.

**Maintenance Shops:**

Sufficient space would be provided for maintenance and repair shops; such as, pipefitting, machine shops, etc.

**Comment:**

The stationary wet and dry separating plant should be such that, as much as possible, straight line operation can be achieved; that is, crude wet concentrates to wet cleaner operation to storage to dryer to dry plant to finished product storage and shipping room.

**Operation and Equipment Capacity**

Let us assume that for the initial operation the tonnage of beach sands mined will be 480 long tons per day, two shifts of 8 hours each, six days a week and a work year of 300 days allowing for non-operating days and repairs. Then:

**Rough Concentration at Mine**

| | Per Hour | Per Day | Per Year |
|---|---|---|---|
| Ore mined - long tons | 30 | 480 | 144,000 |
| Crude concentrates ( R of C 3:1) (= feed to stationary plant) | 10 | 160 | 48,000 |

**First Spiral or Cleaner Operation:**

Products = Concentrates to Second stage or recleaning spirals.
Middlings Recirculated.
Tailings to Waste.

| | | | |
|---|---|---|---|
| Feed (long tons) | 10 | 160 | 48,000 |
| Recirculated middlings | 2 | 32 | 9,600 |
| Tails from second stage | 2 | 32 | 9,600 |
| | 14 | 224 | 67,200 |
| Concentrates to Second stage. | 5 | 80 | 24,000 |
| Middlings Recirculated | 2 | 32 | 9,600 |
| Tails to Waste | 7 | 112 | 33,600 |
| | 14 | 224 | 67,200 |

R of C = 2:1

**Second Spiral or Recleaner Operation:**

Products = Concentrates to Storage (for natural drainage).
Tailings to First stage spirals.

| | Per Hour | Per Day | Per Year |
|---|---|---|---|
| Feed (long tons) | 5 | 80 | 24,000 |
| Concentrates to Storage | 3 | 48 | 14,400 |
| Tailings to First stage | 2 | 32 | 9,600 |

R of C = 1.67:1

**Number of Spirals Required:**

First Stage: One 5-turn spiral handles (1-2/ton/hour), say 1.5 tons per hour.
Total Feed: 14 tons per hour.
Number of 5-turn spirals required = 14 ÷ 1.5 or approximately 10.

Second Stage: One 3-turn spiral handles 0.5 tons per hour. (Dupont).
Total Feed: 5 tons per hour.
Number of 3-turn spirals required = 5 ÷ 0.5 or approximately 10.

**Cost of Spirals:**

| | |
|---|---|
| One 5-turn spiral costs, f.o.b., Fort Wayne, $500 or 10 = | $5,000 |
| One 3-turn spiral costs, f.o.b., Fort Wayne, 300 or 10 = | 3,000 |
| Cost at factory for 20 spirals (10-5T & 10-3T) | 8,000 |
| Add, for freight, installation, etc. | 2,000 |
| Total installed cost. | $10,000 |

**Dryer:**

At Dupont, one 6 x 60 foot, Ruggles-Coles, stoker fired dryer handles 35 long tons per hour of 7% $H_2O$ concentrates. (The concentrates from spirals contain 16% moisture and natural drying reduces this to 7%).

It would be good practice to plan for 10 times the capacity required by having sufficient expandable space for extra drying capacity. But for the immediate requirements a much smaller dryer will suffice, say one which will handle about 6 tons per hour.

Without having cost figures on hand for the dryer installation only an approximation of its cost can be assumed. Costs and other data are being obtained. For the purpose of preliminary planning the cost of the dryer, installed and including burner is estimated at $3,000.

Dry Plant.

High Tension Electric Separators:

According to J. Hall Carpenter, of Carpco Company, manufacturers of the High Tension Electric Separators (HTS), the 40 Rotor (60") Industrial HTS will handle 10 tons of material per hour. The cost of this equipment, $8,580, is f.o.b. factory.

It is recommended that such a unit be considered for the preliminary planning. This equipment would probably be installed for about $8,580 plus $257 (taxes) plus $500 (freight and installation) = $9,337.

