CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the

Arizona Department of Mines and Mineral Resources Mining Collection

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Phoenix, Arizona

March 4, 1941

M E M O R A N D U M

TO: Miles M. Carpenter

FROM: J. S. Coupal

SUBJECT: Report on Arizite Mine.

I am enclosing a copy of a letter just received from the Corporation Commission.

Please arrange to see Mr. Staley at your earliest convenience and go to the property, and with Staley's assistance prepare a report along the lines suggested by Mr. Peterson's letter.

Enc.

March 4, 1941

William (Bill) Petersen
Arizona Corporation Commission
Capitol Building
Phoenix, Arizona

Dear Mr. Petersen:

Your letter of March 3 just received and I am instructing our field engineer Miles Carpenter to examine the property and make report as requested.

Yours very truly,

J. S. Coupal

Director.

JSC:H

COPY

ARIZONA CORPORATION COMMISSION
THE CAPITOL
PHOENIX

William (Bill) Petersen
Commissioner

March 3, 1941.

Mr. J. S. Coupal, Director,
Department of Mineral Resources,
State House,
Phoenix, Arizona.

Dear Mr. Coupal:

The Commission is interested in obtaining a report on the property owned by the Arizite Products Corporation and operated by M. G. Staley, of Oracle, Arizona.

In this report, we would like to have you state what the products from this mine are used for, and to your knowledge, if it is a feasible property that will merit the investment of money to place it on the market and if it can be given, the estimated tonnage and the value of the mill and mill site.

The Commission sincerely appreciates the offer of the Mineral Resorces Department to help with problems that confront us and I personally, sincerely thank you for your kind co-operation.

Sincerely yours,

(SIGNED) WILLIAM (BILL) PETERSEN,
COMMISSIONER

WBP-pat

State of Arizona

Office of the Secretary

Certificate of Trade Name Registration

In accordance with the application filed in this office on the 5th day of March, 1974, the TRADE NAME described below has been duly registered in this Department pursuant to Title 44, Chapter 10, Article 3.1, Arizona Revised Statutes, in behalf of Henry L. Farabee and/or Wanda K. Farabee

Name

1857 East 2nd Avenue, Mesa, Arizona 85204

Address

Description of Trade Name:

AZO MINED PRODUCTS CO.

General nature of business: Wholesale and retail of mined minerals of products of natural origin

[illegible] March 5, 1974

[illegible] March 4, 1979

[illegible] February 26, 1974

In Witness Whereof I have hereunto set my hand and affixed the Great Seal of the State of Arizona. Done at Phoenix the Capitol this 5th day of February A.D. 1974

Wesley Bolin

Secretary of State

File No. 3[illegible]088

SECRETARY OF STATE

APPLICATION FOR REGISTRATION OF TRADE NAMES

(Title 44, Chapter 10, Article 3.1, Arizona Revised Statutes)

No.....

Approved.....

Date.....

Fee.....

Henry L. Farabee and/or Wanda K. Farabee
(Name of Applicant), a person, partnership, corporation, firm, association, society, foundation, federation or organization (strike words inapplicable) or foreign corporation licensed to do business in this state, hereby makes application for registration of the name, title or designation under which such applicant is operating by filing the following statements with the Secretary of State of Arizona:

1. a. Name of Applicant(s) Henry L. Farabee and/or Wanda K. Farabee
1857 East 2nd Avenue
Mesa, Arizona 85204

   b. Business Address .....

2. If incorporated, state of incorporation .....

3. Name, Title or Designation to be registered AZO MINED PRODUCTS CO.

4. General nature of business conducted Wholesale and retail of mined minerals of products of natural origin

5. The length of time during which the name, title or designation has been used by applicant in operations within this state is February 26, 1974

Henry L. Farabee
(SIGN HERE)

By .....

STATE OF ARIZONA

COUNTY OF Maricopa ss.

Henry L. Farabee
(Applicant or Agent of Applicant), being first duly sworn says that he is the applicant, agent of applicant (strike words inapplicable), and that all statements made in the above written application are true.

Henry L. Farabee
(SIGN HERE)

Sworn to before me and subscribed in my presence this 5th day of March

A.D. 19 74

.....
Notary Public

Filing Fee: $3.25

[redacted]

State of Arizona

Office of the Secretary

Certificate of Trade Name Registration

In accordance with the application filed in this office on the 6th day of May, 19 76, the TRADE NAME described below has been duly registered in this Department pursuant to Title 44, Chapter 10, Article 3.1, Arizona Revised Statutes, in behalf of Azo Mined Products Company, Incorporated
Name

Post Office Box 4310, Mesa, Arizona Mammouth, Arizona
Address

Description of Trade Name:

ARIZONA "WHITE GOLD" DIATOMITE CO.

General nature of business Mining - sales and productions

Date of Incorporation May 6, 1976

Registration Expires May 5, 1981

Date First Used In Arizona April 6, 1976

In Witness Whereof I have hereunto set my hand and affixed the Great Seal of the State of Arizona. Done at Phoenix the capital this 6th day of May A.D. 1976

Pat Fabritz

File No. 19564 Assistant Secretary of State

SECRETARY OF STATE

APPLICATION FOR REGISTRATION OF TRADE NAMES

(Title 44, Chapter 10, Article 3.1, Arizona Revised Statutes)

No.....

Approved.....

Date.....

Fee.....

AZO MINED PRODUCTS COMPANY, INCORPORATED, a person, partnership,
(Name of Applicant)
corporation, firm, association, society, foundation, federation or organization (strike words inapplicable) or foreign corporation licensed to do business in this state, hereby makes application for registration of the name, title or designation under which such applicant is operating by filing the following statements with the Secretary of State of Arizona:

1. a. Name of Applicant(s) HENRY FARABEE AND WANDA K. FARABEE

   b. Business Address P.O. Box 4310 Mesa, Az.
   Mammouth, Az.

2. If incorporated, state of incorporation ARIZONA

3. Name, Title or Designation to be registered ARIZONA "WHITE GOLD" DIATOMITE CO.

4. General nature of business conducted MINING - SALES AND PRODUCTION

5. The length of time during which the name, title or designation has been used by applicant in operations within this state is 30 DAYS

Azo Mined Products Co Inc
(SIGN HERE)
By Henry Farabee
Wanda K. Farabee

STATE OF ARIZONA

COUNTY OF Maricopa ss.

Henry K Farabee, being first duly sworn says that
(Applicant or Agent of Applicant)

he is the applicant, agent of applicant (strike words inapplicable), and that all statements made in the above written application are true.

Henry Farabee
(SIGN HERE)

Sworn to before me and subscribed in my presence this 5th day of May

A.D. 19 76

Notary Public

Filing Fee: $3.25

MINING LEASE

THIS MINING LEASE, made and entered into this 26th day of August, 1975, by and between the UNIVERSITY OF ARIZONA, hereinafter referred to as "LESSOR" and HENRY FARABEE dba AZO MINED PRODUCTS CO., hereinafter referred to as "LESSEE".

Lessor represents and warrants that it is the owner of those mining claims listed below, that there are no liens, encumbrances or adverse claims thereto, that said claims have been properly located and perfected according to the law of Arizona and the United States of America and that the assessment work has been done thereon for the year ending September, 1974. Lessor, for and in consideration of the rentals, covenants and mutual agreements herein contained, does hereby grant unto Lessee a lease in the following unpatented placer mining claims located in the Mammoth Mining District, Pinal County, Arizona, location notices of which are recorded in the office of the County Recorder of Pinal County, Arizona, and said property consists of the following mining claims:

NAME OF CLAIM	BOOK OF MINES	PAGE
NUEZ No. 2	49	163
NUEZ No. 3	49	164
NUEZ No. 4	49	165
NUEZ No. 5	49	166
NUEZ No. 6	49	167
NUEZ No. 7	49	168
NUEZ No. 8	49	169
Amended	51	18
NUEZ No. 9	49	170
KAOLIN No. 1	49	171
KAOLIN No. 2	49	172
KAOLIN No. 3	49	173
KAOLIN No. 4	49	174
KAOLIN No. 5	49	175
	DOCKET	
NUEZ No. 10	16	86
NUEZ No. 11	16	87
KAOLIN No. 6	16	92
KAOLIN No. 7	16	91
OVERSITE	65	571
OVERSITE No. 1	65	572
OVERSITE No. 2	65	573

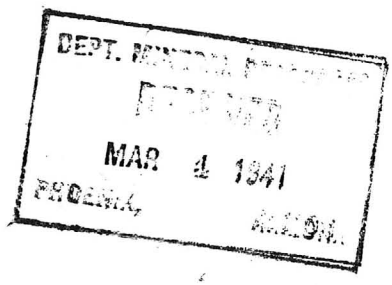
on the following terms and conditions as hereinafter set forth.

1. TERM. The terms of this Lease shall be for five (5) years unless sooner forfeited or terminated in accordance with the

ARIZONA CORPORATION COMMISSION
THE CAPITOL
PHOENIX

WILLIAM (BILL) PETERSEN
COMMISSIONER

March 3, 1941.



Mr. J. S. Coupal, Director,
Department of Mineral Resources,
State House,
Phoenix, Arizona.

Dear Mr. Coupal:

The Commission is interested in obtaining a report on the property owned by the Arizite Products Corporation and operated by M. G. Staley, of Oracle, Arizona.

In this report, we would like to have you state what the products from this mine are used for, and to your knowledge, if it is a feasible property that will merit the investment of money to place it on the market and if it can be given, the estimated tonnage and the value of the mill and mill site.

The Commission sincerely appreciates the offer of the Mineral Resources Department to help with problems that confront us and I personally, sincerely thank you for your kind co-operation.

Sincerely yours,

Bill Petersen

WILLIAM (BILL) PETERSEN,
COMMISSIONER

WBP-pat

****

PROSPECTUS

****

AZO MINED PRODUCTS CO., INC.
(An Arizona Corporation)

****

2,000 SHARES OF INCOME PREFERRED STOCK
(Cumulative when declared, $100. Par Value)
(VOTING STOCK)

****

"THESE SECURITIES ARE OFFERED PURSUANT TO AN EXEMPTION FROM REGISTRATION WITH THE UNITED STATES SECURITIES AND EXCHANGE COMMISSION. THE COMMISSION DOES NOT PASS UPON THE MERITS OF ANY SECURITIES NOR DOES IT PASS UPON THE ACCURACY OR COMPLETENESS OF ANY OFFERING CIRCULAR OR OTHER SELLING LITERATURE."

****

"THESE SECURITIES ARE OFFERED UNDER THE AUTOMATIC EXEMPTION CONTAINED AND SPECIFIED IN 'RULE 146' OF THE RULES AND REGULATIONS OF THE UNITED STATES SECURITIES AND EXCHANGE COMMISSION."

****

" THESE SECURITIES ARE EXEMPT TRANSACTIONS PURSUANT TO SECTION AND SUB-SECTIONS 44 - 1844 (1), 44 - 1844 (4), and 44- 1844 (10) OF THE ARIZONA REVISED STATUTES."

****

" IN KEEPING WITH THE ABOVE STATEMENT: THE PURCHASER MUST QUALIFY UNDER GENERAL ORDER NO. S - 26, "PRIVATE OFFERINGS" OF THE RULES AND REGULATIONS OF THE SECURITIES DIVISION OF THE ARIZONA CORPORATION COMMISSION, SUB-SECTIONS (e(1 & 2))."

****

NOTICE

ALL PURCHASERS (OFFEREES) MUST SECURE AND FILE WITH THE UNITED STATES SECURITIES AND EXCHANGE COMMISSION, "AN OFFEREE QUESTIONNAIRE" SO AS TO COMPLY WITH RULE 146 OF THE REGULATIONS.

****

"THESE SECURITIES ARE OFFERED AS INVESTMENT SECURITIES ONLY, AND NOT FOR RESALE."

****

"THESE ARE SPECULATIVE SECURITIES"

THE DATE OF THIS PROSPECTUS IS AUGUST 5, 1977.

CAPITAL STRUCTURE

The capital stock of this corporation consists of 50,000 share of Income Preferred stock (Voting) at a Par Value of $100.00 per share totalling $5,000,000.00; 10,000 shares of Class "A" Preferred stock at a Par Value of $50.00 per share totalling $500,000.00; 200,000 shares of Class "A" Common stock at a Par Value of $10.00 per share totalling $2,000,000.00; and 2,500,000 shares of Class "B" Common stock at a Par Value of $1.00 per share totalling $2,500,000.00 for an aggregate amount of authorized stock of Ten Million ($10,000,000.00) Dolloars.

OUTSTANDING SECURITIES

Twenty-Six Thousand (26,000) shares of Income Preferred (Voting) stock, having a Par Value of $100.00 per share, are issued and outstanding and have been paid for in assignment of property interests, and are issued to the following:

HENRY LEE FARABEE, and were not registered under the Securities Act of the State of Arizona. Exemption from registration relied on in the issuance of said shares are the provisions of A.R.S. Section 44 - 1844 (9) in that said shares were initially issued to an original incorporator Henry Lee Farabee.

THIS OFFERING ***

This offering consists of 2,000 shares of Income Preferred Voting shares with a Par Value of $100.00 per share, and shall be sold in Units of no less than Five (5) shares per unit, and at least Twenty (20) Units must be purchased by each Offeree.
THE AGGREGATE AMOUNT OF THIS OFFERING IS: $200,000.00.

PURPOSE OF THE OFFERING:

The company intends to engage in the acquisition, operation , marketing, and management of Diatomacious Earth properties, preparation of insulation materials therefrom, and other businesses related thereto in the State of Arizona, and the United States, and such other areas of the world as the Board of Directors of this Corporation deem appropriate. The money to be raised under this offering is to be used for general operating expenses. More specifically, the Corporation plans to use approximately Twenty Five Thousand ($25,000.00) Dollars for general overhead such as office rent, equipment and secretarial help; FORTY Thousand ($40,000.00) Dollars for executive salaries; Twenty Thousand Dollars ($20,000.00) for advertising and travel; and One Hundred Fifteen Thousand ($115,000.00) Dollars for general operating capital and the procurement of certain Arizona Diatomite properties, mining equipment, and supplies incidental to the operating of the business.

EXHIBITS AND AFFIDAVITS ATTACHED HERETO AND MADE A PART HEREOF.
COPIES OF THE ARTICLES OF INCORPORATION MAY BE HAD BY APPLICATION TO THE MARICOPA COUNTY, COUNTY RECORDER. COPIES OF THE LEASE MAY BE HAD AT THE RECORDER'S OFFICE OF THE PINAL COUNTY RECORDERS' OFFICE, BOTH IN ARIZONA.

NAME AND ADDRESS:

AZO MINED PRODUCTS CO., INC. P.O.BOX 4310, MESA, ARIZONA 85201
(An Arizona Corporation)

All correspondence or orders regarding these securities may be mailed to the above address, to the attention of Henry L. Farabee.

The above named corporation is the same as the securities' name which are involved in this issue; to wit:

AZO MINED PRODUCTS CO., INC. [AMPCo.].

AZO MINED PRODUCTS CO., INC. is an Arizona corporation, incorporated on the 27th day of October, 1975. The company in principally engaged in the leasing of, operation of, and mining of, Diatomaceous Earth properties in Arizona, together with the research for markets, marketing and sales of said Diatomite materials, and the manufacture and sale of various qualities of insulation made from Diatomite; and other businesses related to the production and disposition of Diatomaceous Earth in the United States and in foreign markets.

The principal executives and Directors of AZO MINED PRODUCTS CO., INC. and their residence addresses are as follows:

HENRY LEE FARABEE
961 East 10th Drive
Mesa, Arizona 85204
Chairman of the Board of Directors and President

WANDA K. FARABEE
961 East 10th Drive
Mesa, Arizona 85204
Secretary and Treasurer; Director

RANDOLPH E. FARABEE
961 East 10th Drive
Mesa, Arizona 85204
Vice - President and Director

STEPHEN B. PALMER
223 West 2nd Avenue
Mesa, Arizona 85202
Vice - President of International Marketing and Director.

White Cliff mine

[redacted]

Transmitted: 1/3/97 2:34 PM (L100PGtE)

SHERWIN WILLIAMS

CONSUMER DIVISION

The Sherwin-Williams Company
2325 Hollins Ferry Road
Baltimore, Maryland 21230
(301) 837-3030

August 25, 1983

American Mineral Industries
P.O. Box 548
Port Jefferson, N.Y. 11777

Attn: Mr. Gilbert Mott

Dear Mr. Mott:

Evaluation has been completed of the AMI-33 sample. Our laboratory found it to be a suitable substitute for Cellu-Aid #3.

We are very interested in a second source for this product, and the timing is perfect since a new traffic paint bid season is just ahead. Please let me have all the information regarding availability, pricing, lead times, packaging, etc.

We look forward to hearing from you quickly.

Very truly yours,

The Sherwin Williams Co.

Henrietta Williams

Henrietta Williams
Purchasing Manager

HW/ch

cc: G. Foskey

SHERWIN-WILLIAMS

CONSUMER DIVISIO

The Sherwin-Williams Company
2325 Hollins Ferry Road
Baltimore, Maryland 21230
(301) 837-3030

August 24, 1984

Continental Minerals
D.B.A. Microlite
P.O. Box 548
Port Jefferson, N.Y. 11777

Attn: Mr. Graham Mott

Dear Mr. Mott:

Our laboratory has evaluated your sample of SB100 vs. Grefco CA-3.

Their finding is that it is one and one-half units lower in reflectance in the white paint. However, since we normally use CA-3 only in yellow, this should make no difference. We will be happy to consider your company as a second source of supply providing your price is competitive and all other factors are equal.

Very truly yours,

Henrietta Williams

Henrietta Williams
Purchasing Manager

HLW/ch

OWENS-CORNING FIBERGLAS CORPORATION P O BOX 100. BERLIN NEW JERSEY 08009. PHONE (609) 767-3300

June 28, 1984

CONTINENTAL MINERALS INC.
Post Office Box 548
Port Jefferson, New York 11777

Attention: Graham Mott

Dear Mr. Mott:

This is to inform you that I have completed my testing of the latest samples of your diatomaceous earth from your Kearny deposit.

The screen analyses and gelation times were satisfactory. These results are very encouraging and I am looking forward to receiving a sufficient quantity to evaluate as an alternative source of D.E.

Sincerely,

Theodore J. Kamen
Development Engineer

TJK/bef

Pricing

Continentals price structure will place our products cost at approximately 10% below that of our competition's prices. (representitive industry prices are shown at the end of proposal).

It should be noted, that Continental will use Manufacurer's Representitives, in place of a salaried sales force and pay a 10% commission on the net invoice amount for all sales computed from our printed price list. All discounted sales will pay a discounted commission.

It has been determined that it will cost Continental $39.00 per ton to process and bag the diatomaceous earth, and $25.00 per ton to ship the product bulk. In these figures has been calculated a $5.00 contingency facture.

BASALT PLANT

EFFECTIVE FEBRUARY 7, 1983

These prices apply to the United States only. This list supersedes all previous lis
Prices subject to change without notice.

Product	EX WAREHOUSE FOB WAREHOUSE 24-384 Bags Per Bag	CARLOAD/TRUCK LOA EX PLANT FOB BASALT, NV 384 Bags Min. Per Ton
GENERAL FILLER		
Dicalite SA-3	$10.05	$153.00
PAINT & POLISH FILLERS		
Dicalite 104	18.75	398.00
PAPER FILLERS		
Dicalite BP-3	10.05	131.00
Dicalite BP-5	10.05	131.00
Dicalite Cellu-Aid 3	10.05	153.00
INSULATION FILLERS		
Dicalite 183	10.05	131.00
Dicalite 677	10.05	142.00
ASPHALT-CONCRETE-RUBBER FILLERS		
D4A, D4C, D4R	10.05	131.00
INSECTICIDE CARRIERS		
Dicalite IG-3	10.05	153.00
Dicalite IG-33	12.00	153.00
MATCH FILLER-ACETYLENE HOLDER		
Dicalite 143	12.00	181.00

Minimum Order: $150.00

Terms: Net 30 days from date of shipment.

Truck load shipments from warehouse of 384 bags or more, $.75 off 24-384 bag price.

1-23 Bag Price: $40.00 per bag FOB Warehouse or Plant.

Pellets and Dica-Pak Extra Ex Warehouse or Plant.

White bags premium $7.50 per ton all paper grades. Available in carload or mixed

OWENS-CORNING FIBERGLAS CORPORATION P O BOX 100 BERLIN NEW JERSEY 08009. PHONE (609) 767-3300

August 28, 1984

Continental Minerals, Inc.
Post Office Box 548
Port Jefferson, New York 11777

Attention: Gil Mott

Dear Mr. Mott:

This is to inform you that preliminary testing of samples submitted by you are very encouraging.

Upon approval of a grind of diatomaceous earth which meets our specifications and produces an acceptable product, we will consider your product as a major source of diatomaceous earth for our ware.

Sincerely,

Theodore J. Kamen

Theodore J. Kamen
Development Engineer

OWENS-CORNING FIBERGLAS CORPORATION P. O. BOX 100, BERLIN, NEW JERSEY 08009 PHONE (609) 767-3300

August 1, 1984

CONTINENTAL MINERALS INC.
Post Office Box 548
Port Jefferson, New York 11777

Attention: Graham Mott

Dear Mr. Mott:

Thank you for taking time from your busy schedule to meet with us yesterday to discuss the diatomaceous earth industry and to answer our questions.

As we said yesterday, we are anxious for your company to come on line so we can qualify your material as an alternate source of diatomaceous earth. Once a grind is agreed upon, my plan is to first try a one ton sample. From there I will go to a trailerload and then on to a five boxcar run. Finally I will run an approximate one month extended trial (900 tons).

Sincerely,

Theodore J. Kamen

Theodore J. Kamen
Development Engineer

Pinal Co.

ARIZONA DEPT. OF MINES & MINERAL RESOURC
STATE OFFICE BUILDING
416 W. CONGRESS, ROOM 161
TUCSON, ARIZONA 85701

STATE MINE INSPECTOR

Office of State Mine Inspector

705 West Wing, Capitol Building
Phoenix, Arizona 85007
602-255-5971

RECEIVED
MAY 06 1985
DEPT. MINERAL RESOURCES
PHOENIX, ARIZONA

NOTICE TO ARIZONA STATE MINE INSPECTOR

In compliance with Arizona Revised Statute Section 27-303*, we are submitting this written notice to the Arizona State Mine Inspector (705 West Wing, Capitol Building, Phoenix, Arizona 85007) of our intent to start/stop (please circle one) a mining operation.

COMPANY NAME Whitecliff Industries Incorporated

CHIEF OFFICER Joseph Marinelli, Operation Manager

COMPANY ADDRESS 360 Alden Road, P.O. Box 340, Kearny,AZ 85237

COMPANY TELEPHONE NUMBER 602-363-5503

MINE OR PLANT NAME Whitecliff

MINE OR PLANT LOCATION (including county and nearest town, as well as directions for locating by vehicle)
Mammoth Mining District, Section 24-township 9S. Range 17E GSRB & M.

Clark Ranch topo map. East side of San Pedro River approximately 10 miles south of Mammoth town.

TYPE OF OPERATION Open pit PRINCIPAL PRODUCT Diatomeacous Earth

STARTING DATE April 8, 1985 CLOSING DATE

DURATION OF OPERATION Continuous

PERSON SENDING THIS NOTICE Joseph Marinelli

TITLE OF PERSON SENDING THIS NOTICE Operations Manager

DATE NOTICE SENT TO STATE MINE INSPECTOR March 20, 1985

*A.R.S. Section 27-303 NOTIFICATION TO INSPECTOR OF BEGINNING OR SUSPENDING OPERATIONS: When mining operations are commenced in any mine or when operations therein are permanently suspended, the operator shall give written notice to the inspector at his office prior to commencement or suspension of operations.