Electro-Magnetic Separator:

This equipment is also available from Carpco and the 3 Rotor (18") Industrial would handle about 10 tons per hour. The factory cost is $7,150, taxes about $214, freight and installation about $500, or a total of $7,864.

Auxiliary Equipment:

Auxiliary equipment at the stationary wet and dry plant would include:

Wet feed screens.
Wet feed hoppers.
Pumps and electric motors.
Piping.
Clam-shell shovel - for dryer feed.
Conveyor to dryer - screw or belt.
Vibrating conveyor for dry feed to HTS elevators.
Elevators to HTS and EMS.
Motors and electrical installation.
Weightometers.
Bagging equipment.
Hand trucks or dollies.
Shipping truck (could be contracted).

## COST OF PLANT

| | |
|---|---|
| Building: Estimated | $ 15,000 |
| Spirals | 10,000 |
| Dryer assembly - estimated | 3,000 |
| H. T. Separator | 9,337 |
| E. M. Separator | 7,864 |

**Auxiliary Equipment:**

| | |
|---|---|
| Wet feed screen | 300 |
| Pumps & Motors 3 - First Stage - 4" - @ $200 ea.) | |
| 2 - Second Stage - 3" @ 150 ea.) | 1,200 |
| 2 - Pumps - 3" @ 150 ea.) | |
| Piping | 500 |
| Clam-shell shovel - (used) | 3,000 |
| Conveyor to dryer | 200 |
| Vibrating conveyer | 300 |
| Elevators - 3 @ $200 ea. | 600 |
| Weightometers | 300 |
| Trunk - (used) | 2,000 |
| Miscellaneous | 1,000 |
| | $54,601 |
| Engineering 5% | 2,730 |
| Contingencies 10% | 5,460 |
| Total cost concentrating plant | 62,791 |
| Hobart wet separator - estimated | 17,209 |
| Total cost of concentrating plant | 80,000 |
| Working capital 20% | 20,000 |
| Total cost of construction | $ 100,000 |

The foregoing estimate of construction costs must necessarily be only an approximation at this time until direct quotations are received when final engineering plans are drawn up. However, it is believed the costs are fairly close to actuality, probably within plus or minus 10%.

Construction and installation time is estimated at four months depending upon how soon a decision is reached to proceed, final engineering, delivery time of equipment, etc.

## ESTIMATED OPERATING COSTS AND ANNUAL PROFIT
### Based on 480 Long Tons Per Day

**Mining and Wet Concentration:**

| | Tons Per Day | % | Tons Per Year (300 Days) |
|---|---|---|---|
| Sand mined | 480 | 100.00 | 144,000 |
| Crude concentrates | 160 | 33.33 | 48,000 |
| First stage concentrates | 80 | 16.67 | 24,000 |
| Second stage concentrates | 48 | 10.00 | 14,400 |
| Tailings - Total | 192 | 40.00 | 57,600 |

**Dry Concentration:**

| | Per Day | % | Value Per Ton | Value Per Day | Long Tons Per Year | Value Per Year |
|---|---|---|---|---|---|---|
| Feed | 48 | 100.00 | | | 14,400 | |
| Concentrates | 36 | 75.0 | $ 36.50 | $1,314.00 | 10,800 | $394,200.00 |
| Tails | 12 | 25.0 | | | 3,600 | |

R of C = 1.34:1

**Unit Costs of Operation (Based on 480 Long Tons Per 2-Shift Day):**

| Mining: | Per 16 Hours | Per Ton Mined |
|---|---|---|
| Dragline rental ($40) & 2 men/shift @ 10.00 each | $ 80.00 | 16.6 ¢ |
| Crude concentration 2 men/shift @ 8.00 each | 32.00 | 6.7 |
| Power, maintenance, etc. | 20.00 | 4.2 |
| Transportation @ 25¢/ton | 40.00 | 8.4 |
| Total Mining | $172.00 | 35.9 |

| Concentration: | | |
|---|---|---|
| Labor - 7 men/shift @ 8.00 | 112.00 | 23.4 |
| Power, maintenance, etc. | 75.00 | 15.6 |
| Fuel | 10.00 | 2.1 |
| Packaging, marketing, transportation | 24.00 | 5.0 |
| Miscellaneous supplies and repairs | 24.00 | 5.0 |
| Administration & general overhead | 75.00 | 15.6 |
| Royalties $2.00/ton/final concentrates | 72.00 | 15.00 |
| | $392.00 | 81.7 |