Revised 7/84

MAMMOTH DEPOSIT DESCRIPTION, ASSAY, & SURVEY

The mammoth deposit lies on the east bank of the San Pedro River directly opposite the mining community of San Manuel in Pinal County. It is commonly known as the White Cliffs Mine and can be reached from San Manuel (5 miles) or from Mammoth (8 miles) by graded county roads. Rail service connecting with Southern Pacific is available at San Manuel. The El Paso Natural Gas Company pipe line extends to the San Pedro River directly across from the deposit and electric power is available from the Arizona Public Service Company's lines which cross the deposit. The deposit covers about 6 sections located in T 17 E., R 9 S with respect to the Gila and Salt River Base Line and Meridian. The deposit lies nearly level with the beds dipping slightly to the east. Some faulting has occured and in places the continuity of the bedding has been disturbed. A number of canyons transect the deposit from east to west and in places expose more than 100 feet of diatomite. Drainage is from east to west into the San Pedro River. The river is dry except during the rainy season in July and August. Surface run-off from the Galiuro Mountains to the east is diverted around the deposit by the Big Gust James Wash and flood waters are not a problem during the rainy season. Typical Sonoran desert conditions are found at the deposit. The sparse vegetation consists mainly of mesquite, catclaw and greasewood. In spite of the dry surface conditions abundant water is available from underground sources. An artesian well has been drilled on the western edge of the deposit and is used to irrigate farm land along the river bottom. Two well defined clay strata about four feet in thickness are found near the top and near the bottom of the deposit. Some diatomite occurs above them and below them and approximately 100 feet of excellent white material lies between them. Over many acres of the deposit the upper clay band has been eroded away to expose diatomite. In places where diatomite is exposed it is possible to mine the material by ripping it loose with a bulldozer. Any overburden consists of sediments and alluvium of recent and Quaternary origin and ranges from zero thickness over exposed beds to approximately 30 feet. The deposit is located in terrain suitable for open pit mining operations when it becomes necessary to recover diatomaceous earth buried by overburden. The small Arizona communities in the vicinity of this deposit are actively seeking new industries and will be most co-operative with any new industrial development project.

The rapidly expanding western markets and the growing yearly consumption of diatomaceous earth are creating a real interest in this deposit. No company utilizing diatomaceous earth or products derived from it should overlook an opportunity to further investigate this proposal.

It has been calculated that the mammoth deposit contains at least 300,000,000 tons of high grade, fresh water diatomaceous earth. Much of this material would be recoverable with very little mining effort. The total amount would be available using strip method mining procedures. Our intent is to make available diatomaceous earth in many forms eventually. We will offer crude immediately and then begin to develop milling capacity at the site in order to turn out refined and calcined product.

The following chemical assays show that the mammoth deposit compares very favorably and in some cases exceeds the properties of the other large producers on the West Coast. The geologic cross sections and maps further demonstrate the size and availability of the deposit.

TABLE 2

MAMMOUTH DEPOSIT

Chemical Analysis

Silica	87.92%
Alumina	3.90
Iron (Fe_2O_3)	0.10
Calcium oxide	0.84
Magnesium oxide	1.43
Sodium oxide	0.24
Potassium oxide	0.22

pH (50% slurry)	8.00
Oil absorption (Gardner-Colman)	94.7 lbs./100 lbs.
Bulk density	11.18 lbs./cu. ft.
Color	Off White
Sintering temperature	ca 1800° F
Color of sintered crude	Light Tan
Color rating of 5 samples reported	1

CHEMICAL ANALYSIS - NORTH QUARRY SAMPLE

There is always considerable interest in the ultimate analysis of DE samples. Below are results from a reputable laboratory run on a typical sample of North Quarry crude that had been classified, using a laboratory unit such as used by Dicalite which evolved under the writer's direction. The crude was separated in the following fractions.

	% Yield
#1 Trap	24.3
#2 Trap	5.7
#1 Collector	44.0
Baghouse	22.1
Loss	3.9
	100.0%

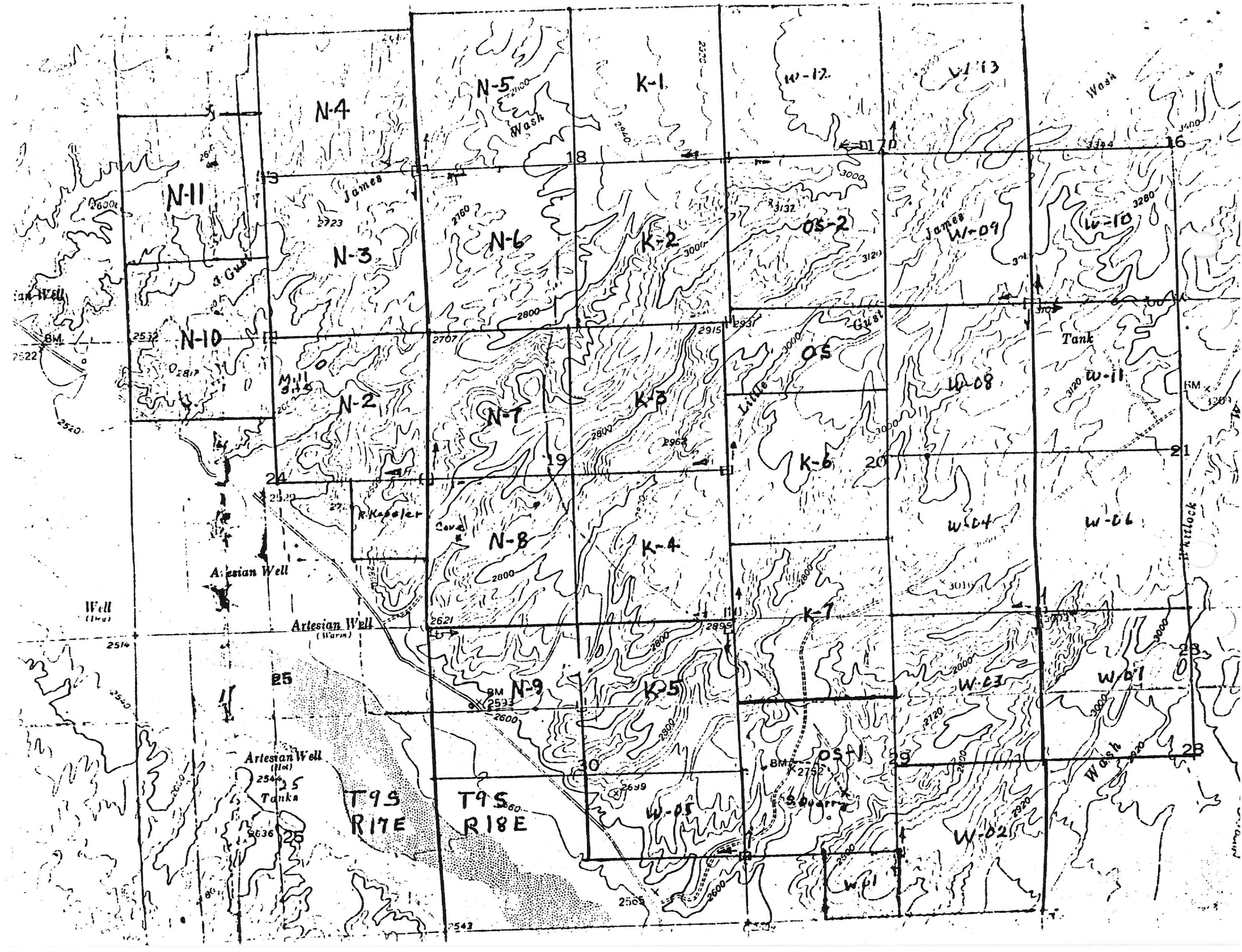
#3 Collector - Main Bin	
Cake Denisity	20.3%
Plus 150 Mesh	0.3%
Flow vs. Filteraid	113 %
Clairity vs. Filteraid	96 %

	#1 Collector	Baghouse	Lompoc	Oregon
Silica	87.92	88.04	92.50	88.2
Aluminum Oxide	3.90	4.01	2.70	6.0
Iron Oxide	0.10	0.15	1.15	2.0
Calcium Oxide	0.34	0.72	0.27	2.3
Magnesium Oxide	1.43	1.25	0.63	0.8
Ignition Loss*	3.00	2.96	----	---
Undetermined	2.81	2.87	2.75	0.7
	100.00	100.00	100.00	100.00

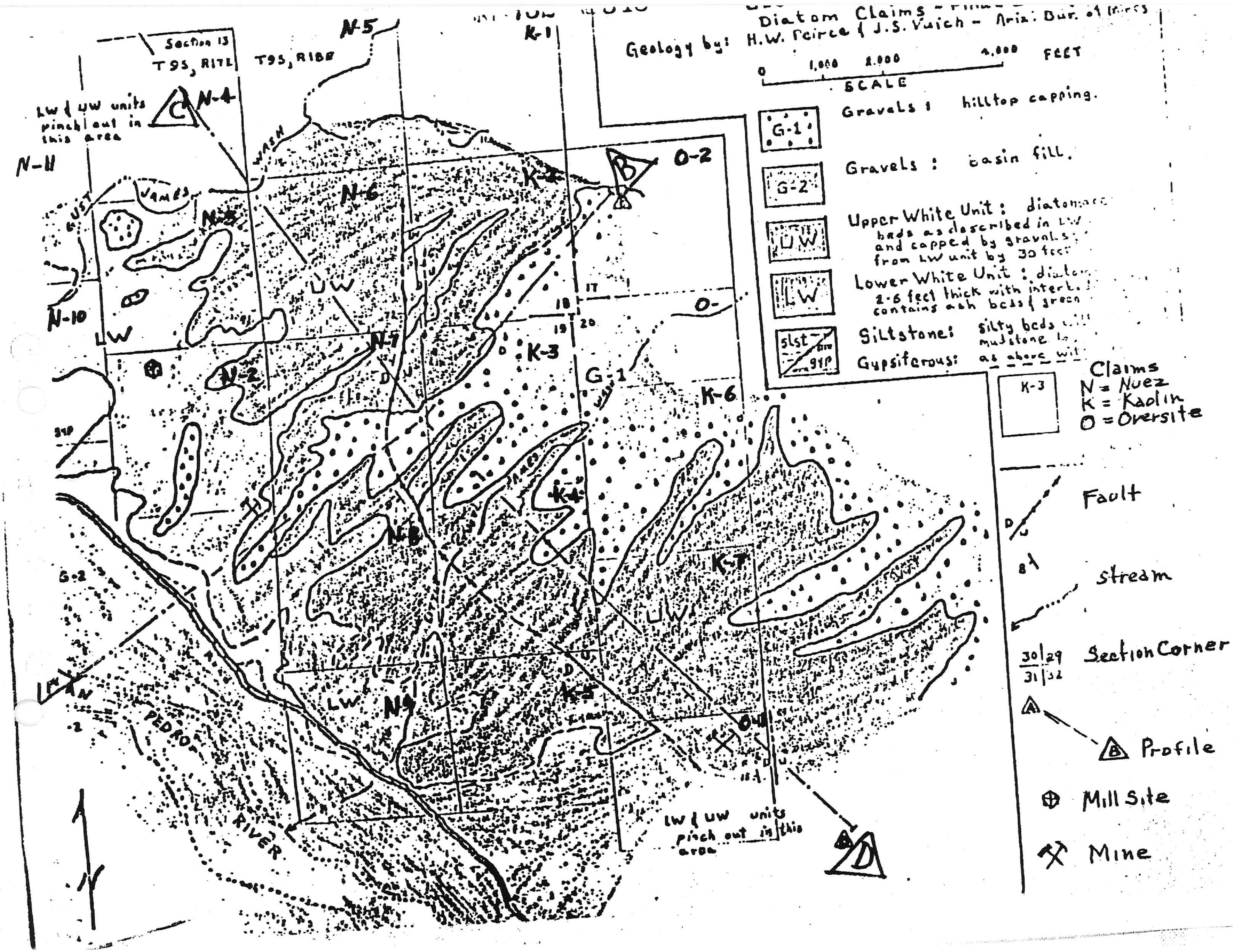
*Note: Other analysis based on an ignited basis. Doing same to the Mammoth material would bring SiO_2 up to 90.75.

The above ultimate analysis shows that the products compare well on an SiO_2 basis to Lompoc and Oregon earths. The iron is exceptionally low which is favorable. High calcium can be bad for some filteraid uses.

1. Bollaert, 1962: 21

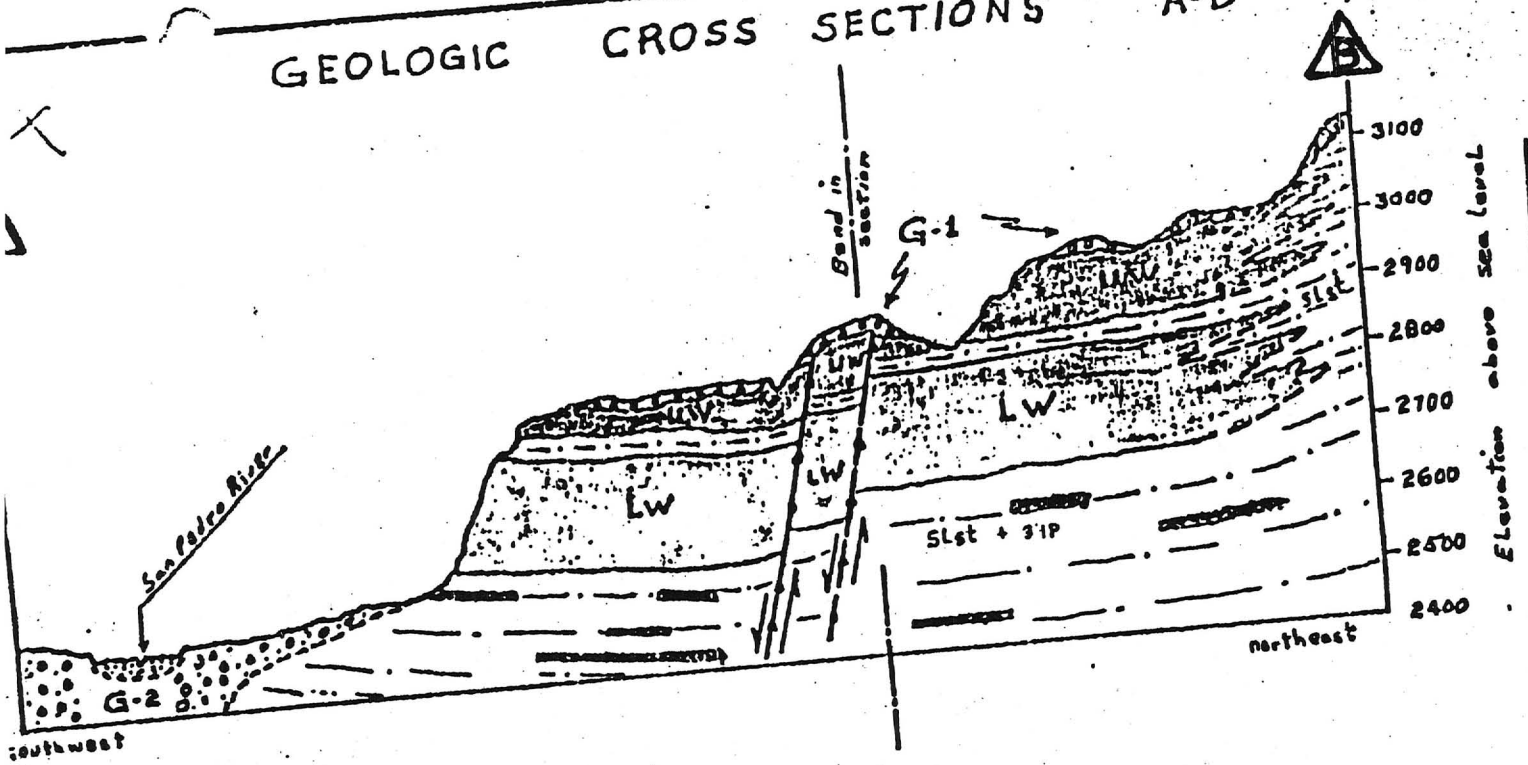


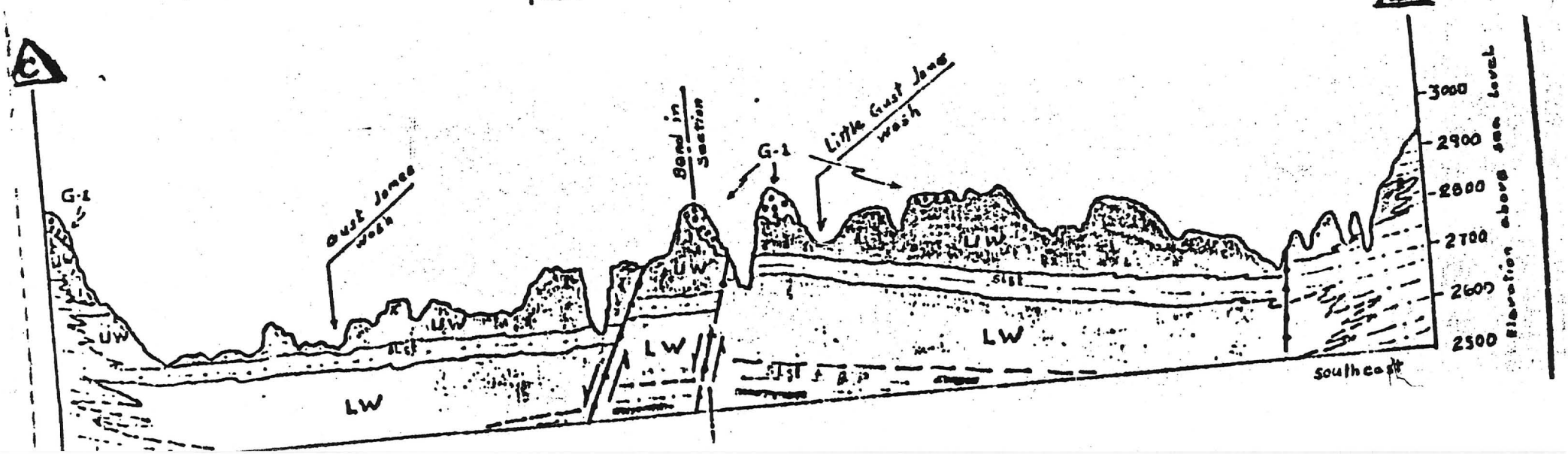
N-4
N-5
K-1
W-12
W-13
Wash
N-11
N-3
N-6
K-2
OS-2
W-09
W-10
James
N-10
N-2
N-7
K-3
OS
W-08
W-11
Tank
Little
Gust
K-6
N-8
K-4
W-04
W-06
Artesian Well
Artesian Well
Artesian Well
Well
N-9
K-5
K-7
W-03
W-01
OS-1
W-05
W-02
W-01
T9S
R17E
T9S
R18E
Tanks
Cove
Mill



Diatom Claims
Geology by: H.W. Peirce & J.S. Vuich - Ariz. Bur. of Mines
0
1,000
2,000
4,000
FEET
SCALE
G-1
Gravels : hilltop capping.
G-2
Gravels : basin fill.
UW
Upper White Unit : diatomaceous beds as described in LW and capped by gravels; from LW unit by 30 feet
LW
Lower White Unit : diato
2-6 feet thick with interb.
contains ash beds & green
slst
gyp
Siltstone: silty beds
mudstone
Gypsiferous: as above
Claims
N = Nuez
K = Kaolin
O = Oversite
K-3
Fault
Stream
30|29
31|32
Section Corner
Profile
Mill Site
Mine
Section 13
T9S, R17E
T9S, R18E
LW & UW units pinch out in this area
LW & UW units pinch out in this area
N-11
N-10
N-4
N-5
N-6
N-7
N-2
N-8
N-9
K-1
K-2
K-3
K-4
K-5
K-6
K-7
O-2
O-
G-1
G-2
UW
LW
WASH
JAMES
PEDRO
RIVER

GEOLOGIC CROSS SECTIONS A-B & C-D





HORIZONTAL SCALE

0 2000 4000 6000

FEET

EXPLANATION

Rock types same as on sheet 1.

Contact; dashed where inferred.

Fault; arrows show relative movement; dashed where inferred.

Geology By:

H.W. Peirce

J.S. Vuich

White Cliffs Mine (F)

THE GEOLOGY AND DEVELOPMENT OF THE WHITE CLIFFS DIATOMITE DEPOSIT, MAMMOTH, AZ

Pinal Co.

Jonathan D. Shenk
Graduate Research Assistant
Arizona Geological Survey
845 N. Park
Tucson, Arizona 85719

38-129

Abstract. The White Cliffs diatomite deposit occurs in a lacustrine facies of the Quiburis Formation, an Upper Miocene to Pliocene basin-fill sediment of the lower San Pedro Valley. On-going geologic mapping has defined an 2.5-3.0 m (8-10 ft) thick ore zone near the mill site, several marker beds, a NNW-trending high-angle normal fault, and a NW-trending syncline. The diatomite has an average loose-weight dry bulk density of 130 kg/m3 (8 lbs/ft3) and is presently marketed outside Arizona for asphalt filler. Current development is projected to yield 3500 mt (4000 st) of finished product, with an estimated 91,000 mt (100,000 st) of finished product obtainable from several other nearby sites.

Introduction

The White Cliffs diatomite deposit is located 13 km (8 mi) south of Mammoth, Arizona in the lower San Pedro Valley. The unpatented claims cover approximately 15.5 sq km (6 sq mi) and are presently held by the University of Arizona. In 1985, Whitecliff Industries, Inc. leased the property and began material testing and property development. In 1986, a geologic mapping and laboratory testing project was initiated to define the distribution and quality of diatomite at White Cliffs. This project is being carried out as part of a graduate program at the University of Arizona (Shenk, in prep).

Geology

The White Cliffs diatomite deposit occurs in a lacustrine facies of the Quiburis Formation, an Upper Miocene to Pliocene basin-fill sediment of the lower San Pedro Valley. The lake bed sediments, composed of interbedded gypsiferous silts, marls, diatomites, and minor amounts of volcanic ash and coarse clastics, were deposited in both ephemeral and perennial saline lakes with surrounding mudflats, sandflats, and alluvial fan environments (Utley, 1980). Examination of the diatom assembly reveals that the lake waters were slightly saline to brackish (J. P. Bradbury, pers. comm., 1987). Table 1 is a listing of diatom species found in the ore zone. K-Ar dating of selected ash beds yielded ages between 5.2 and 5.7 mya (Scarborough, 1975) and fission-track dating of zircons yielded an age of 6.6 mya, (Lindsay and others, 1984). The Quiburis Fm is underlain by the Lower Miocene San Manuel Fm and overlain by recent terrace gravels and alluvial fans (Dickinson, 1987).

Several geologic studies have been done concerning the Quiburis Fm in general and the lake bed sediments in particular, (for a complete list of references, see Shenk, in prep). However, there has never been an adequate geologic study of the diatomite as it relates to its economic potential. The earliest attempt to do so was by W. P. Blake, who first discovered the deposit (Blake, 1903). A second effort was made in the early 1970's when H. Wesley Peirce and John Vuich of the Arizona Bureau of Mines performed reconnaissance geologic mapping of the claim group for the University of Arizona (ABGMT file data). The present study picks up where Peirce and Vuich left off. The main goals of the study are: 1) determining the distribution of the diatomite through detailed geologic mapping and 2) determining the quality of the diatomite through basic laboratory testing of crude diatomite samples.

During initial field reconnaissance, Peirce pointed out that the diatomaceous sediments could be conveniently divided into two informal members, an "upper white" (UW) and a "lower white" (LW). The major quarries were located in the LW, and a volcanic ash layer was noted to outcrop in them, suggesting its use as a marker bed. Initial conversations with Otto Kohl, a consultant for Whitecliff Industries, indicated that the best diatomite in the quarries could be found approximately 2.5-4.5 m (8-15 ft) below the volcanic ash.

In order to do detailed geologic mapping, the ash layer noted in the quarries (the lower ash - LA) and a second ash layer approximately 18.5 m (60 ft) higher in the section (the upper ash - UA) were chosen as marker beds. The mapping began in the northern part of the claim group and several short sections were measured between the LA and the diatomite. Figure 1 is a typical measured section showing the relationship between the LA and the diatomite. The diatomite averages 2.5-3.0 m (8-10 ft) thick and is remarkably widespread. Mapping in the southern part of the claim group has revealed an extensive gravel/sand bed just below the UW and roughly 9 m (30 ft) above the UA. This bed has been chosen as the boundary between the UW and LW. To date, no commercial diatomite has been found to occur in the UW.

A NNW-trending high-angle normal fault and a NW-trending shallow-dipping syncline occur in the claim group. The fault is downthrown to the west with a vertical offset of 18.5 m (60 ft) and the limbs of the syncline range in dip from 5-14 degrees. The recognition of these structural features and their relation to the distribution of the diatomite is very important. First, the slight dip of the sediments caused by the folding has exposed the diatomite ore zone in the western portion of the claim group. However, to the east the diatomite is found under increasing amounts of over-

burden. Second, due to the normal fault, the LW is upthrown in the eastern portion of the claim group resulting in the diatomite being moved up nearer to the surface.

Basic laboratory testing has been carried out on several samples of crude ore. The loose-weight, dry bulk density is determined using a Scott Volumeter with a 16 mesh screen. The sample is dried overnight in an oven at 105 degrees C (225 degrees F), then ground for less than 30 secs in a coffee grinder. The ground material is screened through the volumeter and collected in a 1 cubic inch container. The sample is then weighed and the loose-weight dry bulk density calculated. Next, 5 grams are measured out and placed into a centrifuge for 5 minutes at 18,000 rpm. The amount of sand, silt and diatomite is measured, and the percentage of each calculated. Laboratory testing on the crude ore shows it to have an average loose-weight, dry bulk density of 160-195 kg/m3 (10-12 lbs/ft3) and 50%-60% diatomite. Table 2 lists selected crude samples in descending order of diatomite percentage. A chemical analysis of the finished product produced from the ore zone shows it to be high in silica and low in calcium oxide (Table 3).

Development

The White Cliffs diatomite property has experienced sporadic development efforts in the past. In the 1920's, the material was used in the construction of Steward Observatory on the University of Arizona campus, and as insulation in several houses in Tucson. In the 1940's and again in the 1960's, the diatomite was marketed for a variety of uses, the main use being a functional filler (ABGMT file data, DMMR file data). The Arizona Bureau of Mines estimated a total production at 13,500 mt (15,000 st) from these early development efforts (Peirce, 1969). The University of Arizona has held the claims since 1973.

Whitecliff Industries, Inc. leased the property from the University of Arizona in 1985 and is currently developing the northern end of the claim group. An air-separation mill has been erected and material suitable for filler in asphalt is presently being produced. This filler has an average milled loose-weight dry bulk density of 130 kg/m3 (8 lbs/ft3) and is regularly shipped to markets in Houston and Chicago. In addition, the company is attempting to produce products which meet the specifications for the calcium silicate market and the paint industry.

The initial material processed and test marketed by Whitecliff Industries was from pre-existing quarries. A successful attempt was made to locate a new quarry site. The search was carried out by Otto Kohl and the author. With information from geologic mapping and laboratory analyses, and by considering the distance to the mill and overburden, a decision was made by Whitecliff Industries to open up a quarry in a small side canyon next to the mill. Using an average thickness of 3 m (10 ft) for the ore zone and a quarry size of 90 m x 45 m (100 yds x 50 yds), an estimate of 3500 mt (4000 st) can be calculated for the new site. A combined total estimate of 91,000 mt (100,000 st) is calculated for several other sites examined near the mill. An estimate for total tonnage over the entire claim group has not been attempted.

Several major challenges face Whitecliff Industries in developing the property. Care must be taken in mining to separate the low density, high quality diatomite from the high density, low quality diatomaceous marls. The milling of material for asphalt filler is straight forward, however, milling a higher quality product to meet the specifications of the paint industry will require improved techniques. A successful marketing approach under the current economic conditions of increased competition and low industry growth needs to include the development of new specialized products (Coombs, 1987, Miles, 1987). An examination of past mining attempts (DMMR and ABGMT file data) shows that if these challenges are not met, the chances of success are minimal.

Conclusions

The White Cliffs property definitely contains a deposit of diatomite. However, the mining, milling, and marketing of the diatomite is a formidable challenge. The geologic mapping and laboratory testing carried out over the past year has helped meet this challenge by providing information regarding the distribution and quality of the crude diatomite.

References

ABGMT, Arizona Bureau of Geology and Mineral Technology, Tucson, AZ, file data.

Blake, W. P., 1903, "Diatom-Earth in Arizona," Transactions of the American Institute of Mining Engineers, vol. 33, p.38-45.

Coombs, G., 1987, "Diatomite," Mining Engineering, vol. 39, no. 6, p. 411.

Dickinson, W. R., 1987, "General Geologic Map of Catalina Core Complex and San Pedro Trough," Arizona Bureau of Geology and Mineral Technology, Miscellaneous Map Series 87-A.

DMMR, Arizona Department of Mines and Mineral Resources, Tucson Office, Tucson, AZ, file data.

Lindsay, E. H., Opdyke, N. D., and Johnson, N. M., 1984, "Blancan-Hemphillian Land Mammal Ages and Late Cenozoic Mammal Dispersal Events," Annual Review of Earth and Planetary Sciences, vol. 12, p.445-488.

Miles, W. J., 1987, "Economics of Diatomite in the 1980's" Society of Mining Engineers, AIME, preprint no. 87-123, 14 p.

Peirce, H. W., 1969, "Diatomite," Mineral and Water Resources of Arizona, Arizona Bureau of Mines, Bulletin 180, p.337-342.

Scarborough, R. B., 1975, "Chemistry and Age of Late Cenozoic Air-Fall Ashes in Southeastern Arizona," University of Arizona, M.S. Thesis, 107 p.

Shenk, J. D., in prep, "Economic Geology of the White Cliffs Diatomite Deposit, Mammoth, Arizona," University of Arizona, M.S. Thesis.

Utley, K. W., 1980, "Stratigraphy of the Pliocene Quiburis Formation Near Mammoth, Arizona," Arizona State University, M.S. Thesis, 178 p., 2 pl.

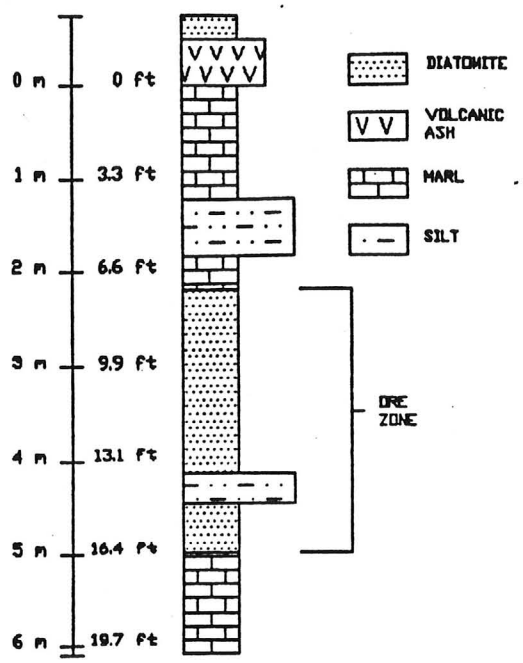


Figure 1. Measured section showing the relationship between the LA and the diatomite.

Table 1. Listing of diatoms found in ore zone. (J. P. Bradbury, pers. comm.)

Actinocyclus ehrenbergii
Melosira juergensi
Melosira moniliformis
Melosira nummuloides
Diploneis sp. cf. D. bombus
D. ovalis
Pinnularia sp. cf. P. microstauron
Fragilaria sp. cf. F. brevistriata
Mastogloia spp.
Amphora spp.
Caloneis silicula
Denticula sp. cf. D. elegans
Hyalodiscus sp.
Rhopalodia musculus
R. gibba
Ntizschia spp.
Navicula spp.

Table 2. Selected samples of crude diatomite ore listed in descending diatomite percentage.

SAMPLE	DENSITY KG/M3	DENSITY LBS/FT3	DIATOM %
AC-1-2	104	6.5	83
AC-1-1	183	11.4	73
GJ-1-2	128	8.0	73
Y-1-1	146	9.1	73
CC-1-2	176	11.0	70
CC-1-4	141	8.8	67
CC-1-6	176	11.0	64
CC-1-24	239	14.9	62
HC-2-1	141	8.8	60
GJ-4-2A	122	7.6	58
CC-1-22	243	15.2	56
GJ-2-2	202	12.6	55
Y-1-3	165	10.3	54
GJ-3-1	159	9.9	53

Table 3. Chemical analysis of final product.

Moisture, %	1.17
On dry basis	
Silica, %	83.90
Iron Oxide, %	1.30
Aluminum Oxide, %	4.15
Calcium Oxide, %	3.20
Magnesium Oxide, %	0.51
Titanium Oxide, %	0.14
Sodium Oxide, %	0.40
Potassium Oxide, %	0.64
Sulfur Trioxide, %	0.25
Loss on ignition, %	5.33

Quarry Preparation

Whitecliff selectively mines the Whitecliff Diatomite deposit, offering some of the purest Diatomite products on the market today.

Processing

Through Whitecliff's efficient air separation process, all products are guaranteed to meet your particular physical property analysis.

WHITECLIFF

General Physical Analysis

Milled, Dried, Air Classified, Natural Diatomaceous Earth originating at Mammoth, Arizona. Amorphous form of Silica, essentially Silicon Dioxide.

Moisture:	**Minimum - 3.0% Maximum - 6.0%**
Color:	**Off White/Cream**
Brightness:	**Minimum 70 (G.E.)**
Refractive Index:	**1.46**
Apparent Density:	**(lbs./cu.ft) Loose**
Weight:	**8.0**

Wet Screen Analysis: **5.0% on 325 Mesh Screen**

Typical Particle size Distribution (ASTM-422-63)%

μ	0-2	2-6	6-10	10-20	20-40	+40
%	39	39	11	7	3	1

Typical Median Partical Diameter: **3.2 μ**

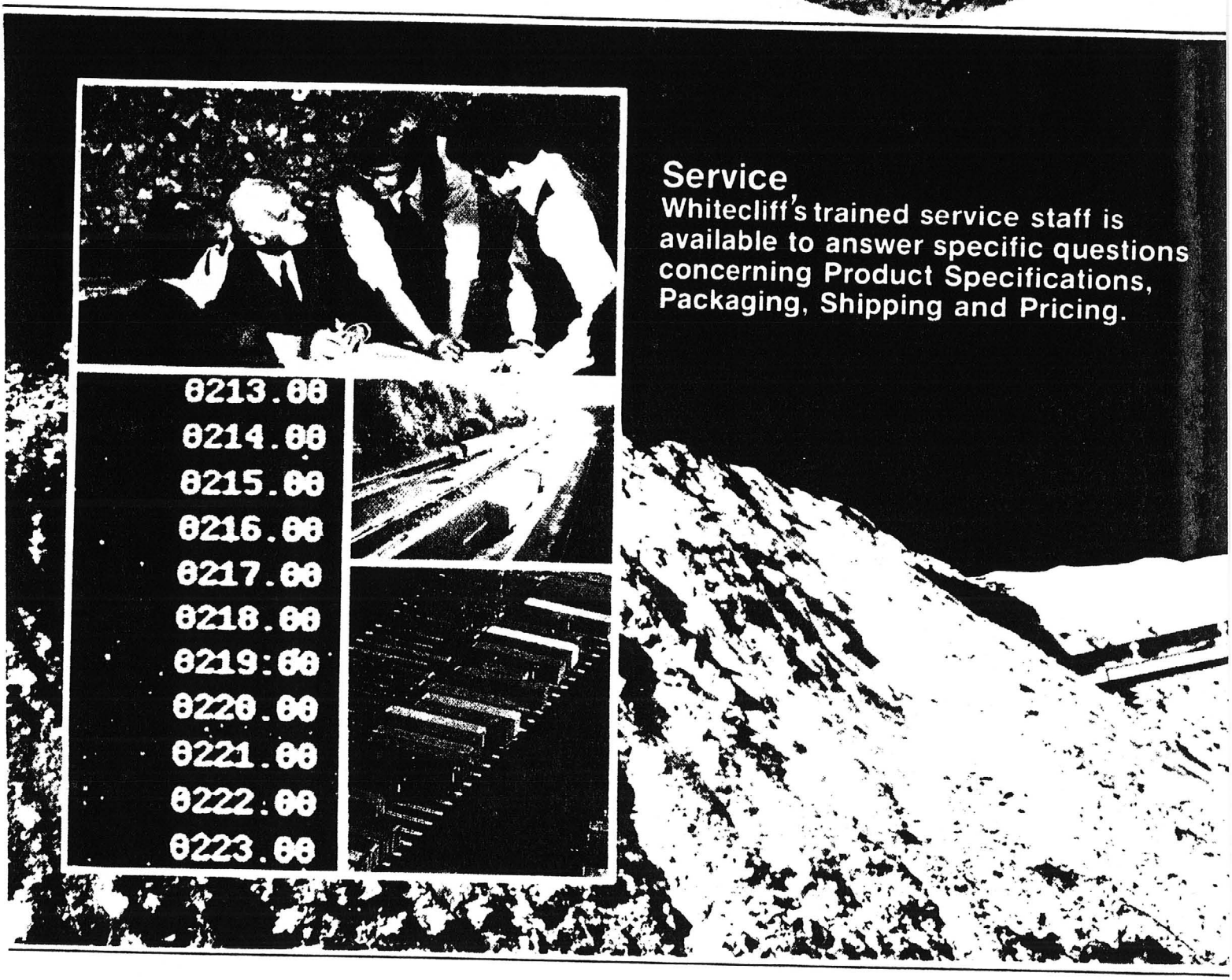
Ph. 10% Slurry **7.5-9.5**

Packaging

Whitecliff can fill your Diatomaceous Earth packaging needs by offering either bulk or bag shipments.

Shipping

Our Diatomite can be shipped by over the road trucks, piggy-back, bulk box car, pressure differential rail cars, or gravity feed hopper cars. Whitecliff also offers containerized shipments overseas.



Service

Whitecliff's trained service staff is available to answer specific questions concerning Product Specifications, Packaging, Shipping and Pricing.

PARTICLE SIZE DISTRIBUTION

SAMPLE IDENTIFICATION Whitecliff DE (F-8)

DATE 10/14/88

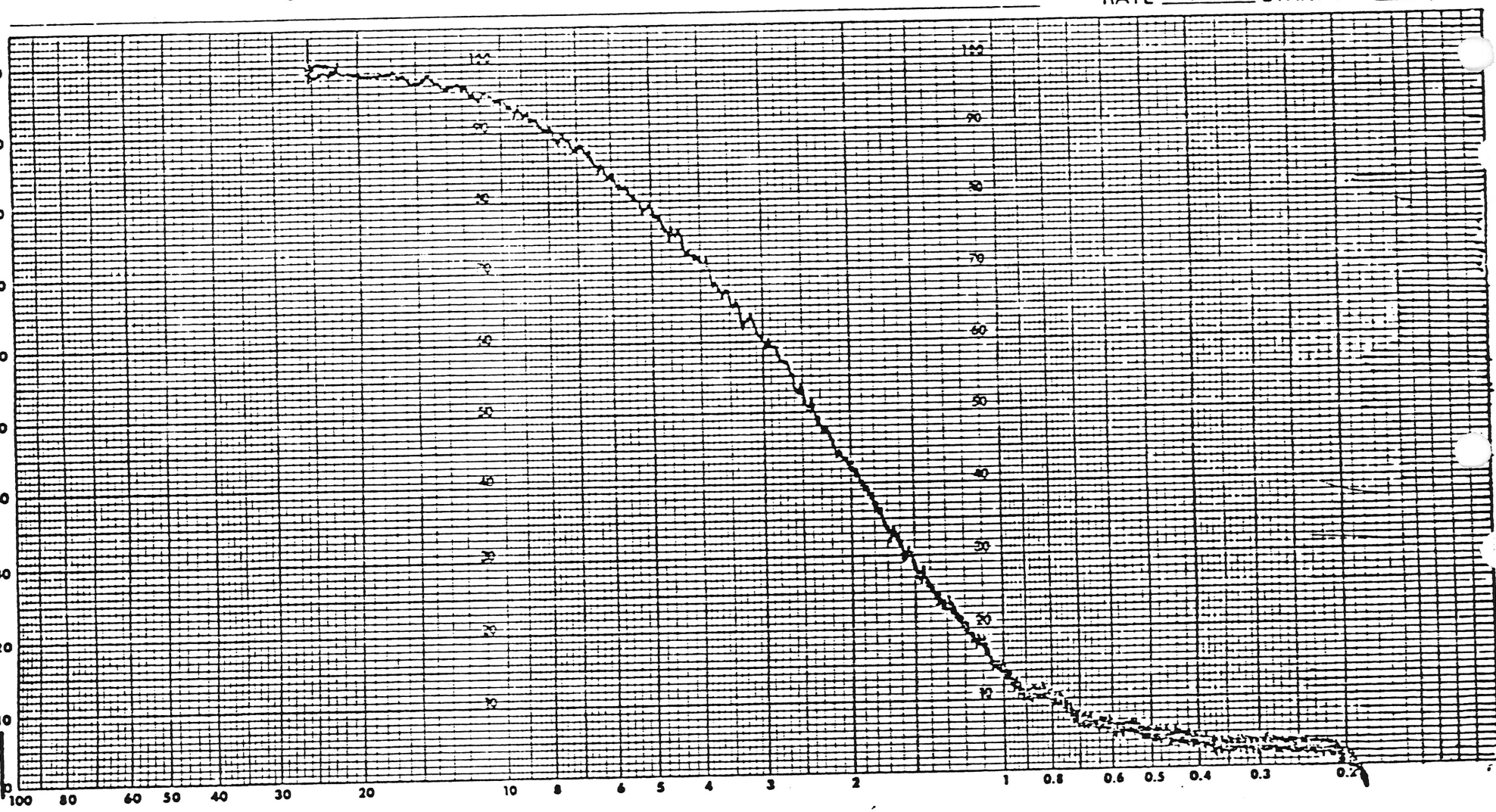
Density 2.5 g/cc LIQUID Deionized water Density 0.9962 g/cc Viscosity 0.8737 cp

BY LC

Preparation 8 g of DE in 100 ml water

TEMPERATURE 25 °C

RATE 91 START DIA. 25 µm



micromeritics instrument corporation

Form 500/42701

WHITECLIFF

INDUSTRIES INC.

TECHNICAL DATA

WHITECLIFF DIATOMITE FILLER

F-10

Moisture %	± 5
Color	Off-White
Reflectance	Min. 70
Water Soluble Chlorides (ppm)	300 max.
Specific Gravity	1.96 - 2.09
Bulking Value (lbs./gal.)	16.8
Apparent Density (loose wt. lbs./cu.ft.)	8 - 10 average
Wet Screen Analysis (325 mesh)	5 - 10% max.
pH (10% slurry)	6.5 - 8.5
Gardner Coleman Oil Absorption	100 - 120
Surface Area	20 sq. meters/gm. (average)
Typical Median Particle Diam.(in microns)	3.5 - 4.5

* All the above specifications are designed to give you approximate information about our natural diatomite. If you should require specific test procedures on coded material, please contact our customer service representatives at (602) 797-0990.

7400 N. Oracle Road, Suite 371
Tucson, Arizona 85704

WHITECLIFF

INDUSTRIES INC.

TECHNICAL DATA

WHITECLIFF DIATOMITE FILLER

F-8

Moisture %	± 5
Color	Off-White
Reflectance	Min. 75
Water Soluble Chlorides (ppm)	300 max.
Specific Gravity	1.96 - 2.09
Bulking Value (lbs./gal.)	16.8
Apparent Density (loose wt. lbs./cu.ft.)	7.5 average
Wet Screen Analysis (325 mesh)	5% max.
pH (10% slurry)	6.5 - 8.5
Oil Absorption	100 - 120

* All the above specifications are designed to give you approximate information about our natural diatomite. If you should require specific test procedures on coded material, please contact our customer service representatives at (602) 797-0990.

7400 N. Oracle Road, Suite 371
Tucson, Arizona 85704

AMERICAN ANALYTICAL LABORATORIES

3441 EAST MILBER • TUCSON, ARIZONA 85714 • PHONE (602) 889-5787

LABORATORY ANALYSIS REPORT

NAME Whitecliff Industries, Inc.
ADDRESS 460 W. Roger Road, Suite #101
Tucson, Arizona 85705

REPORT NUMBER 2033
DATE RECEIVED 02/25/86
DATE REPORTED 02/28/86

SAMPLE IDENTIFICATION	Diatomite Filler F-8
% Na_2O	0.18
% FeO	0.91
% Al_2O_3	1.47
% K_2O	2.60
% SiO_2	82.32
% CaO	1.09
% LOI	9.34 (as rec'd)
% SO_3	<.01
% Cl	<.001
% TiO_2	0.08
pH of 10% slurry = 8.47	
Specific Gravity	2.10g/cc

RECEIVED MAR 3 19

COMMENTS:

Registered Assayer CERTIFICATE NO 15184 JAMES W. ANDERSON Date Signed ARIZONA, U.S.A.

ANALYST

WHITECLIFF PRICE LIST

Effective 1-1-89

This list supersedes all previous lists. Subject to change without notice.

GRADE	CARLOAD/TRUCKLOAD FOB MAMMOTH, AZ PER TON	39 - 468 BAGS PER BAG
F - 8	$ 160.00	$ 12.00
F - 10	145.00	10.00
T - 20	50.00	4.00
LC - 7	170.00	13.00
P - 80	180.00	14.00

EXTRAS:		
	Pallets	$ 10.00 each
	Stretch Wrap	2.50 per pallet
	Banding	3.00 per pallet
	Air Bags	10.00 per bag

TERMS: Net 30 days from date of invoice.

Substantial discount on Bulk sales

R Received in Department 2/16/78 - File prepared. SEF

STREICH, LANG, WEEKS, CARDON & FRENCH
A PROFESSIONAL ASSOCIATION
ATTORNEYS AT LAW
2100 FIRST NATIONAL BANK PLAZA
PHOENIX, ARIZONA

TELEPHONE
(602) 257-0999

MAILING ADDRESS
POST OFFICE BOX 471
PHOENIX, ARIZONA 85001

December 10, 1976

Recieved original of this letter and certified copy of order 335331 + check for $750.00
x H. Lucas — 12/14/76

Mr. H. T. Lucas
Land Agent
The University of Arizona
Tucson, Arizona 85721

Dear Mr. Lucas:

Enclosed is a certified copy of findings and Order of the Honorable Morris Rozar, Judge of the Maricopa County Superior Court dated December 9, 1976. This Order was entered after Judge Rozar heard evidence and reviewed documents respecting Farabee's claim that he retained rights in the mining lease from the University of Arizona. You will note that Judge Rozar ruled that the mining lease was owned by Mammoth Mining & Minerals, Inc. of which Farabee is a 25% owner.