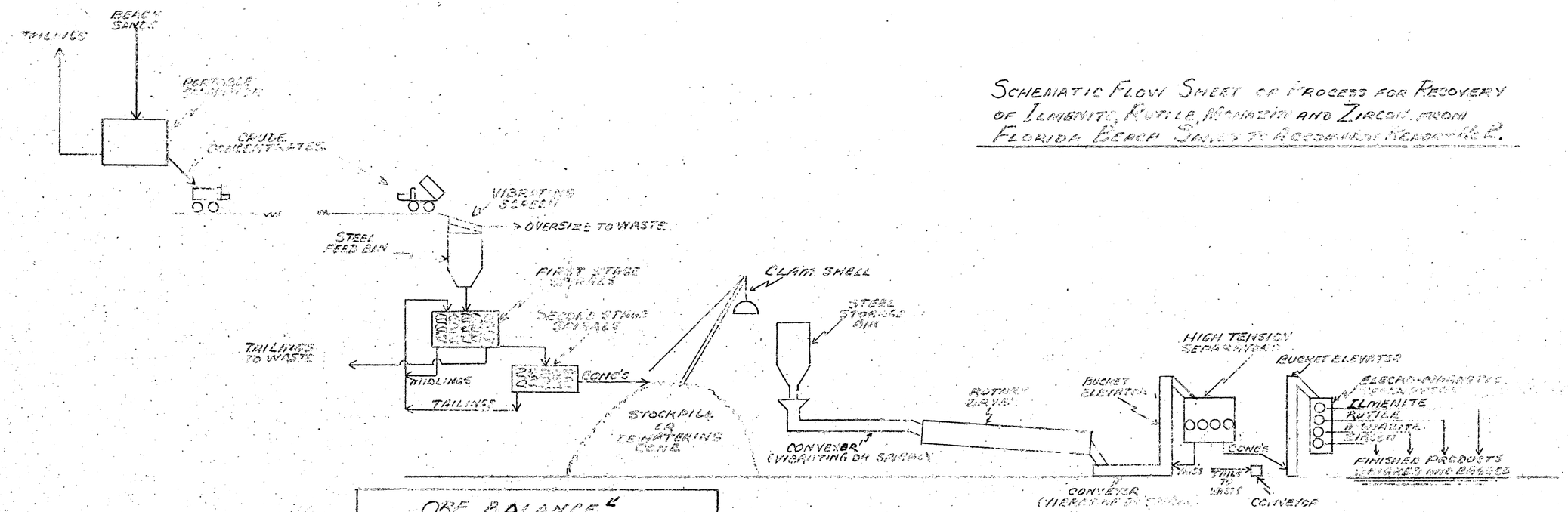
Recap:

| | Per 16 Hours | Per Ton Mined |
|---|---|---|
| Total Mining | $ 172.00 | 35.9¢ |
| Total Concentrating | 392.00 | 81.7 |
| Total | $564.00 | 117.6¢ |

| | Per 16 Hours | Per Ton Mined | Per Year (300 Days) |
|---|---|---|---|
| Gross Product Revenue | $ 1,314.00 | $ 2.74 | $394,200.00 |
| Less Operating Cost | 564.00 | 1.17 | 169,200.00 |
| Net Return Before Taxes & Write-off | $ 750.00 | $ 1.57 | $225,000.00 |

F. James Owen
March 25, 1953

SCHEMATIC FLOW SHEET OF PROCESS FOR RECOVERY OF ILMENITE, RUTILE, MONAZITE AND ZIRCON FROM FLORIDA BEACH SANDS TO ACCOMPANY REPORT NO. 2.