A similar order had been entered by Judge Rozar in September. I had been asked by Melvin Palmer to write to you with respect to that previous order. I was in the process of doing so when Farabee asked the Court to reconsider the previous order which he claimed had been entered without his knowledge. As a result of this claim by Farabee, the Judge held a subsequent hearing and entered the Order enclosed herein.

Although we have consistently urged Farabee to refrain from his assertions that he was still the owner of the mining lease despite its assignment to Mammoth Mining & Minerals, Inc., Farabee apparently continued to take the position that the assignment was somehow invalid. We, of course, were not responsible for Farabee taking this position. Since Farabee would not voluntarily agree, legal proceedings were required.

STREICH, LANG, WEEKS, CARDON & FRENCH
A PROFESSIONAL ASSOCIATION
ATTORNEYS AT LAW

We trust the enclosed Order will serve to relieve any concerns the University might have over the status of the mining lease and hope that no further problems will be forthcoming. We, of course, regret past inconveniences to the University.

Please refer any inquiries coming to the University to Mammoth Mining & Minerals, Inc., 222 West 8th Street, Mesa, Arizona 85201, [602] 962-1511. In the event you are unable to contact anyone at Mammoth Mining, feel free to contact this office and we will see that messages are delivered.

Thank you for your patience in this matter. If you have any questions, please contact me.

Very truly,

Dan M. Durrant

DMD:mm

Enclosure

cc: Sherwood E. Carr w/enclosure
Melvin A. Palmer

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX 7, ARIZONA

Tucson, Arizona,
Jan. 28, 1964

Mr. Frank P. Knight, Director,
Dept. of Mineral Resources,
Phoenix, Arizona.

Dear Frank:

Reg. your inquiry about the location of the Whitecliffs mill:

The mill is located on the NE 1/4 of Sec. 24 --- T 9 S - R 17 E. This is on the Nuez # 2 Placer claim, on the west side of the property, and approximately 1/2 mile from the main road. I have a map of the Whitecliffs property, furnished me by Stanley Secrist, from which this information was taken.

Property consists of 19 -- 160 acre placer claims and 1 -- 80 acre placer claim ---- a total of 3, 120 acres. Description, viz:

T 9 S -- R 17 E ---- NE 1/4; SE 1/4; SW 1/4 & S 1/2 of NW 1/4 -- Sec. 13
N 1/2 of NW 1/4 & NE 1/4 -- Sec. 24

T 9 S -- R 18 E ---- SW 1/4 of Sec. 17
All of Sec. 18
All of Sec. 19
W 1/2 of Sec. 20
NW 1/4 and N 1/2 of SW 1/4 of Sec. 29
N 1/2 of Sec. 30

Sincerely,

Axel

Axel L. Johnson, Field engineer,
Box 5047, Tucson, Arizona.

ARIZONA DEPARTMENT OF MINERAL RESOURCES
Mineral Building, Fairgrounds
Phoenix, Arizona

1. Information from: Personal visit.

   Address:

2. Mine: Whitecliffs. 3. No. of Claims - Patented

   Unpatented

4. Location: S. E. of Mammoth

5. Sec Tp Range 6. Mining District Old Hat

7. Owner: S. Secrist

8. Address: P. O. Box 1088

9. Operating Co.:

10. Address:

11. President: 12. Gen. Mgr.:

13. Principal Metals: 14. No. Employed:

15. Mill, Type & Capacity:

16. Present Operations: (a) Down ☐ (b) Assessment work ☐ (c) Exploration ☐
    (d) Production ☐ (e) Rate tpd.

17. New Work Planned: Arizona Diatom has returned the property to Mr. Secrist who is now trying to find a buyer

18. Miscl. Notes: ~~4-30-70~~

Visited Whitecliffs mine - no activity other than assessment work. GWI WR 10/31/70

Date: 4-30-70

GW Dunn
(Signature) (Field Engineer)

WHITECLIFFS MINE PINAL COUNTY

Not working ALJ Weekly Report June 29, 1964

Received information on Whitecliffs diatomaceous earth deposit - they are still operating but they plan on moving the mill to their gypsum operations north of Mammoth soon

ALJ WR 10/5/64

Conference with William Kessler, Arizona Gypsum Co.

Bill Kessler said that Arizona Diatoms, Inc. is now merged with Arizona Gypsum and that the mill had been moved to Feldman. The diatomite is being hauled 19 miles to Feldman. The combined operation at Feldman uses 9 men.

The gypsum operation is doing quite well.

MEMO LAS 12/9/64

Whitecliffs

In 1951 Mr. Secrist agreed to a sublease with Arizona Diatom Corporation for $150,000. Mr. Fred Loveday the president and the company secretary would each put in for a round trip daily from Tucson to the mine. This somewhat weakened the treasury.

They negotiated a lease with Super-lite of Phoenix, who proceeded to strip and haul unclassified diatomaceous material to Phoenix for use in Super-lite block. At first they used a 10% ratio of diatomaceous earth in the blocks, then gradually increased the ratio. The clay was not removed from the impure material, nor was an attempt made to mine clay free material. The result that a period of ~~rain~~ rainy weather took care of the clay removal with rather astonishing results.

A Mr. Vogel (Neil) introduced a Mr. Risk to Mr. Wendell Pratt of Twin Star Industries and a lease was negotiated.

Mr. Pratt then sublet from Twin Star to another Pratt owned subsidary and finally to Associated Minerals on the basis of a lease from Mr. Secrist to Arizona Diatom.

Mr. Pratt & Mr. Vogel then sub-let 1 claim to Arizona Gypsum who installed a mill. After the mill was operating Pratt sought to raise the Royalty from 50¢ to $1.00 per ton. Secrist then took $5000 worth of stock in Arizona Diatom in lieu of a $5000 cash payment.

Arizona Gypsum was working the south quarry and sold several car loads of material to Dupont.

Then Mr. Pratt and, or one of his companies sued Arizona Gypsum in Florence.

Mr. Secrist then started to intervene, so a settlement was made that Arizona Gypsum would remove their mill and get off of the property. Arizona Gypsum then staked 10, 5 acre mill sites around the mill, and thru their lawyer, Hale Tognoni sought to have the Secrist claims invalidated. Boyle, Bilby, Thompson and Schoenhair were the attorney's for Arizona Diatom's. In the end Arizona Gypsum was given time to remove their mill. This was done, and they now mill the material at their mill at Feldman.

Mr. Secrists claims cover 3120 acres, and is on two sides of Vogel & Pratts, NE Forty.

Some little finger areas on the edges may have been staked and mined by Arizona Gypsum.

Mr. Secrist is sure that the Phoenix Office has a map of the claims. So to answer your question. The Vogel, Pratt claim borders the Whitecliffs claims.

The Tucson office may get a map of the claims in the near future. It appears that Kaiser Engineers have been investigating the property,

Notes by B.W. Irwin
May 27, 1968

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date December 29, 1964

District Mammoth Mining District, Pinal County Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from C. Neil Vogel & Wendall Pratt

References: (1) Report of Sept. 26, 1963 & previous reports
(2) Letter of Dec. 12, 1963

Location: About 11 miles SE of Mammoth.

Owner: Stanley M. Secrist, 15 Calle Conquista, Tucson

Lessees: Arizona Diatom Corp., 4625 E. Broadway, Tucson
Fred H. Loveday, President - Clyde Lewis, Vice Pres.
Kenneth Seiler, Secretary-Treasurer

Number of Claims: 19 unpatented placer claims (160 acre claims)

Principal Minerals: Diatomite

Present Mining Activity: Idle

Review of Recent Activity: Field engineer visited the property on Sept. 24, 1964. At the time of this visit the mill used by Arizona Gypsum and Associated Minerals, Sub-Lessees, was still in place and operative. Engineer was informed that it was closed temporarily on account of wet weather.

A short time subsequent to this, it was reported that the mill had been dismantled and removed from the property.

It is reported that the Arizona Diatom Corp. has now acquired the interests of the previous sub-lessees.

No plans have been announced regarding the resumption of mining operations at the property.

Visited White Cliffs, diatomaceous area, some activity by Gypsum Co.

GWI WR 1/28/67

Visited Whitecliffs - Diatomaceous earth mine, no sign of recent activity. (This may be due to the previous weeks down-pour.

GWI WR 9/30/67

Mine Visit to Arizona Diatom, White Cliffs, no activity.

GWI WR 1/27/68

Mine Visit- Whitecliffs, someone had been doing work since last visit. (Fixing roads, assessment work, etc. Some drilling reported).

GWI WR 6/30/68

IV-IV-63

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

Whitecliffs Mine, Pinal County, Ariz.

Successions according to department files are:

1. The Mine formerly known as Arizite is on the east side of the San Pedro River in the SE part of T. 9 S. R. 17 E. and SW part of T. 9 S. R. 18 E. Arizite Products Corp. in 1941 owned four 160 acre claims and leased the balance of the property from Andres M. Herreras of Tucson. The Arizite company had forfeited its lease and sold its 30 ton mill and machinery by 1946.

2. Stanley M. Secrist, 15 Calle Conquista, Tucson, bought the property in 1948.

3. Arizona Diatom Corp., Tucson, Arizona, in 1952 obtained a 20 year lease and option. Fred H. Loveday, 3856 E. Ryan Road, Tucson, and 16 others formed the lessee company. The leased property consisted of 19 unpatented claims, 18 of 160 acres each and one of 80 acres.

4. In 1954, Loveday et al sub-leased one 160 acre claim to Builders Supply Corp. of Phoenix.

5. About 1928, Twin Star Industries, Inc. of Austin, Texas sub-leased the property from Arizona Diatom. C. Neil Vogel, former automobile dealer at Austin, was agent for Twin Star.

6. In 1959, American Diatomes, Inc. of Phoenix, held a sub-lease from Twin Star Industries and started construction of a plant with rated capacity of 6 tons per hour.

7. In 1960 American Diatomes, Inc. reorganized and in 1961 it bought out Twin Star Industries, Inc., according to owner Stanley Secrist.

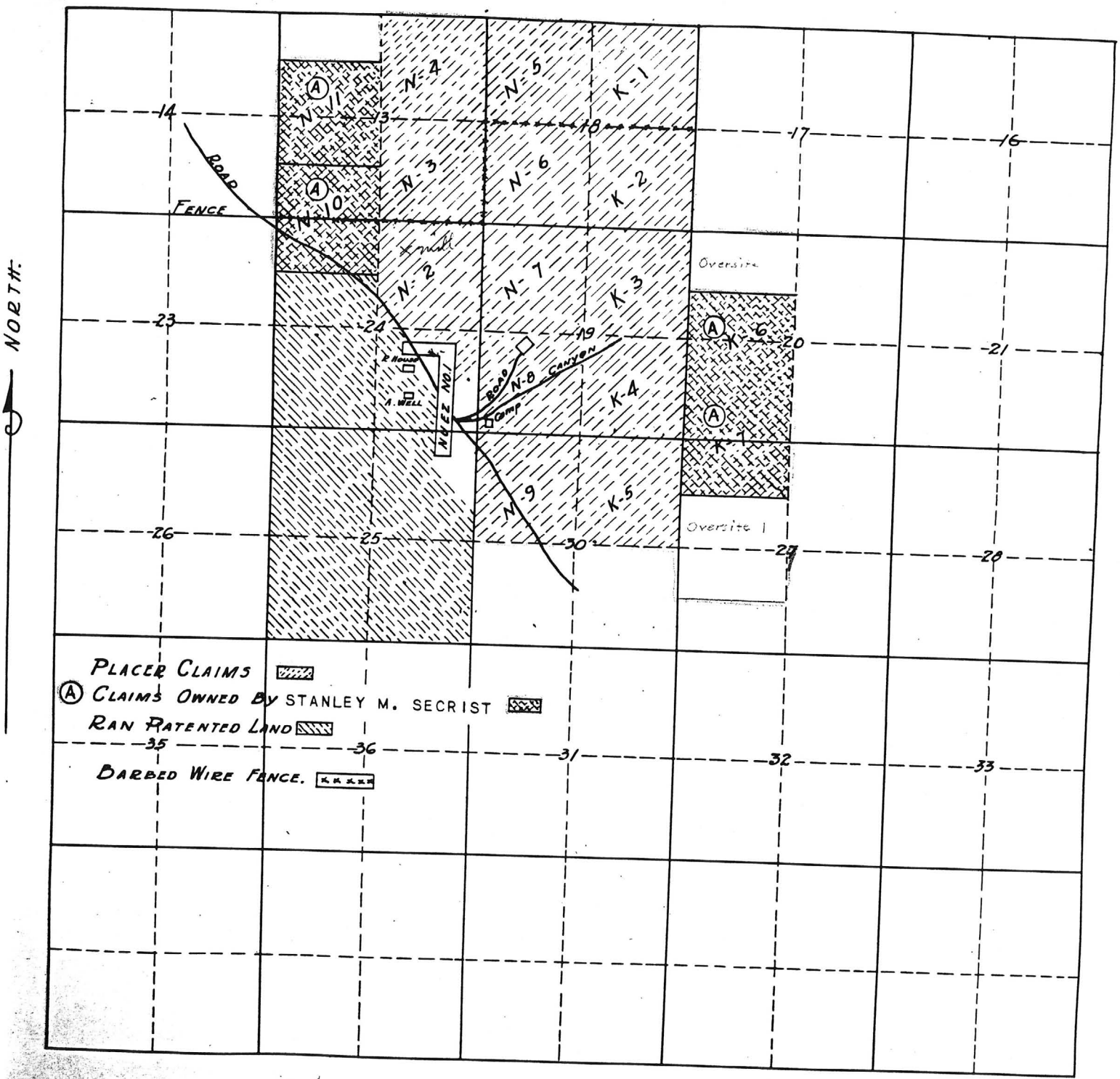
8. In late 1963 American Diatomes dropped its lease and Associated Enterprises, 231 Sansome Street, San Francisco, picked it up. Fred Armstrong and Wendall B. Pratt are president and vice-president respectively of Associated Enterprises, formerly Associated Minerals.

MAP SHOWING PLACER CLAIMS BELONGING TO STANLEY M. SECRIST

RANGE 17 E. TOWNSHIP 9 S.

RANGE 18 E. TOWNSHIP 9 S.

GILA & S.R.B.&M



DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine 'Whitecliffs Mine Date Sept. 26, 1963

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Jim Nicholson.

References: Report of May 29, 1963 & previous reports.

Location: About 11 miles SE of Mammoth.

Owner: Stanley M. Secrist, 15 Calle Conquista, Tucson

Lessees: Arizona Diatom Corp., 3856 E. Ryan Road, Tucson.

Sub-Lessees: ~~Arizona Gypsum Corp., P.O. Box 6675, Phoenix 5, Ariz. at 2255 S. 19th Ave., Phoenix, Arizona~~
~~William Kessler, Manager, address above~~
~~James Nicholson, P.O. Box 513, Mammoth, Ariz., plant foreman.~~

Number of Claims: 19 unpatented placer claims (160 acre claims)

Principal Minerals: Diatomite

Present Mining Activity: Same as report of Feb.14, 1962. 3 men working. Production about 400 tons per month, the daily production varying from 10 to 25 tons per day.

Marketing:
(1) Preparation of Perma-Guard Insecticide, packaged in 25 lb. bags are sold to Phoenix Gems, Inc., 1701 E. Elwood St., Phoenix, Ariz. for use as insecticides.
(2) Preparation of Perma-Guard Grain Storage Insecticide, packaged in 50 lb. bags, are sold to Arroya Grain Co., Willcox, Ariz.
(3) Sale of Perma-Guard Insecticide to a company in Stanfield, Ariz. for crop dusting (5 tons per week).
(4) Sale to Apache Powder Co. of about 10,000 lb. per mo.
(5) Sale to Arizona Sand & Rock, Phoenix, for use as a cement additive.

Advise 12/63

12/12/63 Arizona Gypsum Co. advise that the complicated royalty set-up made the Whitecliffs property unattractive to them. They have therefore leased an adjacent property which is said to be somewhat inferior but amenable to beneficiation. (diatomaceous earth).

F.P.K. Memo 12/63

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date May 29, 1963

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Jim Nicholson

References: Report of March 20, 1963, Feb. 14, 1963 and previous reports.

Sub-Lessees & Operators: Same as report of March 20, 1963.

Present Mining Activity: Same as report of Feb. 14, 1963. 2 men working all the time, and a third man when required. Production variable - 10 to 25 tons per day.

Recent Markets: Phoenix Gems, Inc., 1701 E. Elwood St., Phoenix, Arizona, have been buying diatomite from American Diatomes, Inc. and packaging same in their Phoenix office for use as insecticides. It was reported that Phoenix Gems, Inc. had obtained patents for this use, and that the material has been tested by Government engineers and found to be an effective insecticide.

The diatomite, mixed with a small amount of other materials according to formula, is sacked by American Diatomes in 50# bags and delivered to Phoenix Gems for repacking in smaller packages for sale to users of the product. The other ingredients amounting to only about 1% of the total weight are added to the diatomite as a liquid and mixed at the American Diatomes plant in a mixer. These additives are evidently added to make the diatomite pleasantly tasting to the insects. One of the additives used is pine oil, while the others are mixtures of chemical compounds.

Three different kinds of insecticides are prepared named as follows:

(1) Perma-Guard Household Insecticide
(2) " " Pet and Livestock Insecticide
(3) " " Garden Insecticide

In addition to the above, a grain storage insecticide is being prepared by the name of Perma-Guard Grain Storage Insecticide and sacked in 50# bags. It was reported that Phoenix Gems, Inc. was anticipating, or hoping for, a substantial order of this from the Government for use in Government grain storage.

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date March 20, 1963

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Stewart Helffrich

References: Report of Feb. 14, 1962

Location: See report of Feb. 14, 1962.

Number of Claims: See report of Feb. 14, 1962.

Owner: Same as report of Feb. 14, 1962.

Lessees: Same as report of Feb. 14, 1962.

Sub-lessees: American Diatomes, Inc.
2449 "A" East Indian School Road, Phoenix, Arizona.
W.O. Wood, President
Stewart Helffrich, Vice President & General Manager
Mrs. Mary Grooters, Secretary-Treasurer

Principal Minerals: Diatomaceous earth

Present Mining Activity: Same as report of Feb. 14, 1962. 3 men working. Production variable - 10 to 25 tons per day.

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine	WHITECLIFFS MINE American Diatomes, Inc.	Date	January 24, 1963
District	Mammoth District, Pinal County	Engineer	Lewis A. Smith

Subject: Interview with S. Helffrich, 2600 E. Thomas Rd., Phoenix 16, - Marketing Field man. 1-21-63

Mr. Helffrich reported that 2 men were working at Whitecliffs. At present the base product is a crudely refined diatomite for mixing with cement. This is said to prevent slumpage of the concrete during setting, or to prevent segregation of the cement and water during pouring or transfer of the aggregate through pipes, etc. The retention of the water by the diatomite performs this function. Mr. Helffrich, therefore, wanted a list of mining companies that use concrete in underground structures where the concrete would have to be transported through tubes. He also stated that Arizona Sand and Rock, and Superlite were using diatomite in pre-stressed beams, etc. He is negotiating with contracting companies who pour bridges, or other larger structures.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date Feb. 14, 1962

District Mammoth Mining Distridt, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Paul E. Cook, and personal visit

References Report of Dec. 14, 1960 and previous reports.

Location About 11 miles SE of Mammoth. For directions to the property see report of Mar. 11, 1959.

Number of Claims 19 unpatented placer claims (18 - 160 acre claims & 1 - 80 acre claim)

Owner Stanley M. Secrist, 15 Calle Conquista, Tucson, Ariz.

Lessees Arizona Diatom Corp., 3856 E. Ryan Road, Tucson, Ariz. Fred H. Loveday, Pres.

Sub-Lessees American Diatomes, Inc., 2600 East Thomas Road, Phoenix, Ariz.
Paul E. Cook, Managing Difector 11-62 - Stewart Kelffirk, Mgr.
(Note:- On 2/28/61 Stanley Secrist reported that Twin Star Industries, Inc., the former sub-lessees had been bought out by American Diatomes, Inc.)

Principal Minerals Diatomaceous earth

Present Mining Activity Mining the diatomaceous earth by means of ripper, bulldozer and loader. Processing the material in the plant at the mine. The mining operations are carried on part of the time, and the material is processed at the plant the remainder of the time. 3 men working. Average production of processed material is about 25 tons per day.

Milling The milling operations are substantially the same as reported in my July 13-20, '60 report, with a few minor refinements added. A ribbon blender was also installed in Dec. 1960 for the manufacture of ADITE, a dry wall paint (formerly called "adacote") by mixing the diatomaceous earth with other ingredients (see report of Dec. 14, 1960) The plant capacity is reported by Mr. Cook to be 40 tons per 8 hrs. or 120 tons per 24 hrs. He reports that they usually mill about 50 tons per shift.

Products and Uses Mr. Cook reports that the company is manufacturing 2 principal products, ADITE And ARI-LITE.

(1) ADITE is a dry wall spray texture paint, sold as a dry powder in 25# bags to dealers at $ 1.49 per bag. It is mixed with water and applied with a spray, roller or brush to wall board, bricks, or concrete blocks, providing an excellent paint base. (See advertising folder on same)

(2) ARI-LITE is a cement additive, sold as a dry powder in 50# bags sold only to dealers. It is added to Portland cement, providing a saving in the amount of cement used, and also resulting in increased compressive strength. It is sold to dealers at from $ 18.90 to $ 20.90 per ton, depending on the grade. (See price list on same)

Mr. Cook informed me that they manufacture 3 grades of ARI-LITE (a) ARI-LITE 75--- 80 % minus 325 mesh; (b) ARI-LITE 98 --- 98 % minus 325 mesh; and (c) ARI-LITE 100 --- 100 % minus 325 mesh (last one not mentioned in the price list)

He stated that they had made several tests, which confirmed the increased strength of concrete, when ARI-LITE was added to the cement. One test, he said gave the following results:-

(a) 3 parts of 3/8 in. to 8 mesh coarse aggregate, 1 part of 8 mesh fine aggregate and 4 sacks of Portland cement produced 390# psi after setting 7 days.

(b) the same amount of coarse and fine aggregate, 3 sacks of Portland cement and 1 - 50# bag of ARI-LITE produced 520# psi after setting for 7 days.

SPEED LETTER®

FROM Mr. I: TO L. Pare

SUBJECT Whitecliffs Diatomite property

FOLD

MESSAGE DATE 5-~~28~~-23-68 19

A/c a map that Mr. Secrist put of record re the above property the NE1/4 of Sec. 24, T9S R17E is part of the Whitecliffs group, the SE1/4 of the section is not. When you state ". . . claimed by C. Neil Vogel & is within the Whitecliffs area" is the "area" supposed to mean the actual property claimed by Whitecliffs or within the immediate area???? Mr. Kessler of Arizona Gypsum told this office (as reported to you before) that he couldn't deal with the many sub-lessees & was on adjacent property with his diatom operation.

SIGNED L Pare

REPLY DATE 5-27 19 68

Immediate Area ↑

SIGNED RJ.

RETAIN WHITE COPY, RETURN PINK COPY. TURN OVER FOR USE WITH WINDOW ENVELOPE.

WHITECLIFFS MINE

PINAL COUNTY
MAMMOTH MINING DIST.

Mr. Russ Lyon, a member of the board of the White Cliff Diatomite development reported that 4 men were employed on research at the mill and stated that the mill will probably commence operations in 60 days. So far $250,000 have been invested.

LEWIS A. SMITH - WR - 9-16-60

MEMO

WHITECLIFFS MILL

9-20-61
Lewis A. Smith

Interview with P. E. Cook, American Diatoms, Inc.

Mr. Cook stated that the mill is operating with 3 men. They are producing several products including refined diatomite, "Grade 98", dry wall texture grade, concrete block fill, and pozzolan types.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date Dec. 14, 1960

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Jim Nicholson and personal visit.

References: Report of July 13-20, 1960 and previous reports.

Present Activity: Plant construction, with processing operations being conducted about ½ of the time. 3 men working. Production about 14 tons per day.

Review of Recent Operations: Since my last visit to the property on July 13, considerable mine development work has been done. This has consisted principally of stripping overburden and building access roads. The mining operation has been carried on with the use of a bulldozer TD 9 Skid Shovel and hauling theproduct to the mill in a 2 ton truck.

A ribbon blender is now in the process of being installed, at the mill, for the manufacture of dry wall paint. In this blender, the finely ground and processed diatomaceous earth will be mixed with other ingredients (formula is confidential information) to produce a dry powder, which will be sold as dry wall paint to building contractors.

Proposed Plans: Operators expect to be in full plant production, working day shift only, in about 6 to 8 weeks (Feb. 1961). The production will then be about 28 tons per day.

Gradual changes in the plant will then be made to increase the mill capacity. Also, if the demand for the product keeps increasing, the plant will go on a two shift or three shift operation. 8 men are expected to be employed on full day time production, with 5 additional men on each of the other two shifts.

This property active Feb. 1961

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine — Date July 13, 1960 and July 20, 1960.

District Mammoth Mining District, Pinal Co. — Engineer Axel L. Johnson

Subject: Field Engineers Report. Personal visit & information from Jim Nicholson & Paul Cook.

References Reports of Mar. 9, 1960, Sept. 16, 1959 and previous reports.

Sub-Sub-Lessees and Operators : American Diatom, Inc., 3500 N. Central Ave., Phoenix, Ariz.
Paul E. Cook, Managing Director in charge of operations
Dr. A. V. Partipilo, Chairman of the Board
Russ Lyon, Vice President
A. T. LaPrade, Jr., Treasurer
Leonard H. Forman, Secretary
Jim Nicholson, Foreman at Whitecliffs processing plant

The above list of officers were elected at a reorganization meeting of the company a short time ago. The address of Paul E. Cook is 1010 E. Osborn Road, Phoenix, (Tel CR 4-3331) and the address of Jim Nicholson is Box 513, Mammoth, Ariz.

Present Activity Construction work at the plant & some test runs. 3 men working. Expect plant to be completed in about 30 days and operations to start shortly thereafter.

Review of Recent Operations Since my last visit to the property on March 9, 1960, a dryer has been installed, 1 dust collector has been added, and 2 more dust collectors are ready to be installed. Besides this, the old equipment in the plant has been remodelled, and an entirely new flow sheet has been worked out. Mr. Nicholson, foreman, stated that further changes and additions may be necessary before operations will reach the maximum efficiency.

Proposed Mining Operations The diatomaceous earth, which will first be processed, is located about 5 miles by road from the plant. Mining operations will be conducted with the use of a bulldozer, a TD 9 Skid Shovel, loading into trucks, and trucks for hauling the material the 5 mile distance to the processing plant. Very little blasting will be necessary.

Milling Operations The milling or processing operations, according to Mr. Nicholson, will be about as follows, except for minor improvements, as required:

The mine run material is dumped into a 20 yd. crude ore bin, and conveyed by means of a feeder belt into a 20" x 10" jaw crusher. The crushed product is then elevated by meand of a bucket elevator into a 50 ton ore bin.

From the ore bin, the material is dropped into a 6' x 25' ore dryer, operated by diesel fuel, where the ore is dried to about 1 % moisture content.

From the dryer, the fine material (-325 m) is removed by a dust collector, the product from the dust collector going into a bin followed by a sacker arrangement, and the coarse material (+ 325 m.) going to a set of vibrating screens.

From the vibrating screens, the O. S. material (+ 1/4 in.) goes into a Pallman Mill for further grinding; the intermediate product (called granular product), which is - 1/4 in.-- + 1/8 in., goes into a bin followed by a sacker arrangement to be sold to the industry as required; and the U. S. material (- 1/8 in.) goes back to the Pallman Mill for further grinding. The granular product constitutes about 20 to 25 % of the total.

From the Pallman Mill, the material is elevated by means of a Liftmaster. From the Liftmaster, the fine material is removed by means of a dust collector, the product from the dust collector going into a bin followed by a sacker, while the heavier material goes directly into a bin followed by a sacker, 85 % of this material being - 325 m. This heavier material can also be diverted into a classifier for removal of impurities, if this is found to be necessary.

From the classifier, the + 325 m material, which contains some sand and chert, is wasted, while the - 325 m goes into a liftmaster.

From this liftmaster, the dust is removed by means of a dust collector and is dropped into a bin with a sacker arrangement, while the remaining material also goes into a bin with a sacker arrangement.

As stated previously, other changes might be found necessary before the final flow sheet is worked out. (See Flow Sheet as planned at present.)

Uses of the Product The following uses of the product was mentioned by Paul E. Cook:

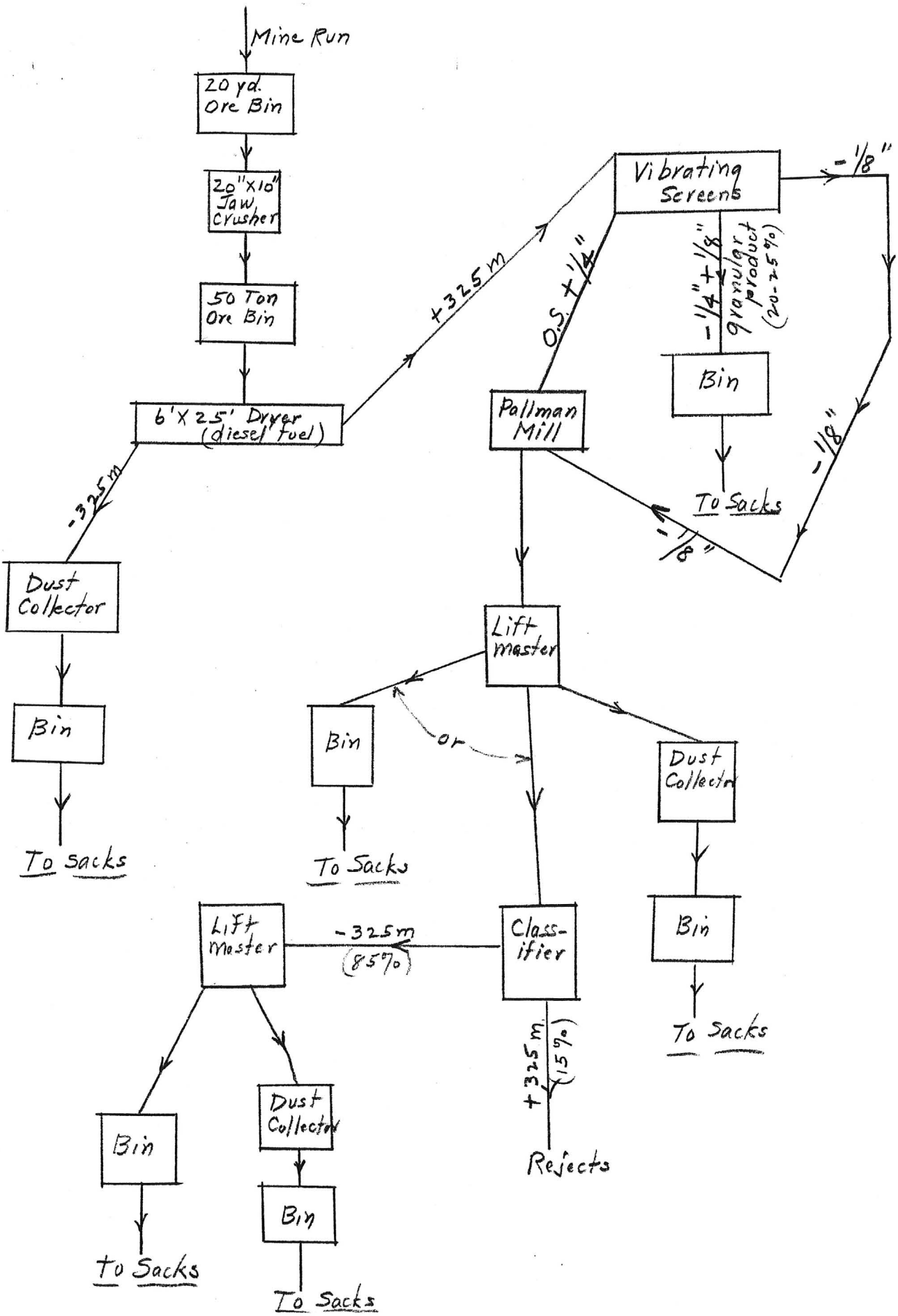
(1) For the granular product (- 1/4 -- + 1/8)
   - (a) for a filler in insecticides
   - (b) for use in horticulture as a mulching material
   - (c) as an insulation material
   - (d) use in chemicals
   - (e) use in termite control

(2) For the dust and the - 325 m material
   - (a) for use in texture or dry wall paint
   - (b) for use in oil paints
   - (c) for use in concrete paints
   - (d) for use in insecticides

It is also expected that some material will be sold later on for use as a pozzolan material, for mixing with cement.

The material will be sold f. o. b. plant.

FLOW SHEET


Mine Run
20 yd. Ore Bin
20"x10" Jaw Crusher
50 Ton Ore Bin
6'X 25' Dryer (diesel fuel)
+325 m
-325m
Dust Collector
Bin
To Sacks
Vibrating Screens
O.S. +1/4"
-1/8"
-1/4" + 1/8" granular product (20-25%)
Bin
To Sacks
Pallman Mill
-1/8"
-1/8"
Lift master
Bin
To Sacks
or
Dust Collector
Bin
To Sacks
Lift Master
-325m (85%)
Classifier
+325 m. (15%)
Rejects
Bin
to Sacks
Dust Collector
Bin
To Sacks

Not for publication

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date March 9, 1960

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Jim Nicholson, and personal visit.

References: Reports of Sept. 16, July 15, May 13, & Mar. 11, 1959.

Sub-Sub-Lessees & Operators American Diatom, Inc., 3701 W. Indian School Road, Phoenix, Ariz.
Jim Farmer, Pres.
Byron D. Young, V. Pres.
A. H. Ellett, Sec'y

Jim Nicholson, Box 513, Mammoth, Ariz. ---- Foreman
(Mr. Nicholson began his duties as Foreman on March 3, replacing Byron D. Young)

Present Activity Construction work at the plant. 3 men working. At present pouring a concrete floor.

Review of Recent Operations

Since my last visit to the property on Sept. 16, 1959, the plant has been operated very little, except for the purpose of trying to solve the processing difficulties, and obtaining samples of the product for testing. It was reported that the operations were closed down at various times in Nov., Dec., and Jan. due to the weather conditions (principally rain). No additional processing equipment has been installed since my visit of Sept. 16.

Mr. Nicholson stated that, due to lack of proper processing equipment, the company has been unable to produce a uniform product of the required standards and size. He also stated that the dry classifiers and separators do not work properly when there is an appreciable amount of moisture in the diatomaceous earth processed, as the product balls and cakes up.

Proposed Plans

(1) A dryer has been ordered and will be installed, as soon as it arrives.
(2) It is also planned to install 2 additional cyclones, and storage bins.
(3) Resumption of operations is expected in about 3 weeks.

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

October 20, 1959

To: Frank P. Knight, Director

From: Lewis A. Smith, Field Engineer

Subject: Weekly Report for the week ending October 9, 1959

Mr. A. H. Ellett, 6030 N. 11th Ave., Phoenix, reported that ...ing machines were being installed at the White Cliffs diatomaceo...th deposit, south of Mammoth. He believes that these machines will aid ... in the proper sizing of the material which will be used for soil c...ning and for swimming pool fillers.

LAS - WR 10-20-...

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date July 15, 1959

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Byron D. Young and personal visit.

References Reports of Mar. 11, 1959 and May 13, 1959.

Principal Minerals Diatomaceous earth.

Present Activity Making additions and improvements on the processing plant. 3 men working. No production at present.

Plant Operations Operators have just finished the installation of a double deck vibrating screen, for screening 1/4 in. to 1/8 in. material.

They will now install an air separator for removing heavy particles in the diatomaceous earth, like chert and silica.

After these improvements are made, two additional grades of the product will be produced, viz. (a) a very fine product (325 mesh), a product from the air separator (b) a 1/4 in. to 1/8 in. product from the vibrating screen.

Sizing of the product will be adjusted, depending on the specifications required by the users of the product.

Processing operations closed down about 3 weeks ago, in order to make the above described plant additions. Mr. Young could not say when operations would be resumed. In the meanwhile, operators have a small stock of sacked diatomaceous earth on hand for sale to buyers of the material.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date May 13, 1959

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Byron D. Young, and Personal Visit.

References: See report of March 11, 1959.

Officers: Byron D. Young, Plant Supt., General Delivery, Oracle, Arizona (lives at Rancho Robles)

Principal Minerals: Diatomaceous earth

Present Activity: Ironing out bugs in the mill equipment and operation. Making experimental test runs. 4 men working 1 shift. No production as yet. Mr. Young reports that the mill will be fully finished for operation in about a week.

Milling Operations: At present the milling equipment and flow sheet are as follows:

The mine run material is dumped into a 20 yd. crude ore bin, and conveyed by means of a feeder belt into a 20" x 10" Jaw Crusher. The crushed product is then elevated by means of a bucket elevator into a 50 ton ore bin. From this ore bin, it is passed by means of a screw conveyor to a Pallman Micron Mill. The product (now minus 250 mesh) is raised by suction into a Liftmaster, which separates the 250-325 mesh material, and the dust, which is minus 325 mesh, dropping each product into separate bins for sacking. Capacity of the plant is about 6 tons per hour and referred to by Mr. Young as a pilot plant.

Mr. Young states that the company plans to install Cyclone or Sturdevant Separators for better separation and sizing of the products.

Proposed Plans:

(1) To install a larger mill, as soon as the demand for the products warrants additional milling capacity.

(2) To construct a Wall Board plant some time in the future, either at Phoenix or at the mine site.

(3) To let a contract for the mining and hauling of the ore to the mill and also for hauling the finished product from the mill to the railroad for shipment.

Additional: Mr. Young states that the dust (minus 325 mesh) is the most valuable product. It is used for face powder, ceramics, tooth paste, etc.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date September 16, 1959

District Mammoth Mining District, Pinal County Engineer Axel L. Johnson

Subject: Information from Byron D. Young and Personal Visit.

References: Reports of July 15, May 13, March 11, 1959.

Principal Mineral: Diatomaceous earth.

Present Activity: Making additions and improvement on the processing plant. An Air Classifier and Cyclone Liftmaster is now being installed. Operators expect to be ready to start operations in about a week or 10 days. 3 men working at the present time. After operations are started about 8 men will be employed, 5 at the mill, and 3 on the mining operations.

Milling and Marketing Facilities: Mr. Young states that the mill capacity will be approximately 3 tons per hour of finished product. He refers to this as a pilot plant with plans for a larger plant to be constructed at a later date, as soon as the demands for the product will justify this additional expenditure.

The following is an approximate flowsheet that will be used when the plant starts operating:

(1) The Diatomaceous earth will be mined by means of International TD 9 Skid Shovels loading in trucks which haul the product to the plant.

(2) The trucks dump the material into a crude ore bin where it is run through a 10" x 20" jaw crusher.

(3) From the jaw crusher the material is elevated into a screening unit which screens the material into 2 sizes --- a $+\frac{1}{4}$" size and a $-\frac{1}{4}$" size.

(4) The $-\frac{1}{4}$" is dropped into a 15 ton bin from where it goes into a sacker which sacks it into paper bags.

(5) The $+\frac{1}{4}$" material is first passed into a 50 ton bin from where it is elevated by means of a Screw Conveyor and passed in a Pallman Pulverizer Mill for further grading.

(6) The material is then elevated by means of a Liftmaster into a 15 ton bin from where the material goes into a sacker. It is sacked into paper bags. This material is 90% -325 mesh.

(7) If sales specifications require additional processing, then the material in the 15 ton bin is diverted into an Air Classifier. This Air Classifier removes the heavy particles consisting mainly of silica, volcanic ash and volcanic glass.

(8) The purified material is elevated by means of a Cyclone Liftmaster into a 1 ton bin from where the material is run into a sacker and sacked into paper bags. 90% of this material is -325 mesh.

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date Mar. 11, 1959

District Mammoth Mining District, Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Byron D. Young, and Personal Visit.

Location The mine is located about 58 miles north-east of Tucson, and 11 miles south-east of Mammoth. Drive 2 miles north from Mammoth on the Mammoth-Winkelman road, then turn right (south-east) about 1/2 mile after crossing the San Pedro river bridge and drive 9 miles south-east on a gravel road to the property.

Number of Claims 19 unpatented placer claims (18 -- 160 acre claims, and 1 -- 80 acre claims)

Owner Stanley M. Secrist, 15 Calle Conquista, Tucson, Arizona.

Lessees Arizona Diatom Corporation, Tucson, Arizona
Fred H. Loveday, 3856 E. Ryan Road, Tucson, Arizona.

Sub-Lessees Twin Star Industries, Inc., Austin, Texas.

Sub-Sub-Lessees American Diatom, Inc., 3701 W. Indian School Road, Phoenix, Arizona
Jim Farmer, President
Byron D. Young, Vice-President
A. H. Ellett, Secretary

Principal Minerals Diatomaceous Earth

Present Activity Building processing plant. This plant is now about one-half completed, and Mr. Young estimates about 30 days more time will be required to finnish same. 5 men are working on the plant installation (4 men plus Mr. Young, the manager.

Proposed Plant The equipment of the processing plant will consist of the following:

(1) 20" x 10" Jaw crusher
(2) 2 bucket elevators
(3) one 50 ton ore bin
(4) a Pallman mill
(5) one Cyclone Separator
(6) a Bag House
(7) a Bag Dust Collector
(8) automatic weighing and sacking equipmen

The plant capacity is reported as about 6 tons per hour.
The plant will be operated 2 shifts per day.

Proposed Operations The material will be mined open pit by means of bulldozer and shovel and loaded into trucks for haulage to the processing plant. The material will be crushed to minus 325 -- plus 700 mesh, and the various impurities removed, after which the material will be sacked into 50 # paper bags for shipment to the various consumers.

Uses of the Product The various uses, as reported by Mr. Young, are as follows:

(1) For mixing with cement as a pozzolan material
(2) As a soil conditioner
(3) As an insulation material
(4) As sound proofing material
(5) As a filtering material
(6) For use in wall board manufacture.

Proposed Plans Mr. Young states that the company is planning the construction of a plant in Phoenix for the manufacture of Wall Board.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine Date March 29, 1954.

District Mammoth Mining Dist., Pinal Co. Engineer Axel L. Johnson

Subject: Field Engineers Report. Information from Fred.H. Loveday, Lessee.

For Location, Number of Claims, Owner, Lessees, and Officers, see report of July 31, 1952.

Metals Mined Diatomite (diatomaceous earth)

Men Employed None as yet.

Production Rate No production, as yet.

Milling Facilities No milling facilities have been installed to date.

Geology and Ore Values See report of July 31, 1952.

Past History and Production See report of July 31, 1952.

Markets for the Product Since taking over the lease on the property, in the spring of 1952, the lessees, Fred H. Loveday and W. G. Ostler, have spent a considerable amount of time and money in research and investigation in order to determine what uses can be found for the product, how it can be processed for each particular use, and what markets for same are available.

Following are the uses that have been found for the product:- (1) In the manufacture of building blocks, (2) In the manufacture of paints, (3) As an ingredient added to fertilizers, (4) As a soil conditioner, (5) In the manufacture of insecticides, (6) As an insulation material.

Special Sub-lease The lessees, Mr. Loveday and Mr. Ostler, has sub-leased one of the placer claims (160 acres) to the Builders Supply Corp., 4012 N. Central Ave., Phoenix, Ariz. This lease was executed in January, 1954, and calls for a straight royalty, percentage not disclosed for publication. Officers of the Builders Supply Corp. are Paul M. Thomas, President; Roger C. Thomas, Secretary; and Gilbert Olson, Treasurer and Sales Manager.

The Builders Supply Corp. will mine and crush the product, haul the product to Phoenix, and use same in the manufacture of light weight building blocks at their plant in Phoenix. In the manufacture of the building blocks, the diatom material is mixed with a certain amount of pumice and cement in the proportion designed to obtain the maximum strength, as well as other favorable physical properties. The favorable properties are said to be (1) very strong for a light block (2) very good insulating qualities, (3) water proof, (4) very light in weight.

The lessee, Mr. Loveday, reports that the Builders Supply Corp. has already started to build a road into the property, will very shortly install a crusher, hammer mill and ore bin at the property, and will start mining operations in the latter part of April. Operations will be open pit----by bull dozers, scrapers, and car loaders, the mined material being crushed and ground at the property, and then hauled by trucks to Phoenix to the Builders Supply Corp. build block plant. Mr. Loveday reports that the company plans to make several different size blocks for different purposes.

Proposed Plans Lessees, Mr. Loveday and Mr. Ostler, plan on sub-leasing the remaining 18 --160 acre placer claims to other users of diatom products, as soon as deals for same can be negotiated.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine (formerly Arizite Products) Date July 31, 1952.

District Mammoth Mining Dist. , Pinal Co. Engineer Axel L. Johnson

Subject: Mine Report ---Personal Visit & inf. from Mr. Loveday, Lessee.

Location Mine is located 58 miles north-east of Tucson, and 11 miles south-east of Mammoth. Go 2 miles north of Mammoth on the Mammoth-Winkelman Road, then turn south-east 1/2 mile after crossing the San Pedro River bridge, and go 9 miles south-east on gravel road, which crosses a corner of the property.

Number of Claims 19 unpatented placer claims--- 18--160 acre claims, and 1-80 acre claim. (See accompanying map)

Owner Stanley M. Secrist, 3108 E. Ft. Lowell Rd., Tucson, Ariz.

Lessees & Operators Arizona Diatom Corporation, Tucson, Arizona.
composed of following - - Fred H. Loveday, 3856 E. Ryan Road, Tucson, Ariz.
W. G. Ostler, Tucson, Ariz.
15 others ---20 year lease with option to buy.

Officers Fred H. Loveday, 3856 E. Ryan Road, Tucson, Ariz.
W. G. Ostler, Tucson, Ariz.

Metals Mined Diatomite (diatomaceous earth)

Men Employed None as yet. Operations to start within 60 days.

Production Rate No production yet. In 60 days, will start with small production, which will be gradually increased until 100 tons per day production will have been reached within a years time. 100 tons per day is to be the minimum.

Milling Facilities None now. Operators plan on constructing a mill, or processing plant to treat the crude ore, which has to be processed for sale to certain industries. Not all the crude ore will have to be processed, as some buyers can use the crude form as it is mined. The processing plant will consist of a primary crusher, a rotary dryer, a pulverizer, an air classifier, and bagging equipment. The plant will be erected on the property.