## ORE BALANCE[L]

| | PER HOUR | PER DAY | PER YEAR |
|---|---|---|---|
| ORE MINED[2] | 30 | 450 | 144,000 |
| CRUDE CONCENTRATES | 10 | 150 | 48,000 |
| TAILINGS TO WASTE | 20 | 300 | 96,000 |
| RATIO OF CONC'N 3:1 | | | |

| | PER HOUR | PER DAY | PER YEAR |
|---|---|---|---|
| 1st STAGE TOTAL FEED | 10 | 160 | 48,000 |
| RECIRCULATED MIDS | 2 | 32 | 9,600 |
| 2nd STAGE TAILS | 2 | 32 | 9,600 |
| TOTAL TO 1st STAGE | 14 | 224 | 67,200 |
| 1st STAGE CONCS | 5 | 80 | 24,000 |
| " " MIDS | 2 | 32 | 9,600 |
| " " TAILS TO WASTE | 7 | 112 | 33,600 |
| R OF C 2:1 | | | |

| | PER HOUR | PER DAY | PER YEAR |
|---|---|---|---|
| 2nd STAGE TOTAL FEED | 5 | 80 | 24,000 |
| " " CONCS | 3 | 48 | 14,400 |
| " " TAILS TO 1st STAGE | 2 | 32 | 9,600 |
| R OF C 1.67:1 | | | |

| | PER HOUR | PER DAY | PER YEAR |
|---|---|---|---|
| FEED TO 2nd PLANT | 3 | 48 | 14,400 |
| FINAL CULL CONCS | 2.25 | 36 | 10,800 |
| TAILINGS | 0.75 | 12 | 3,600 |

OVERALL RATIO OF CONCENTRATION = $\frac{30}{2.25}$ = 13.4:1

[2] LONG TONS.

[L] ORE BALANCE BASED ON 450 LONG TONS MINED PER DAY - TWO - 8 HOUR SHIFTS 300 DAYS PER YEAR

F.J.O. MARCH 22, 1953.

Preliminary Design for Mill Building Will be Included Later

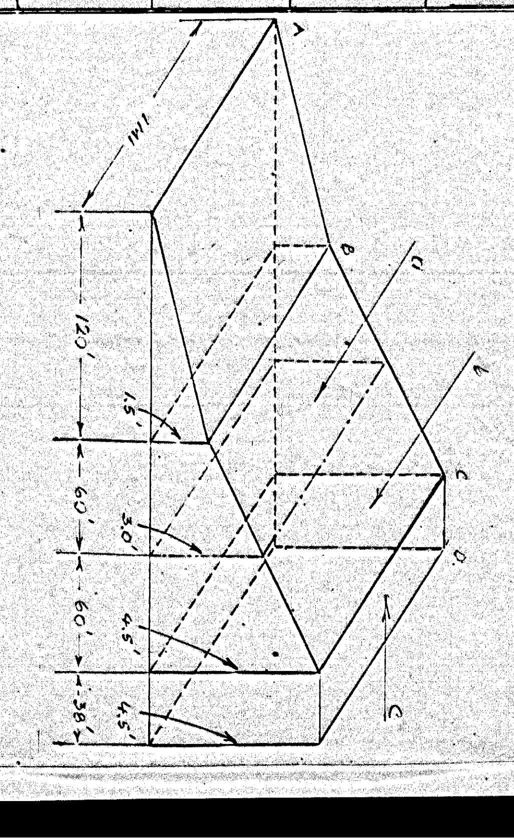
OFFICIAL BUSINESS

(PMGC)