Geology The diatomite is found in gently sloping, almost horizontal sedimentary beds, which covers a large part of the 19-160 acre placer claims. The diatomite deposit is covered by a small amount of overburden or detritus, ranging from a thickness of only a few inches and up to 100 ft.in thickness. The part of the deposit which is scheduled for mining operations, have only a couple of feet of overburden overlying same. The deposit is cut into by a number of canyons, from 100 to 500 ft. in width, which have eroded away the diatomite, and left canyon walls from 30 to 150 ft. in height and almost vertical, exposing the diatomite. Also see description filed under ~~Arizite~~ Arizite Products Corporation.

Ore Values See accompanying sheet on chemical analysis of samples, etc.

Past History & Production continued on page 2.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Whitecliffs Mine (formerly Arizite Products) Date July 31, 1952.

District Mammoth Mining Dist., Pinal Co. Engineer Axel L. Johnson

Subject: Mine Report --- Personal Visit & inf. from Mr. Loveday, Lessee.

Past History & Production Previous owner---- M. Hererras.
Previous lessee and operator----Arizite Products Corporation.
The Arizite Products Corp. worked the property in 1940 and 1941 by open cut and underground methods, milling the material at Mammoth in an air flotation plant of 30 tons daily capacity. Operations were suspended owing to failure of the company to obtain markets for their products, at prices which would give them a profit on their operations.

Mr. Stanley M. Secrist bought the property in 1948. Since then it has been idle up to the present time.

The present lesees, the Arizona Diatom Corporation, leased the property from Mr. Secrist on May 12, 1952, and are now getting ready to start operations, as mentioned under ''Production Rate''

Proposed Operations

(1) Plan to build about 4 miles of haulage roads on the property, and to surface same.

(2) Plan to contract for the mining of the ore.

(3) Plan to contract for the hauling of the ore.

(4) Plan to build a processing plant for processing part of the ore. Plant will be built on the property, as explained under ''Milling Facilities''.

(5) Expect to sell the product from the processing plant to the following users---- (a) Abrasives, (b) Paint Extenders, (c) Manufacture of Explosives, (d) Insulation products, (e) Diluents for crop dusting, (f)For the manufacture of building blocks, (g)For chicken litter.

(6) Expect to sell the product from a separate special plant (plant to be designed to suit requirements) to manufacturers of pre-fabricated building panels to be used in Home and Class A construction.

(7) Expect to sell the crude mined product without processing to (a) Manufacturers of filtration materials, (b) For concrete aggregate, (c) For manufacture of building blocks, (d) For soil conditioners, (e) For an ingredient added to fertilizers.

(8) Expect to saw out blocks from parts of the deposit to be used as insulation bricks for refractory furnaces.

Conclusion & Remarks

(1) Tonnage is very large---and should be adaptable for large scale operations for a long time.

(2) Very little overburden to strip to get at the ore.

(3) Mining operations very easily accessible by building a few mine access roads in the numerous canyons.

(4) Deposit can be mined very cheaply by open pit mining operations.

(5) Drying the ore should be easy and cheap, as it contains very little moisture.

(6) Operation should yield a good margin of profit at the present prevailing prices for the material.

(7) Success of the operation will depend on (a) Obtaining markets for the sale of the product, (b) Ability to meet specifications on chemical analysis required by purchasers of the product, and (c) Ability to process the product economically to meet the needs of the purchasers.

DEPARTMENT OF MINERAL RESOURCES
State of Arizona
MINE OWNER'S REPORT

Date July 2 - 46

1. Mine: Arizite Prod. Corp.
2. Location: Sec..... Twp..... Range..... Nearest Town.....
   Distance..... Direction..... Road Condition .....
3. Mining District & County:.....
4. Former Name of Mine:.....
5. Owner: This firm is inactive, with lease forfeited
   Address: and mill & machinery sold
6. Operator: .....
   Address: .....
7. Principal Minerals: .....
8. Number of Claims:..... Lode..... Placer.....
   Patented ..... Unpatented .....
9. Type of Surrounding Terrain:.....
10. Geology & Mineralization:.....
11. Dimension & Value or Ore Body:.....

12. Ore "Blocked Out" or "In Sight":

Ore Probable:

13. Mine Workings—Amount and Condition:

No.	Feet	Condition
Shafts		
Raises		
Tunnels		
Crosscuts		
Stopes		

14. Water Supply:

15. Brief History:

16. Signature: Mary L. Moore, Secy-Treas.
29 W. 42nd St. Indianapolis 8 Ind.

17. If Property for Sale, List Approximate Price and Terms:

TWIN STAR INDUSTRIES, INC.
AUSTIN, TEXAS

C. NEIL VOGEL, Agent
1820 E. Hampton
Tucson, Arizona

Have taken over Arizona Diatom Lease of White Cliffs Mine, near San Manuel.

Research by:
Dr. Frenell, S. W. Research, San Antonio, Texas, and
Dr. Savage, Case Institute of Applied Sciences,
Cleveland, Ohio.

Have 40-50 samples.

After research, expect to build mill - grind 325-550 mesh.

Property has 3,000 acres, 100 ft. cliff of diatom earth, 150 ft. in places.

Grinding a problem want diatom intact $5\frac{1}{2}$ microns vs 22

Date ?

COPY

USES OF DIATOMACEOUS EARTH.

Insulation- high and low temperature.
Food filtration.
Absorbent and Inert Fillers for:

- Battery Boxes
- Match Heads
- Paints, varnishes and lacquers.
- Polishing Materials
- Concrete
- Explosives
- Perfume
- Sugar
- Moulded Plastics
- Flooring and roofing materials
- asphalt pavings,
- Bituminous enamels
- Rubber
- Paper.

Absorbing agent for liquids and pastes - also hard, dry soils.
(D.E. absorbs 4-5 times its own weight of liquid)
Carboy Packings.
Soaps
Cosmetics,
Waxes,
Printing Inks.
Filtration of mineral and vegetable oils.
Mulch for fertilizer.
Carrier for insecticides.
Chicken litter.
Admixture in the manufacture of plaster.

CHEMICAL ANALYSIS OF DIATOMACEOUS EARTH

Owner: Arizona Diatom Corporation.

	1. %	2. %	3. %	4. %
Silica ($Si O_2$)	74.02	76.07	81.16	68.60
Calcium Oxide (Ca O)	7.17	3.27	3.64	8.50
Alumina ($Al_2 O_3$)	7.03	6.31	5.77	8.78
Iron Oxide ($Fe_2 O_3$)	1.99	1.48	1.19	2.93
Titanium Dioxide ($Ti O_3$)	0.20	0.26	0.20	Trace
Magnesia (Mg O)	1.32	0.98	1.10	1.67
Sulphuric Anhydride (SO_3)	0.11	0.02	0.03	0.79
Chloride (Cl)	0.20	Trace	0.32	Trace
Sodium Oxide ($Na_2 O$)	0.46	0.94	0.21	1.19
Potassium Oxide ($K_2 O$)	0.21	0.68	0.06	

Weight per Cu.Ft. - 99% minus 200 - 15 pounds. (#1)
" " " " " " " - 13.44 pounds. (#3)

Specific Gravity - 2.13

Moisture content about 2%. (No drying necessary)

400 to 500 pounds per square inch compressive strength.

Using an aggregate of minus one inch in a concrete mix of 5 to 1 the resulting block tests about 500 p.s.i. This is done with the raw material. Calcined material would no doubt test much higher, probably about 700 p.s.i. (We are experimenting with this now and will have more detailed information in about 10 days.)

The material occurs naturally with a moisture content of 2% to 4%.

The principal impurities are: volcanic ash, clay, and sand.

The chemical analyses of the four samples show the great difference of this material, one place with another.

7-26-52

Fred H. Loveday.

Telephone 6054

ARIZITE PRODUCTS CORPORATION

Valley National Building
TUCSON - ARIZONA

Producers and Refiners of Diatomaceous Products

CHEMICAL ANALYSIS OF A X 10 - ARIZITE.

Loss on Ignition	7.66%
Silica (SiO_2)	74.02
Lime .. (CaO)	7.17
Alumina (Al_2O_3)	7.03
Titanium Dioxide (TiO_2)	0.20
Iron Oxide (Fe_2O_3)	1.99
Magnesia (MgO)	1.32
Sulphuric Anhydride (SO_3)	0.11
Chlorides (Cl)	.20
Sodium Oxide (Na_2O)	.46
Potassium Oxide (K_2O)	.21

Pyrometric Cone Equivalent	15
Weight lbs. per cubic foot	15.00

Telephone 6054

ARIZITE PRODUCTS CORPORATION

Valley National Building
TUCSON - ARIZONA

Producers and Refiners of Diatomaceous Products

ANALYSIS OF ARIZITE - CRUDE MATERIAL.

Silica (SiO_2)	76.07%
Alumina (Al_2O_3)	6.31
Iron (Fe_2O_3)	1.48
Titania (TiO_2)	0.26
Calcium Oxide (CaO)	3.27
Magnesia (MgO)	0.98
Sodium Oxide (Na_2O)	0.94
Potassium Oxide (K_2O)	0.68
Loss on Ignition	9.68
Sulphur Trioxide	0.02
Chlorides	Trace

Pyrometric Cone Equivalent	Cone 23
Specific Gravity	2.13

ARIZITE PRODUCTS CORPORATION,
TUCSON, ARIZONA.

CHEMICAL ANALYSIS OF X 20 ARIZITE.

Loss on Ignition	6.09%
Silica (SiO_2)	81.16
Lime (CaO)	3.64
Alumina (Al_2O_3)	5.77
Titenium Dioxide (TiO_2)	0.20
Iron Oxide (Fe_2O_3)	1.19
Magnesia (MgO)	1.10
Sulphuric Anhydride (SO_3)	0.03
Chlorides (Cl)	.32
Sodium Oxide (Na_2O)	.21
Potassium Oxide (K_2O)	.05

Pyrometric Cone Equivalent ---------- 18

Weight lbs. per cubic foot ---------- 13.44

Moisture Content ---------- 3 - 5%

99% - 200 Mesh Minus

Color - White

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine ARIZITE (Diatomaceous Earth Deposit) Date March 10, 1941.

District Old Hat, Pinal County, Arizona. Engineer Miles M. Carpenter, E. M.

Subject: Arizite Products Corporation Property.

This is a special report made under instructions of the Director for the information and use of the Arizona Corporation Commission. One day was spent on the examination, March 6. In addition to inspecting the ground in the vicinity of the present working, a traverse was made of the large canyon to the east for a distance of about a mile and a quarter, then crossing to the next canyon north and following it westward to the highway, then south to the mine road and east to the working. Not nearly all of the property controlled by this company was covered, but with previous knowledge of this deposit the conclusions herein expressed are believed to be well founded.

LOCATION: The property is located on the east side of the San Pedro River, about ten miles south from the town of Mammoth. With reference to the public land survey it lies in Township 9 S, Ranges 17 and 18 east. The common corner NE of Sec 25, R 17 E and NW of Sec 30, R 18 E provides a starting point for tracing the boundaries. From this point the ground controlled by this company extends two miles north, one mile south, one mile west, and one and one-half miles east, less the south half of Sec 30.

AREA AND TITLES: According to the company map this comprises an area of about 3760 acres. It is held by placer location of public domain and patented land. Four 160 acre claims are owned by the Arizite Products Corporation, the balance by Andres M. Herreras of Tucson, from whom the corporation has a long term lease and operating contract. Titles or contract were not checked.

TOPOGRAPHY: Topographically, this diatomaceous earth deposit is part of the foothill slope rising from the east bank of the San Padro river and continuing to the Sombrero B Butte area of the Galiura mountains. It is cut by west running canyons having moderately steep banks and narrow widths.

GEOLOGY: No thorough and detailed geologic study of this deposit has been reported, so far as known, but a preliminary examination by Carl Trischka, chief geologist of the Phelps Dodge Corporation was reported in the technical press and is summarized in a recent circular on DIATOMACEOUS EARTH, compiled by Eldred Wilson, geologist of the Arizona Bureau of Mines. Reference is made to these sources for technical descriptions of the material and the occurrance. My own brief study checks the conclusion that this deposit was accumulated in a lake or playa over a long period of time during which quantities of volcanic ash settled in layers over the accumulating deposit and small amounts of medium acidic lava found its way into the deposit and became volcanic glass, sometimes in sheets and sometimes in nodules resembling chert. Also, sedimentation occurred showing in some places as beds of clay but more gererally as sand or silt like material intimately associated with diatomite, forming the material referred to as "second class" by the operators.

In most of the deposit examined the structure is stratified, more or less regularly horizontal, but some exposures suggest erosion of the beds as originally laid down by cross canyons and later filling with different material. Beds of the purer diatomite appear to have a thickness of four to ten feet for the most part, but were noted only a few inches thick and again 20 feet or more. It is difficult to judge the character of material in the weatherd faces.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine ARIZITE Page 2 Date March 10, 1941.

District Engineer M. M. C.

Subject:

TONNAGE: Trischka states: "The thickness of the deposit ranges from 40 to 70 ft", and speaking of the entire deposit says: "It covers 10 to 20 square miles .." The area of the holdings under consideration is some six square miles and it is presumed that practically all of the ground taken up showed evidence of being underlaid with diatomaceous . It is impossible to estimate the depth, for the depth below the present day surface is not known. Figured from existing exposures, depths vary from 20 ft to 150 ft or more. A mile or so east from the loading bin the depth exposed in the canyon channel and on the adjacent benches is believed to approach 200 ft. (See photos Nos 6 and 7) It is quite possible that a detailed measurement of the exposures would show an average thickness of close to 100 feet. The management estimates an average of 2 yards (54 cu ft) to the ton. This appears to be in line, and assuming an average depth of 54 ft gives one ton of material for each square foot of surface. The area of 3760 acres would contain 163,785,600 tons. This figure is not presented as an estimate since no data are available on which to base an estimate, but rather as a conservative suggestion of its immensity. Drilling to determine the depth and prove the horizontal continuity might increase this figure several times.

VALUE: The value of this deposit depends on so many factors of development, processing, marketing and handling that a concrete valuation from this point does not appear justified. It is manifest that the deposit is the foundation of whatever enterprise may be builded upon it and as such has an essential value. A fair and reasonable method of arriving at a value is to start with the selling price of the products and work backwards. From the selling price deduct the costs of processing, transporting and selling the finished products; developing, mining and hauling the crude material; royalties and all overhead and other expense. The balance remaining would be available for amortization of investment, profits and property value. The amortization is fixed, the profits can be regulated and from the remainder considered as income from the property the valuation can be fixed.

A development arises in this connection that has no precedent in the experience of the reporting engineer. At the present rate of production, assumed to be 10,000 tons per year on a plant capacity of 30 tons per day, and reducing the tonnage to 100,000,000 , it would require 10,000 years to work out the deposit. If the plant were increased 100 times it would still require 100 years to work that tonnage, and no formula has been found to compute the present value of production 100 years hence.

If it is essential to assign a value to the property, it appears reasonable to allow about 25 times the annual profits and surplus.

PRESENT OPERATIONS: Present operations are on a restricted scale due, presumably, to lack of market. Neither the mill nor the mine was working at the time of this inspection.

Mining is currently being done thru a tunnel driven 30 ft or so into the face shown in Photo Nos 2 and 3. A flat stope is started and the two grades of material, first and second are mined separately. Photo No 4 shows the center section of this stope. A track leads to the 30 ton loading bin in front of the tunnel.

The working is equipped with gasoline engine driven air compressor and chipping hammers.

REGISTERED MINING ENGINEER
CERTIFICATE EXPIRES
MILES M. CARPENTER
DEC. 31, 19—
ARIZONA U. S. A.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine ARIZITE · Page 3 Date March 10, 1941.

District Engineer M. M. C.

Subject:

Crude material is drawn from the bin thru double chutes into dump trucks, hauled about 12 miles and dumped into the receiving bin at the mill. When water is not running in the San Padro river crossing is made south of Mammoth and then the distance is about 11 miles. Management states that the hauling cost is slightly under $1.00 per ton.

Milling. Crude material is taken from the 30 ton receiving bin and put thru the primary crusher, a No 2 Little Giant hammermill type, then lifted by vertical, enclosed elevator with about 40 ft centers and discharged into the steel coarse ore bin. Fed thru Willran pulverizer and drawn into super separator with heat conduit to raise temperature to 200 deg F and drawn up thru Cyclone classifier. Here 300 mesh material is drawn into bag house and the coarser product goes to a 10 ft mechanical separator where the diatomite goes to a St Regis packer and the ash to waste.

Mill operator states that the first grade material loses 5% upward in ash, and in the second grade the ash loss might reach 15%

Power originates at the Coolidge Dam plant and is brought in at 2300 volts and transformed to 440 volts. All units of the plant are motor driven using about 140 motor horse power in eight motors ranging in size from 1/2 HP to 50HP.

Fuel for drying is Butane gas stored in a large tank in the yard.

Mill Building is of structural steel frame covered with galvanized iron. Floors are of cement, well finished. Width of building is 30 ft and length 60 ft, the west half has walls about 45 ft high and the east half about 25 ft. Photos No 8 and 9 show two views of the mill.

PRACTICAL CONSIDERATIONS: This property is not only of immense size but can be mined economically by modern rock moving equipment. It is not sufficiently uniform to be mined as a whole for treatment in the present plant, but it occurs so that the waste can be removed and the desired material recovered progressively. There are scores of beds that appear suitable for opening, some in which the first grade of diatomite is abundant and others where volcanic ash and impure diatomite predominate.

Material could be handled in sizeable blocks by first removing the overburden, which is light in some places and considerable in others, then the successive layers. Work couldbe arranged so the different types of material would be exposed at the same time. Drag line, Bulldozer or shovel and trucks could doubtless be adapted to this job and a little experimenting would show what combination was most satisfactory. Costs would depend largely upon the scale of operation but even on the present small capacity of 30 tons per day it is believed that, with suitable equipment, a cost of $1.00 per ton of clean material is feasible.

As before indicated, there is no question of quantity or availability in this deposit. It is ample for any size plant now on the horizon. The problem is one of processing and marketing the material and on this phase of the undertaking your reporting engineer does not feel qualified by knowledge or experience to advise.

REGISTERED MINING ENGINEER CERTIFICATE EXPIRES MILES M. CARPENTER DEC. 31, 19... ARIZONA U.S.A.

Miles M. Carpenter, E.M.

Miles M. Carpenter, E. M.
Field Engineer, Southern District.

COPY

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

Field Engineers Report

Mine ARIZITE Page 4 Date March 10, 1941.

District Engineer M. M. C.

Subject:

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(Registered Mining Engineer Seal)
(Certificate Expires Dec.31,19__)
MILES M. CARPENTER
ARIZONA U. S. A.

MILES M. CARPENTER, E. M.
Miles M. Carpenter, E. M.
Field Engineer, Southern District.

USES OF DIATOMACEOUS EARTH.

Insulation- high and low temperature.
Food filtration.
Absorbent and Inert Fillers for:
- Battery Boxes
- Match Heads
- Paints, varnishes and lacquers.
- Polishing Materials
- Concrete
- Explosives
- Perfume
- Sugar
- Moulded Plastics
- Flooring and roofing materials
- asphalt pavings,
- Bituminous enamels
- Rubber
- Paper.

Absorbing agent for liquids and pastes- also hard, dry soils.
(D.E. absorbs 4-5 times its own weight of liquid)
Carboy Packings.
Soaps
Cosmetics,
Waxes,
Printing Inks.
Filtration of mineral and vegetable oils.
Mulch for fertilizer.
Carrier for insecticides.
Chicken litter.
Admixture in the manufacture of plaster.

January 5, 1929

DIATOMITE IN ARIZONA

By Carl Trischka
Chief Geologist, P. D. C.
Copper Queen Branch, Bisbee, Arizona

Miscroscopically there is no difference between the diatomite of Arizona and that of any other place, as it consists of siliceous tests of diatoms, radiolaria, and other aquatic organisms, beautiful in shape and great in variety. Those specimens examined are mostly of the fresh-water type, but some, because of their location between sandstones and limestones, may be of marine orgin. More work, however, will have to be done on this phase of the subject before conclusions can be reached. Chemically also, the Arizona diatomite is similar to that of the best found elsewhere. It contains, SiO_2, 85.75 per cent; Al_2O_3, 3.50; Fe_2O_3, 1.50; CaO, 2.0 and H_2O, 5.0. Physically it is a white to cream-colored, dull in luster, light in weight, and finely granular porous aggregate. It will absorb 1.5 to s times its weight in water and weighs when dry 18 to 20 lbs per cublic foot.

Leddo, in "Non-Metallic Minerals," gives an excellent description of diatomite. In Arizona it is found inbedded deposits in the Pleistocene or Piliocene (late Tertiary) along the banks of the San Pedro and Gila River system. The accompanying map gives the four localities, which will be described. Other deposits probably exist, but no information regarding them has been obtainable. The conditions set forth in the foregoing description, and the fact that fossils of mammoth and other prehistoric animals have been found along the banks of these rivers, warrant the conclusion that marshes, lakes and possibly inland seas once existed in this now almost arid part of Arizona. Curtis Flat is a notable locality for fossils of the Pleistocene.

The following description suggest that Arizona has valuable deposits of diatomite although probably only one is economically accessible at present, and that all of them are in a common river system.

1. Mammoth, Pinal County--This deposit is 8 miles southeast of Mammoth and 20 miles from the nearest railroad at Winkelman, Gila County, The thickness of the deposit ranges from 40 to 70 ft. and it has alternate 20 to 40 ft. layers of good grade diatomite and worthless sandy material. Thin, green, cherty bands are often found. It covers 10 to 20 squares miles and is undoubtedly a good deposit. Unfortunately it is too far from the railroad. Thin chert-like layers are intercalated. The capping and intermediate layer are composed of sandstones.

At Clark School, on the edge of the property, an artesian well was drilled to depth of 700 to 800 ft. In it diatomite was encountered off and on, but no log is available. In this deposit, of which a section is shown there are also found two layers of volcanic ash 8 and 14 in. thick, respectively, indicating that volcanic activity occurred during deposition. The ash probably furnished some of the silica for the organisms. It is an excellent polishing material as it is composed of small broken bubbles of volcanic glass. Three large washes cut this deposit and have in a manner prepared it for mining. The faces that resulted from erosion are steep and extend in most places to the bottom of the deposit.

DEPARTMENT OF MINERAL RESOURCES

News Items

Date

Mine: Another unit of 10 Tons an

Location: hour this Summer – This

Owner: one – 1½ tons an hour –

Address: On this plant –

20 men –

Operating Co.: When new unit in

Address: full plant 200 men not

including sales force –

Pres.: Insulation main use &

Genl. Mgr.: admixture for cement –

Mine Supt.: & increase Concrete strength –

Mill Supt.: wall plaster & wall board –

Principal Metals: Capital Expenditure

Men Employed: within year about $200,000

Production Rate: Power from Indian Service

Mill, Type & Capacity: Coolidge Dam –

Automatic Sacking machine

Power, Amt. & Type: (paper) – 2 sacks a min

50# to a sack –

Signed

(Over)

DEPARTMENT OF MINERAL RESOURCES.

News Items

Date: November 14, 1939.

Mine: Arizite Products

Location: 9⅛ miles south of Mammoth

Owner: Herrera (initials unknown)

Address: Mammoth

Under lease to

Operating Co.: Arizite Products

Address: Mammoth, Arizona.

Pres.: Fred Fisher, Indiana.

Genl. Mgr.: Marian Staley

Mine Supt.

Mill Supt.