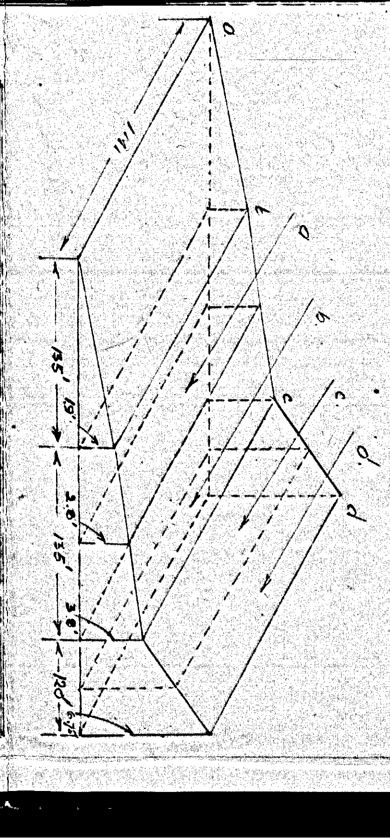
SPOKANE, WASH.

Contract Administration and Audit Division,
Defense Minerals Exploration Administration
Department of the Interior
Washington 25, D. C.

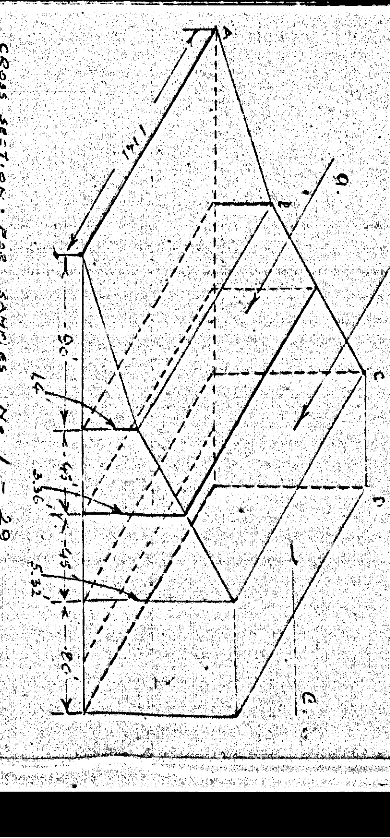
| SAMPLE No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DISTANCE IN FT HT TO S.D | 60 | 25 | 25 | 25 | 35 | 35 | 50 | 25 | 35 | 60 | 50 |
| DEPTH OF HT IN FEET | 3.5 | 3.5 | 3.5 | 4.5 | 4.5 | 5 | 4 | 5 | 5 | 5 | 4.5 |
| PERCENT H.MIN. OF HT. | 5.50 | 9.64 | 12.18 | 3.53 | 3.17 | 2.83 | 1.94 | 3.67 | 3.91 | 4.53 | 1.90 |
| DISTANCE IN FEET MT TO HT. | 150 | 150 | 150 | 150 | 125 | 100 | 85 | 85 | 100 | 100 | 100 |
| DEPTH OF MT IN FEET | 1 | 1 | 0.75 | 0.75 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| PERCENT H.MIN OF MT. | 0.54 | 1.14 | 1.59 | 1.15 | 1.27 | 1.22 | 0.59 | 1.07 | 0.90 | 0.68 | 0.67 |
| REMARKS. | | | | | | | | | | | |



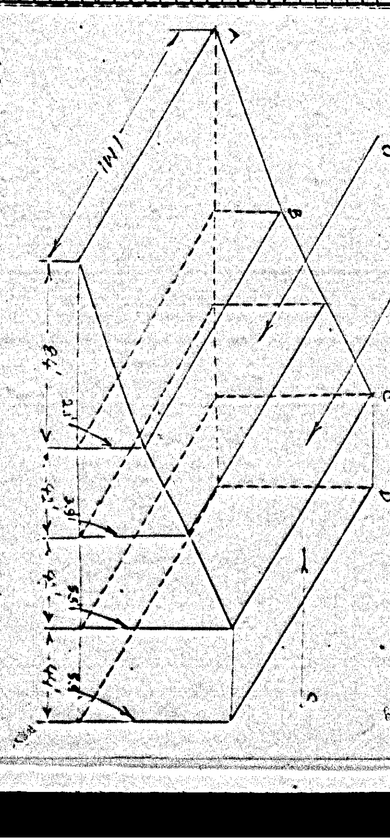
| SAMPLE No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DISTANCE IN FT. H.T. TO S.D. | 175 | 120 | 80 | 82 | 60 | 82 | 60 | 70 | 65 | 70 | 200 | 260 | 250 |
| DEPTH IN FEET HIGH TIDE | 3.5 | 3.5 | 3.0 | 3.0 | 3.0 | 4.5 | 3.5 | 4.5 | 3.0 | 4.0 | 4.5 | 4.5 | 4.5 |
| PERCENT OF H.M OF H.T. | 10.2 | 11.3 | 9.8 | 7.8 | 7.0 | 3.5 | 5.7 | 10.0 | 3.3 | 5.9 | 5.4 | 6.4 | 8.8 |
| DISTANCE IN FT. M.T. TO H.T. | 125 | 150 | 125 | 135 | 135 | 150 | 130 | 125 | 100 | 125 | 150 | 120 | 125 |
| DEPTH IN FEET MIDDLE TIDE | 1.5 | 2.0 | 1.5 | 2.0 | 2.0 | 2.5 | 2.5 | 2.5 | 2.0 | 1.5 | 1.5 | 1.5 | 1.5 |
| PERCENT OF H.M OF M.T. | 2.0 | 3.9 | 4.0 | 1.9 | 1.9 | 1.9 | 3.0 | 2.0 | 2.7 | 4.8 | 3.0 | 3.4 | 3.8 |
| REMARKS. | | | | | | | | | | | | | |



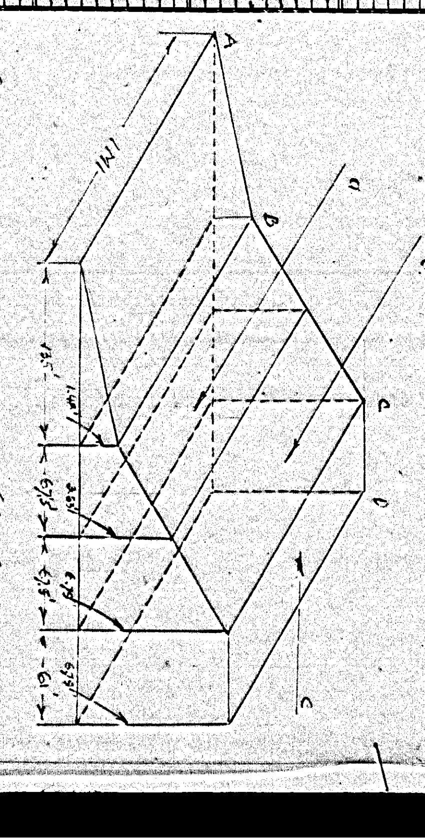
CROSS SECTION FOR SAMPLES No 1 - 29.



CROSS SECTION FOR SAMPLES No 30 - 39.



CROSS SECTION FOR SAMPLES No 40 - 60.