Principal Metals: Diatomaceous earth

Men Employed

Production Rate: Expect 30 tons da. initially.

Mill, Type & Capacity

See other side

Power, Amt. & Type

Signed: [illegible signature]

(Over)

DEPARTMENT OF MINERAL RESOURCES

News Items

Date: 5/15

Mine: Arizite Product Corp –

Location: Fred Fisher – Pres.

Owner: Marion G Staley – V.P. & G.M.

Florence J. Moore Sec. & Treas.

Address: 307 Valley Bank Bldg

Tucson – [illegible]

Operating Co.

Address: Mine – 9 – 5? Mammoth [illegible]

Side of San Pedro River

Pres.: Mill is 1 mile N. of Mammoth [illegible]

on W side of Mammoth [illegible]

Genl. Mgr.

Mine Supt.: Now 5 men at mine

Mill Supt.: Deposit – 3000 acres deposit

Principal Metals: 1 30 to 300# [illegible]

Men Employed: Salt water diatoms –

Production Rate: Particularly free from [illegible] – but has

Mill, Type & Capacity: admixture of [illegible] ash & [illegible]

Power, Amt. & Type: [illegible]

to take in [illegible] of Plaster [illegible]

[illegible] –

Signed

(Over)

Present Operations

~~Dehydrated with [illegible]~~

Clean and volcanic ash in air flotation. Will find use of this as by-product.

Price on finished product from $45 to $120 per ton.

Formerly excess [illegible]

Misc. Notes July 11, 1938 Staley started investigation —

Plant consists of cyclone separators — hammer mills crushing —

Send Butler note to Staley — by [illegible] available for [illegible] Indianapolis

Send sample [illegible] Staley

Present Operations

Started construction yesterday on the refining plant which is to be located at Mammoth.

Mine Amrite Products

Location 4 miles south of Mammoth

Owner Herrera [illegible]

New Work Planned Will produce diatomaceous earth of unusually pure quality.

Under lease to

Operating Co. Amrite Products

Address Mammoth, Arizona.

Misc. Notes These people spent eight months in working out a process of refinement for the material. The process will consist of grinding to break the coarse lumps, heating to expand the material, and treatment by air blast to remove impurities. It is reported that several large eastern manufacturers are ready to accept the finished product.

See other side

Signed [illegible]

(Over)

Present Operations Mining [illegible]

Chipping Sullivan Hammers with chisels & spades — no water no powder — Hauling is by contract in 10 ton trucks —

New Work Planned Mill Bldg. 30 x 66' Corrugated iron frame —

Coarse Bin — 45 ton

Air flotation — mill — separating 3000# hour — products 3

Misc. Notes 1 - filtration material — 200 (sugar — vegetable oils — margarine & wine —) 1½% impurities 9%

1 filtration — 1000 for [illegible] chemicals & cosmetic trade 1%

1 - insulation material 300 — 3½% impurities 90%

In place 45# cu ft.

Finished products 11 - 13½ # 16# cu ft.

Ship to Chicago area

Entire output sold - 5 years with renewal privilege —

(Over)

DEVELOPMENT ANALYSIS

OF THE

MAMMOTH DIATOMITE DEPOSIT

American Diatomes, Inc.
Phoenix, Arizona

TABLE OF CONTENTS

I. CONCLUSIONS & RECOMMENDATIONS

1. Natural and calcined filler products and aggregate materials appear economically feasible from Mammoth crude.

2. Estimated potential for these products from the Mammoth diatomite deposit are sufficiently great to justify additional development efforts.

3. A program to determine crude yields must be established following a decision to construct a new plant.

4. A program to determine calcined yields, product characteristics and costs is next in line of research need.

PRESENT OPERATIONS

1. Potential for products of the present pilot operations offer sufficient promise to justify continued efforts to achieve a self-sustaining position.

2. Concrete application (concrete, mortar and stucco), insecticides, copper smelting, foundry moldwashes and non-critical filler applications should produce $100,000 - $125,000 in annual sales volume within 24 months.

3. Marketing efforts must be undertaken to expand distribution into New Mexico and Texas. Emphasis will be on filler applications.

4. Plans for added capacity on present products will be put into effect as volume develops in existing markets.

II SUMMARY

1. Potential

a. Total markets for diatomite products in 1961 are estimated at slightly over 540,000 tons, valued at $29-1/2 million.
(A. R. Bollaert letter dated August 9, 1962.)

b. The total 1961 dollar volume breakdown by product type is estimated as follows:
Flux-calcined (60%), Calcined (18%), Natural (untreated) (22%)

c. Markets for natural and calcined products show the stronger growth trend from 1949 to 1961.

2. Markets and Products

a. Filtration applications for diatomite accounted for 60% of 1961 dollar volume. Flux-calcined products dominated these markets.

b. Industrial insulation, ammonium nitrate fertilizer (granular), abrasives, paper and insecticide applications consumed an estimated $6 million. (20% of estimated 1961 potential. Natural products were used in all of these applications.)

c. Miscellaneous uses such as paint, concrete and oil absorbents made up the balance of 1961 estimated volume. Calcined products were used for the largest share of these applications.

3. Mammoth Diatomite Products

a. Based on the 1961 diatomite markets, the potential for diatomite products processed from Mammoth crudes is estimated at 260,000 tons, valued at $11.5 million.

b. Mammoth crude is best suited to natural and calcined products. Flux-calcined possibilities appear to be borderline.

c. Total crude reserves have been estimated in excess of 150 million tons. Three crudes, suitable to the processing of marketable products, have been located and defined at 3-1/4 million tons. (A. R. Bollaert report July 25, 1962)

d. Application evaluations by present users of diatomite products reveal favorable performance in fertilizers, concrete products and insecticides.

4. Investment and Profit Considerations

a. A processing plant with 25, 000-ton capacity will require an estimated $450, 000 including site and site preparation. (A. R. Bollaert report July 25, 1962)

b. An estimated sales volume of about $1, 000, 000 should result from capacity operations. (A. R. Bollaert report July 25, 1962)

c. A maximum working capital requirement of $200, 000 is estimated to support initial operations after plant goes on stream (A. R. Bollaert report, July 25, 1962)

d. Estimated profits after loss write-off, depletion and federal income taxes are estimated at $300, 000 at capacity.

e. Based on conservative estimates of sales and profit projections, the above investment requirements should be returned in 4 years.

5. Present Operations

a. Present production facilities are on a pilot scale.

b. Present products include a natural refined diatomite filler (Ari-Lite 98); a ground crude filler material (Ari-Lite 75); and Adite Blok-Fill (a powdered product for use as a concrete block base paint coat). Production of Ari-Lite 98 and Blok-Fill is limited.

c. During 1962, these products found successful application

in concrete products of all types, ammonium nitrate production, insecticides, foundry sand molds, foundry moldwashes and oil well cementing.

d. While a potential for present products is impossible to estimate accurately, sales estimates of $50,000 in 1963 and $150,000 in 1964 certainly appear conservative if applications in concrete can be developed. (Potential in Arizona concrete alone is estimated at 35,000 tons, valued at $720,000).

e. Breakeven on present plant should be reached at the 3000-ton level.

f. Annual capacity of present equipment on a single-shift basis is as follows:

Ari-Lite 75	8,000 tons
Ari-Lite 98	875 tons
Ari-Lite 100	variable, depending on crude
Adite Blok-Fill	1,250 tons

If capacity operations can be achieved, a conservative estimate of total sales is $200,000 on a single-shift basis.

g. Expansion of Ari-Lite 98 production to 3,000 tons (on a single-shift basis) can be accomplished with an expenditure of $25,000 for equipment, engineering and installation.

III. PURPOSE - SCOPE - OBJECTIVES - BACKGROUND

A. OBJECTIVES

To define the markets for diatomite with particular emphasis on the mineral filler uses and to project the development of the Mammoth deposit into these markets.

B. PURPOSE

To provide a basis for profit and investment analysis of the development of the Mammoth Diatomite Deposit.

C. SCOPE

The analysis covers the present markets for diatomite and brief comments about new markets.

The information contained in the analysis has been based on investigations of both the deposit and the existing markets for diatomite. The analysis is as complete and as accurate as is possible at the present time. It is recognized that additional technical analysis is essential before full-scale development can be accomplished. But these steps need not be taken until firm decisions have been made to move ahead with full-scale development and plant construction.

It is felt that there is sufficient information available on which to project a full-scale diatomite operation.

D. BACKGROUND INFORMATION

This report is an up-to-date analysis and presentation of the development possibilities for the diatomite deposit near Mammoth, Arizona, presently under operations by American Diatomes, Inc., Phoenix, Arizona. The report is designed to answer several important questions about the profit opportunities that exist for full-scale operations on the Mammoth properties.

The data, analysis and opinion contained in the report

are the results of approximately 10 years of efforts to put the deposit on a commercial basis and to successfully mine and refine diatomite products for marketing. It covers the experiences of Arizona Diatom Corp., who actively investigated the markets and the deposit from 1952 until 1956 and the efforts of American Diatomes, Inc. since 1959. Of particular importance in the evaluation of the results is the experience of Mr. Armand R. Bollaert, consultant to Spencer Chemical Co., Arizona Diatom and American Diatomes, Inc. Mr. Bollaert's diatomite experience covers 11 years with Great Lakes Carbon Corporation (Dicalite Division), during which time he served as Technical Director and as General Manager. Mr. Bollaert first examined the Mammoth Deposit in 1950-51 and has been connected with it during the past 12 years. His advice, knowledge and reports have served as the basis for this report. His reports are available for further study and he can be reached for personal comment at the present time.

The history of diatomite and its industrial application is a long and successful one. The product is a non-metallic mineral used in agriculture and industry for a wide variety of applications and in an almost endless list of everyday products. Simply stated, diatomite is the fossil remains of the microscopic water plant, algae. The mineral is universally found (Richmond, Virginia, is built on a bed of diatom shells 33 feet thick) and is useful because of a high silica content, unique structure and unusual physical characteristics.

A very concise statement from the book, "Industrial Minerals and Rocks", published by the American Institute of Mining, Metallurgical and Petroleum Engineers (Sponsored by the Seely W. Mudd Memorial Fund) serves as a backdrop for this entire analysis. In the chapter dealing with diatomite, Mr. A. B. Cummins, of Johns-Manville Research Center, writes, "In considering diatomite for commercial use, it must be recognized that it is found in nature due to origin, diagenetic history, and content of associated impurities. Thus, many crude earths may be practically worthless for some of the major uses. Many grades must be highly beneficiated to be made suitable for particular

purposes. Thus, it is senseless to consider diatomite as a uni-variant material and it becomes essential to fit the usage of the particular type of diatomite or product made therefrom to the end use for which it is most suited, technically and economically."

From this statement, it is easy to see that the deposit and the crude material are of the utmost importance in evaluating a commerical operation. The present markets for diatomite will absorb those materials with suitable characteristics and properties only to the extend and to those uses that the crude materials will yield marketable products. Since the crude was "manufactured" and deposited 20 million years ago, nothing can be done to change its basic nature.

There are three basic types of diatomite products - natural (ground and refined), calcined (ground, refined and heat-treated), and flux-calcined (ground, refined and heat-treated with a fluxing agent.) This analysis will be devoted to defining the markets for these products, comparing Mammoth potential to these markets and developing the profit considerations in a commercial operation.

The following summary concerning the Mammoth Deposit was published by the Arizona Development Commission. It explains the deposit location and a part of the history of the deposit. The report was prepared in 1955 by Messrs. John T. Long and George G. Olson of Arizona Research Consultants for the State of Arizona.

"The best known Arizona diatomite deposit lies on the east bank of the San Pedro River directly opposite the new mining community of San Manuel in Pinal County. It is commonly known either as the Mammoth deposit or the White Cliffs Mine and can be reached from the town of Mammoth by crossing the river and following the east bank of the San Pedro River south for a distance of eight miles on a graded county road. It can also be reached by driving east from San Manuel on a graded county road for a distance of 5 miles and crossing the river to the deposit. Rail service connecting

with Southern Pacific is available at San Manuel. The El Paso Natural Gas Co. pipe line extends to the San Pedro River directly across from the deposit and electric power is available from the Arizona Public Service Company's lines which cross the deposit. The deposit covers about 6 sections located in T 17E, R 9S with respect to the Gila and Salt River Base Line and Meridian. The deposit lies nearly level with the beds dipping slightly to the east. Some faulting has occurred and in places the continuity of the bedding has been disturbed. A number of canyons transect the deposit from east to west and in places expose more than 100 feet of diatomite. Drainage is from east to west into the San Pedro River. The river is dry except during the rainy season in July and August. Surface run-off from the Galiuro Mountains to the east is diverted around the deposit by the Big Gust James Wash and flood waters are not a problem during the rainy season. Typical Sonoran desert conditions are found at the deposit. The sparse vegetation consists mainly of mesquite, catclaw and greasewood. In spite of the dry surface conditions abundant water is available from underground sources. An artesian well has been drilled on the western edge of the deposit and is used to irrigate farm land along the river bottom. Two well defined clay strata about four feet in thickness are found near the top and near the bottom of the deposit. Some diatomite occurs above and below them and approximately 100 feet of excellent white material lies between them. Over many acres of the deposit the upper clay band has been eroded away to expose the diatomite. In places where the diatomite is exposed it is possible to mine the material by ripping it loose with a bulldozer. Most of the diatoms present are Navicula (canoe shaped) with 20% - 30% Syndra. Also present are sponge spicules and volcanic glass".

IV. POTENTIAL AND MARKETS

To determine the approximate size of the diatomite markets, an examination of all existing data on sales and production was made. This information was then brought up to date through Mr. A. R. Bollaert's trade contacts and intimate knowledge of present activities.

These figures provide the basis for estimating total potential and the amount of potential that presently exists for diatomite products processed from Mammoth crude.

A. U.S. PRODUCTION SHOWS AN AVERAGE ANNUAL GROWTH RATE OF 6.5%.

World production of diatomite has moved from roughly 600,000 tons in 1949 to over 825,000 tons in 1958, according to the U.S. Department of the Interior. (See Chart I)

United States production of all diatomite grades show an annual growth of 6.5% over the same period with 1958 production at 440,000 tons. West Germany and France, the other large producing countries, show annual growth rates of 17% and 9.5% respectively. The United States, West Germany and France accounted for 81% of total diatomite production in 1958. (See Chart II)

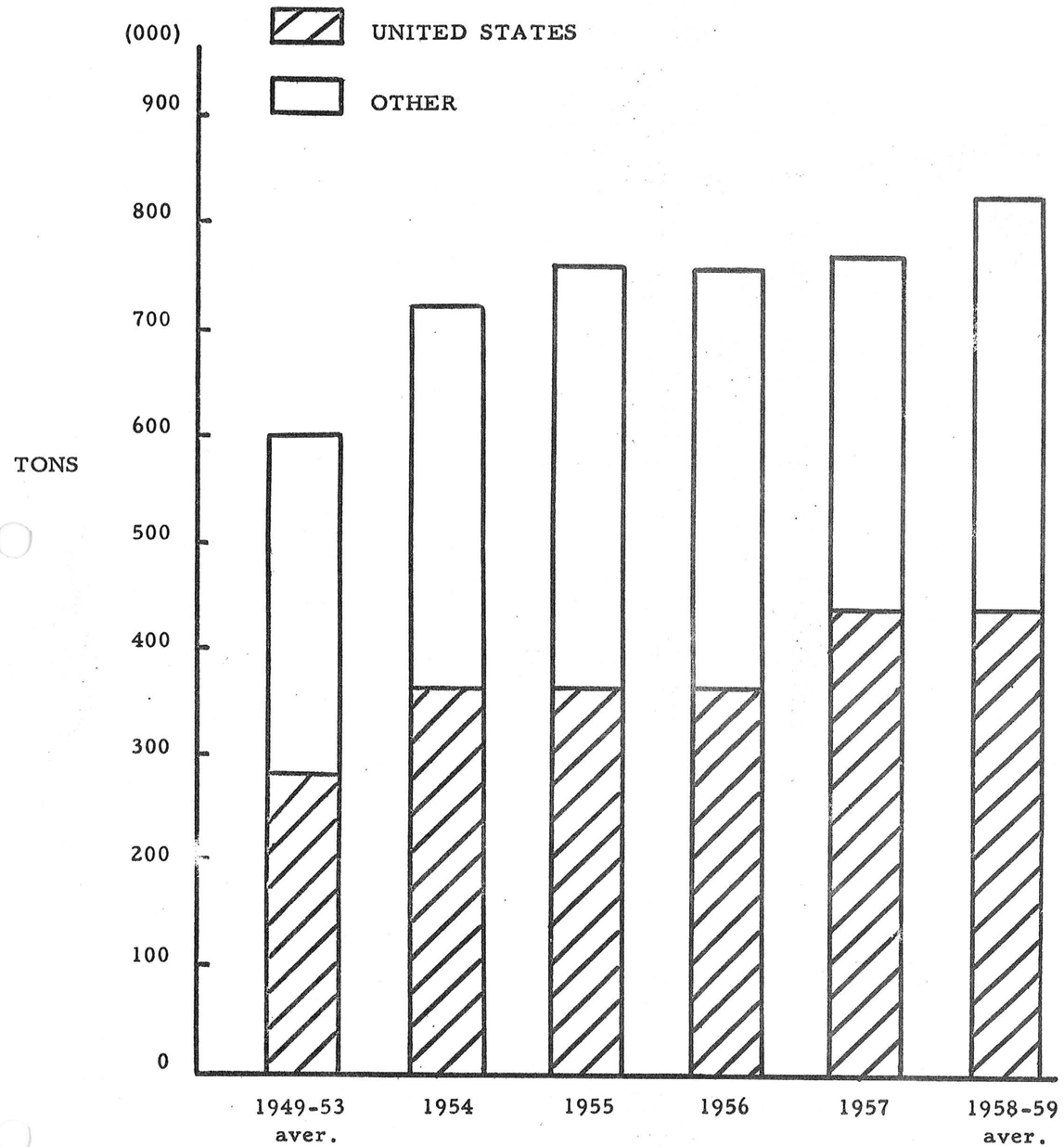
B. U.S. MARKETS IN 1961 ESTIMATED IN EXCESS OF $29 MILLION.

While no published information exists on present production levels, Mr. A. R. Bollaert, through intimate knowledge of the trade and numerous producers contacts, estimates 1961 production at a level in excess of $29,000,000 at current market prices. This figure represents 542,000 tons. The estimate is most reasonable since the 6.5% annual growth from 1949 through 1958 if projected through 1961, would bring total U.S. production to 530,000 tons.

C. NATURAL AND CALCINED PRODUCTS TOTAL 40% OF 1961 DOLLAR VOLUME.

CHART I

WORLD DIATOMITE PRODUCTION
(tons)

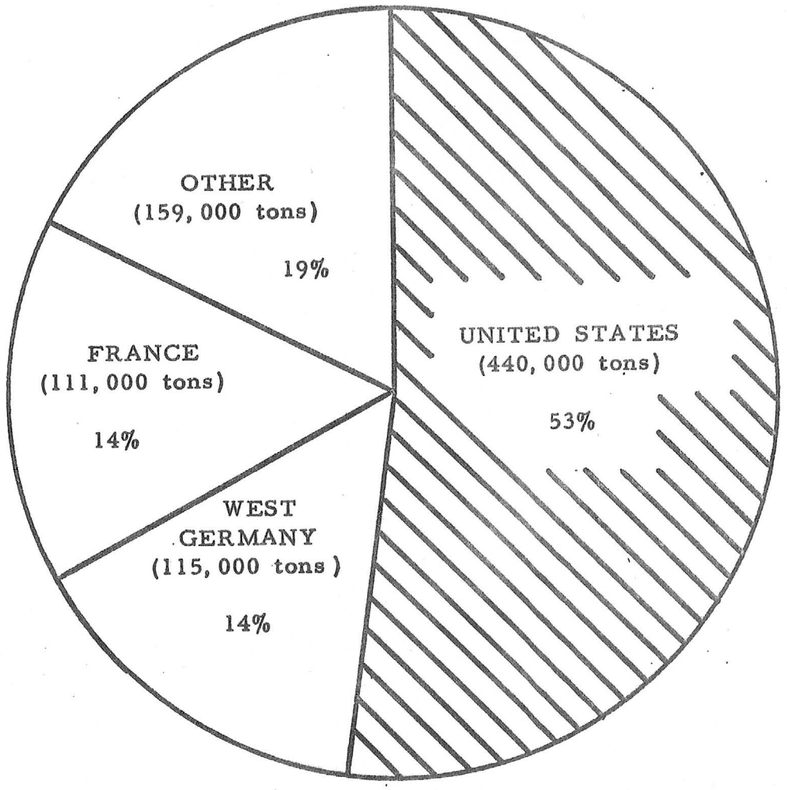


Source: Table A - Appendix

CHART II

WORLD PRODUCTION - 1958

By Country



Source: Table A - Appendix

Flux-calcined sales estimated at almost $18 million.
Of the total 1961 market, flux-calcined products are estimated at 254,000 tons, representing 47% of the total. Valued at an average of $70.00 per ton, total sales equal $17,780,000.

Natural product sales were second in size at $6-1/2 million.
Refined natural grade sales amounted to 181,600 tons (33% of total). Selling at $36.00 and $40.00 average, dollar volume is estimated at $6,547,000.

Calcined product sales estimated over $5 million.
Calcined grades were lowest of the three basic product types at 106,400 tons (20% of total). At an average selling price of $50.00 per ton, dollar volume approximated $5,320,000.

Chart III on the next page shows these product type breakdowns graphically.

D. FILTER-AIDS ACCOUNT FOR THE LARGEST SHARE OF PRESENT DIATOMITE VOLUME.

There are two major uses of diatomite products - filter-aids and fillers. The type of product selected depends on the physical and chemical properties required in each specific application.

Estimated filter-aid use in 1961 was slightly over $18 million (62% of total market) with filler volume estimated at slightly under $8 million (26%). Miscellaneous uses accounted for the remaining $3-1/2 million (12%). (See Chart IV).

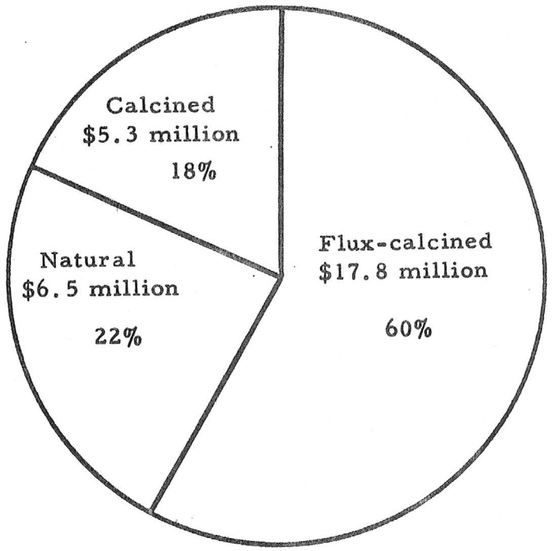
The flux-calcined diatomite products dominated the filter-aid use, accounting for 89% of dollar volume. Natural products took the largest share of the filler application (69%), while finding small use in the filter-aid and miscellaneous use. The "other" applications were almost entirely clacined products.
(See Chart V).