| SAMPLE No | 1. | 2. | 3 | 4 | 5. | 6 | 7. | 8 | 9 | 10 | 11. | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DISTANCE IN FEET HT to S.D. | 0. | 0. | FLAT ISLAND | FLAT ISLAND | FLAT ISLAND | FLAT ISLAND | 325 FT. | 150 FT. | FLAT ISLAND | | | | EDGE | 100 | 125 | 65 | 50 | 65 | 85 | 25 | EDGE | 50 | 35 | 35 | 35 | 75 | 75 | 60 |
| HT DEPTH IN FEET | 4.5 | 4.5 | 4 | 4 | 4 | 4.5 | 4 | 5 | 5 | | | | 5 | 5 | 6 | 6 | 6.5 | 6.5 | 7 | 7 | 6.5 | 6 | 6 | 6 | 6 | 5.5 | 5 | 4 |
| % HS of HT. | | | 2.22 | 2.23 | 12.9 | 9.79 | 12.6 | 7.99 | 9.67 | | | | 4.61 | 1.21 | 2.29 | 0.96 | 3.64 | 2.43 | 2.3 | 2.82 | 3.77 | 2.28 | 4.34 | 4.0 | 5.47 | 0.70 | 2.50 | 1.63 |
| DISTANCE IN FT MT to HT | 0 | 0 | 45 | 45 | 125 | 100 | 125 | 75 | 50 | | | | 125 | 100 | 110 | 100 | 85 | 100 | 100 | 100 | 85 | 100 | 100 | 85 | 85 | 60 | 65 | 75 |
| MT. DEPTH IN FEET | | | 2.5 | 2.5 | 1.75 | 1.5 | 1.5 | 1.5 | 1.5 | | | | 2 | 3.5 | 1 | 1 | 1.5 | 1 | 0.5 | 1 | 1.5 | 1 | 1.5 | 1.5 | 1 | 0.5 | 0.5 | 1 |
| % HS of MT. | | | 2.09 | 1.91 | 1.96 | 2.1 | 2.03 | 2.64 | 2.51 | | | | 0.82 | 1.05 | 1.12 | 1.32 | 0.68 | 0.75 | 1.26 | 1.30 | 2.26 | 0.79 | 0.95 | 1.06 | 0.80 | 0.63 | 0.95 | 1.63 |
| REMARKS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| SAMPLE No | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DISTANCE IN FEET HT to S.D. | 50 | 35 | 50 | 25 | 50 | 40 | 50 | 40 | 50 | 50 | 50 | 60 | 50 | 50 | 35 | 50 | 50 | 60 | 60 | 75 | 50 | 60 | 75 | 75 | 50 | 50 | 75 |
| HT DEPTH IN FEET | 4.5 | 5 | 6.5 | 6 | 5 | 5.5 | 5.5 | 5 | 6 | 5 | 5.5 | 6. | 6 | 6.5 | 6 | 6 | 6.5 | 6 | 6 | 6.5 | 6. | 6. | 6 | 5 | 8 | 8 | 8 |
| % HS of HT. | 4.39 | 13.52 | 8.76 | 9.88 | 7.11 | 4.95 | 9.14 | 4.78 | 4.40 | 7.12 | 5.83 | 3.3 | 5.17 | 5.86 | 9.39 | 10.9 | 3.42 | 7.46 | 6.98 | 9.12 | 3.61 | 5.56 | 4.26 | 0.83 | 6.12 | 2.79 | 2.9 |
| DISTANCE IN FT MT to HT | 100 | 60 | 65 | 75 | 75 | 100 | 85 | 100 | 100 | 100 | 80 | 100 | 100 | 125 | 100 | 150 | 125 | 175 | 150 | 150 | 150 | 175 | 125 | 150 | 125 | 125 | 150 |
| MT. DEPTH IN FEET | 1 | 2 | 3 | 2 | 2 | 1 | 2.5 | 1 | 2 | 1.5 | 4 | 1.5 | 3. | 2 | 2 | 1.5 | 1.5 | 1.5 | 1 | 1.5 | 1.5 | 1. | 1 | 1 | 2 | 2 | 1.5 |
| % HS of MT. | 0.92 | 1.32 | 0.87 | 2.24 | 1.72 | 1.75 | 1.09 | 0.93 | 0.60 | 0.69 | 0.76 | 0.85 | 0.85 | 0.89 | 0.56 | 1.27 | 0.46 | 0.9 | 1.19 | 1.01 | 1. | 1. | 0.60 | 0.95 | 1.01 | 0.85 | 0.85 |
| REMARKS | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| SAMPLE No | 56 | 57 | 58 | 59 | 60 |
|---|---|---|---|---|---|
| DISTANCE IN FT HT. to S.D. | 75 | 75 | 75 | 75 | 75 |
| H.T. DEPTH IN FEET | 8 | 8 | 8 | 8 | 8 |
| % HS. of H.T. | 4.73 | 3.47 | 2.91 | 2.02 | 3.05 |
| DISTANCE IN FEET HT. to MT | 150 | 125 | 125 | 125 | 125 |
| M.T. DEPTH IN FEET | 1.5 | 1. | 1 | 1 | 1. |
| % HS. of M.T. | 1.2 | 1.0 | 0.95 | 1.1 | 1.2 |