CHART III

U. S. DIATOMITE MARKETS - 1961

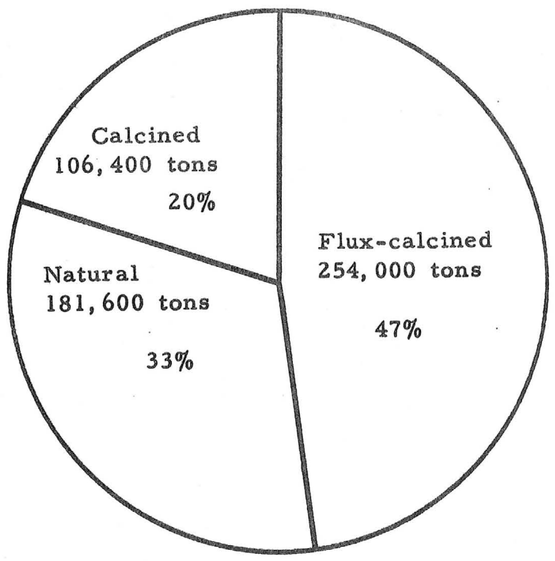
By Product Type

DOLLARS



$29.6 million

TONS



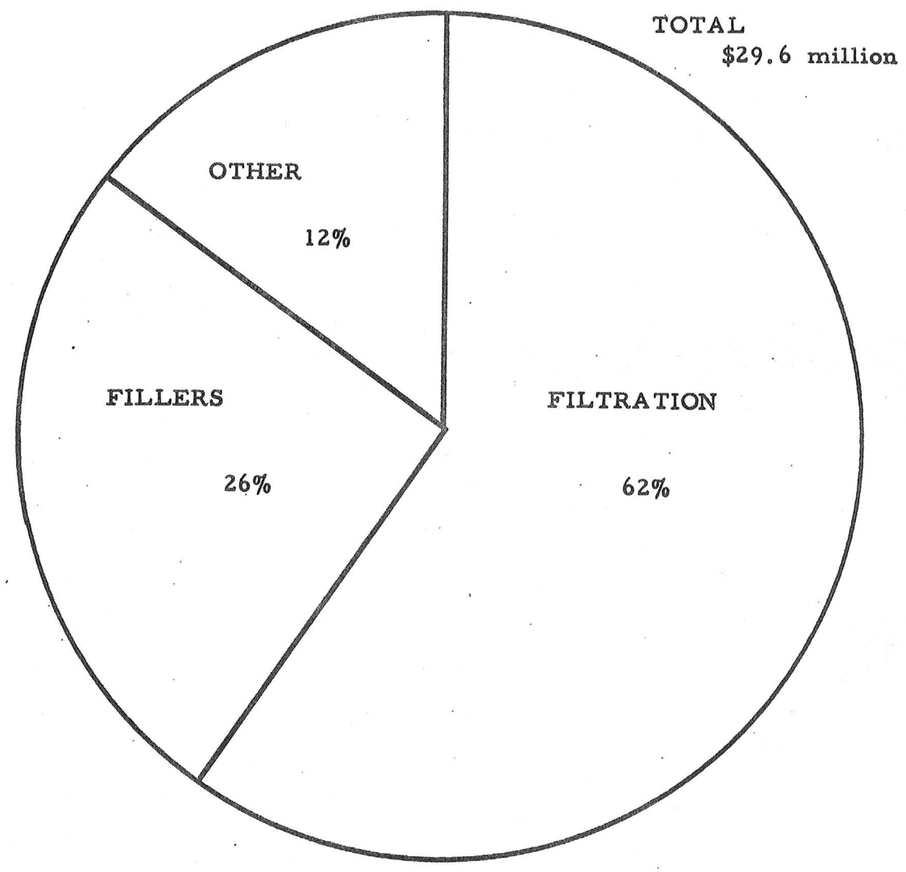
542,000 tons

Source: Table B - Appendix

CHART IV

U. S. DIATOMITE MARKETS

By Product Use

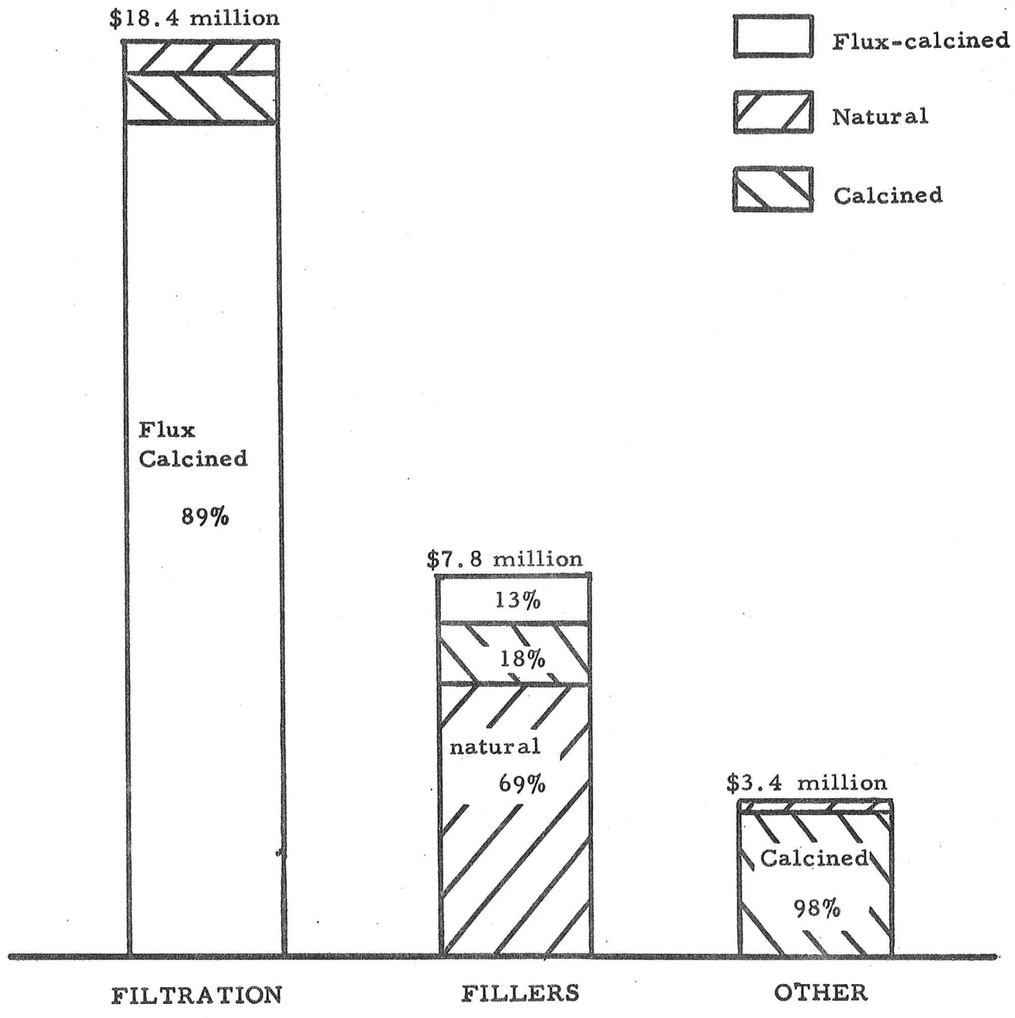


Source: Table C - Appendix

CHART V

U. S. DIATOMITE MARKETS - 1961

Dollar Volume Basis



Source: Table F - Appendix

E. USAGE OTHER THAN FILTRATION SHOWS FAVORABLE GROWTH TREND SINCE 1949.

Since 1949, the total usage of diatomite products has been growing at an annual rate of 6-1/2%. The mineral fillers and other applications have been moving ahead at a faster rate and taking an increasing share of the total volume. In 1949, according to the U.S. Department of the Interior estimates, filler and other tonnage accounted for about 40% of total. In 1961, it is estimated that these uses accounted for 48% of total tonnage.

This growth of fillers and other applications correlates with population and industrial growth. It is emphasized by the rapidly expanding industrial trends in the western states - the areas most accessible to the present producing areas (California and Nevada accounted for over 95% of 1961 diatomite production).

This favorable trend is expected to continue as population continues to grow in the west. The recent tax allowance for plant and equipment investment should stimulate industrial expansion in the fastest-growing western areas.

At the same time the filter-aid grades are encountering intense competition from perlite, carbon, asbestos, and cellulose, which are being successfully applied to the filter-aid field (Chemical Week, August 12, 1961). Combining this aspect with industrial expansion certainly indicates favorable trends for the fillers and other applications for diatomite products.

These two considerations give strength to the assumption that natural and calcined products will continue to show a favorable growth pattern.

F. FERTILIZER AND INSULATION MARKETS OFFER POTENTIAL IN EXCESS OF 100,000 TONS.

The mineral filler and other applications offer a potential of 260,000 tons, valued in excess of $11 million. For a number of excellent reasons this potential is particularly suited to Mammoth crude and will be analyzed

in considerable detail in the next section.

Based on Mr. Bollaert's opinion and estimates, the markets for calcined and natural products are broken down as follows.

TABLE I

MARKET	TONNAGE	DOLLAR TOTAL	%
TOTAL NATURAL PRODUCTS	260,000 tons	$11,449,000	100%
Fertilizers	65,000	2,340,000	20
Insulation	35,000	1,400,000	12
Paper	15,000	675,000	6
Abrasive	12,000	1,020,000	9
Insecticide	12,000	432,000	4
Concrete	9,000	324,000	3
Natural aggregate	6,000	180,000	2
Paint, rubber, plastic	6,000	510,000	4
Other	21,600	648,000	6
Total Natural	181,600	7,529,000	
CALCINED PRODUCTS	78,400	3,920,000	
Calcined Fillers	21,000	1,050,000	9
Calcined aggregate	57,400	2,870,000	25

Source: A. R. Bollaert letter 8 - 9 - 62

Due to the nature of the crude (fully examined in the following section), Mammoth potential is limited to the above markets.

V MARKETING CONSIDERATIONS

The marketing tasks involved in developing a new source of diatomite are pretty much defined by the job to be done and the nature of competition. Since the objectives of a commercial operation would be to obtain a share of the existing markets and to develop new markets, the present competitive situation must be examined.

But more importantly, the success of a new venture will be determined by the competitive advantage that can be gained, either in product quality or in production. For this reason, any analysis of the marketing considerations must develop the weaknesses of competition and the best ways to capitalize on them. At this writing, the only major weakness uncovered lay in the size of competitive companies and their relatively set method of operations.

A. COMPETITION

While intense, competition is of the highest type with three major firms and two relatively minor companies operating.

1. IN CALCINED AND NATURAL PRODUCTION, JOHNS-MANVILLE, GREAT LAKES CARBON CORPORATION AND EAGLE PICHER ACCOUNTED FOR 66% of 1961 TONNAGE.

Of the total estimated 1961 diatomite volume, the three major producers account for 89% as follows:

Johns-Manville	47%	(Celite)
Great Lakes Carbon	30%	(Dicalite)
Eagle Picher	12%	(Celatom)
Other	11%	

However, it is important to realize that there is considerable difference within each product classification. Flux-calcined products require a larger plant investment and more production control than natural products. The competition in the markets for the latter products is not as concentrated - the above three producers ac-

counted for just 66% of tonnage.

Since special attention need be given to calcined and natural diatomite products, a breakdown of these products will give a better picture of the competitive situation.

The percentage share in the Mammoth market potential (260,000 tons) shows Johns-Manville with 33%; Great Lakes Carbon Corporation, 27%; Eagle-Picher, 16%; Kenite, 7%; Agua-Fill, 5%; and others 9%. In Mineral Fillers, J-M has 29%; Great Lakes Carbon Corp, 30%; Eagle-Picher, 12%; and Kenite 8%. In natural filter-aids it is J-M, 50%; Great Lakes, 30%; and the balance split. In the miscellaneous (72,400 tons), J-M dominates with 41%; Great Lakes has 19%; and Eagle-Picher, 25%.
(See Chart VI)

Another particularly important point to keep in mind is the manner in which each competitive company operates in their approach to these markets. Both Johns-Manville and Eagle-Picher use large quantities of filler grades in their own production of calcium silicate insulations. In addition, J-M has other products such as asphalt tile, acoustical tile and asphalt roofing where diatomite conceivably might be utilized.

It is felt that the nature of the competition, while intense and excellent, is so concentrated that inroads can be made through a well-integrated marketing and technical approach.

2. COMPANY SALES FORCE IS USED BY MAJOR PRODUCERS.

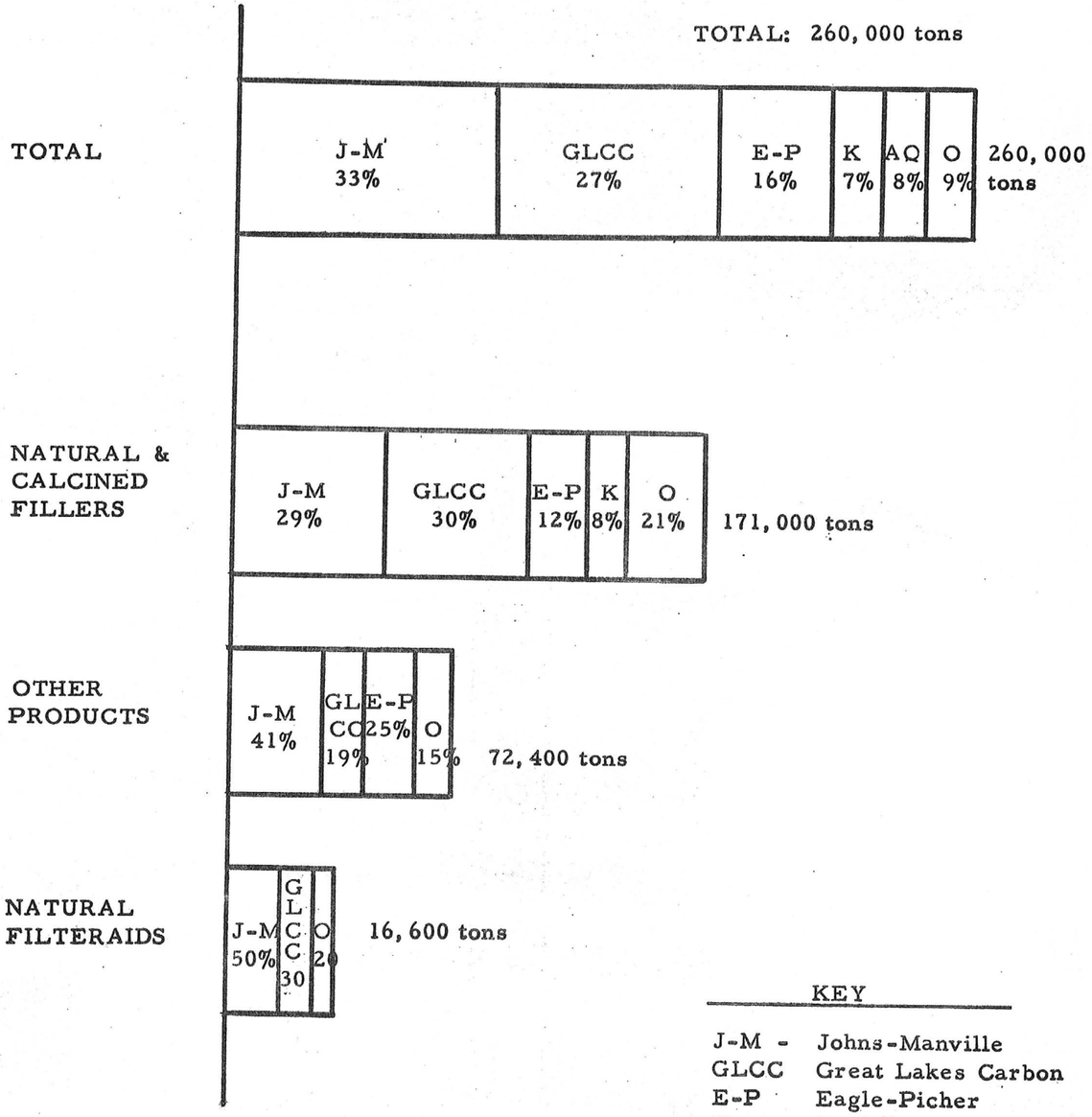
Johns-Manville and Great Lakes Carbon employ a system of company salesmen and technical sales service. Eagle-Picher uses manufacturers' agents and distributors in their approach to the markets.

The former technique seems more suitable to the job at hand, but is more costly since sales costs become fixed. With an agent arrangement, sales costs vary with volume.

CHART VI

U. S. DIATOMITE COMPETITION - 1961

Natural & Calcined Products



KEY

J-M -	Johns-Manville
GLCC	Great Lakes Carbon
E-P	Eagle-Picher
K	Kenite
AQ	Aquafill
O	Other

Source: Table F - Appendix

For an operation devoted to filler applications, a combination of agents and technical sales service representatives seems to take advantage of the strong points within each system. The movement of natural and calcined products does not require as much technical service as might be true of flux-calcined materials (filteraids).

B. MARKET STUDY REVEALS ESSENTIAL MARKETING INFORMATION.

In July-August 1962, a mail survey was conducted among 128 companies across the country to determine diatomite filler information and usage. The complete results of the survey are available. A copy of the questionnaire is included at the end of the Appendix. The high points are reported here to assist in the evaluation of the marketing considerations involved in developing a new source of supply.

In considering the validity of the following information, the results represent a minimum of 25,000 tons of 1961 volume as reported by the companies that responded to the mail questionnaire. This volume was reported among 20 of the 30 companies that indicated volume in 1961. (10 companies did not give specific volume information.)

While no attempt was made to use accepted sampling techniques, the results do represent over 10% of the estimated 1961 potential that exists for Mammoth products (estimated at 260,000 tons).

1. Fertilizers and insulation account for largest volume of survey returns.

Usage among fertilizer and industrial insulation producers is at the highest level among companies surveyed. Of 10 fertilizer producers responding, four indicated that diatomite fillers were used and five answered "no" (one did not know). Among the ten industrial insulation producers responding, seven indicated usage, two did not use and one did not know.

This confirms the largest potential markets as estimated in the Potential section of this report.

2. Johns-Manville, Great Lakes Carbon and Eagle-Picher dominate the survey returns.

   Confirmation of the major producer dominance was obtained. Of 32 brands and grades mentioned in the returns, Johns-Manville received 13, Great Lakes Carbon 12, Eagle-Picher 6, and Kenite 1. All of these were designated by fertilizer producers while the first three (J-M, GLCC and E-P) were reported by the industrial insulation producers.

3. Specifications are important among users.

   Among the 30 responding companies that use diatomite fillers, all but four indicated that a specification was used by their purchasing department in selecting products. However, only 12 stated that they had developed their own specification. The remaining 14 use the information developed by producers. As usage increases (and control becomes more critically), an internally-developed specification becomes the practice.

   Among the fertilizer and industrial insulation producers, company specifications are important.

4. New source of diatomite fillers must supply a quality product; that performs; at a competitive price.

   The factors considered in evaluating a new source of diatomite fillers give the basis for starting a new operation. In the order of number of mentions by the 30 using companies, product quality (14), price (11), dependability (8), product performance (70) and product characteristics (5) were the most important.

5. The present suppliers seem to be doing an excellent job on prompt shipments, product quality and technical service.

6. Weakest points of present supplier performance are in warehousing and packaging. However, there was a noteworthy lack of specific and frequently-mentioned additional services desired by the responding companies. This points up the excellent nature of the competition in the diatomite field.

C. PRESENT MARKETS FOR DIATOMITE ARE CONCENTRATED IN THE HIGHLY INDUSTRIALIZED EASTERN AREAS.

The present markets for diatomite lie in the eastern states where industrial production is located. However, industrial expansion is expected to occur in the western areas as population continues to increase. While this will not eliminate the market concentration in the east, the expansion of industrial production in the west will give rise to expanding usage and ever-broadening application in the west.

This concentration in the east must be considered at the outset of any new venture in diatomite and will call the pattern of distribution and selling efforts.

VI MAMMOTH CRUDE

The crude in the deposit near Mammoth, Arizona, holds the key to the profits that can be made from commercial development of the deposit. Extensive work has been done in evaluating the crude material over the past 10 years. Mr. A. R. Bollaert has covered the property and has located the best quarry sites from the standpoint of mining ease and crude quality.

A. BOLLAERT STUDY

The following conclusions are the results of his investigations over the past 10 years (taken from his report to American Diatomes, dated May 21, 1962).

1. Recent DE (diatomaceous earth) samples compare favorable with 1952 and 1953 samples.

2. The crude in the South Quarry will not yield satisfactory calcined filteraids.

3. The crude in the South Quarry will make fillers for many purposes when properly processed.

4. Earlier surveys, confirmed by a current one, show that the South Quarry contains a minimum of 303,000 tons of readily available crude under favorable mining conditions.

5. The North Quarry contains over a million tons of cleaner crude that has better structure than the South Quarry.

6. The North Quarry crude will process into excellent fillers. The flux-calcined filteraids possibilities are borderline.

7. The mining conditions in the North Quarry are very favorable.

8. The North Quarry crude will yield product lighter in weight and color than the South Quarry.

9. The South Quarry products can be made to nearly approach the properties of the North Quarry by heavier

removal of oversize or tailings.

10. The Mill Site Quarry has over two million tons of crude that will yield certain types of fillers and, based on opinion, should produce calcined aggregates of various sizes. In this respect, it will be better than the other two quarries.

11. Muffle burns on Mill Site crude confirm conclusion 10.

12. Plant baghouse product shows considerable promise.

B. EXPERIMENTAL PRODUCT SHOWS PROMISE

Under Mr. Bollaert's supervision, an experimental product (called Ari-Lite 200X) was produced at the present plant to attempt to determine crude yields and product characteristics of a diatomite filler from South Quarry crude. Mr. Bollaert reported the results of his examination of the product:

"... Baghouse Run No. 2 - Much finer and cleaner than Baghouse No. 1. Crystalline matter less than 1/2%. Should be satisfactory for paper. The color is superior to all other samples, showing that the coarse fraction of the product is largely responsible. Unfortunately, we have no idea of percentage yield. It should, however, be possible to obtain a fair percentage of this type product using standard equipment."

Mr. Bollaert reported the results of a second examination of the experimental product:

" My microscopic examination turned out to be favorable. Very little crystalline or glassy matter is evident. It appears that a good separation has been made. Whereas the sample is not perfect, I believe it would represent a practical product and, therefore, suggest that you distribute samples for consumer evaluation."

These samples are presently being evaluated. To date, the replies have produced the following comments:

An ammonium nitrate producer (using 6,000 tons annually), "... The south and north quarry Mammoth crudes appear to be satisfactory as does possibly '200 MMC'."

Another ammonium nitrate producer (using 2,000 tons annually), "... Generally speaking, it is our opinion that the material you forwarded compares favorably with that being offered by other producers."

The analysis work done on this experimental product shows the following results (data from independent test sources).

	Ari-Lite 200X	Celite 379	Dicalite 109-3
Silica (SiO_2) % (on ignited basis)	90.36	89.7	85.1
Moisture %	2.71	3.00	6.30
Ignition Loss %	4.24	3.70	5.10
Bulk Density lb/cu.ft.	6.36	8-10	9.2-10.4
Screen Analysis			
through 200 %	100	100	-
through 325 %	99.4	100	-
pH	7.22	7.0	7.3-8.6

(Comparison made to competitive products for anti-caking applications)

The applications in concrete also indicate that the Mammoth crude can be considered competitive to that of the present producers of diatomite (see Market Profile on Concrete). In addition, two companies presently using diatomite for oilwell cementing have approved "Ari-Lite 75" (from present pilot production). The successful application as an insecticide has been accomplished by a Phoenix company.

These and other practical applications add specific evidence to support Mr. Bollaert's conclusions regarding the Mammoth crude.

VII PROFIT CONSIDERATIONS

The key to commercial development of the Mammoth Diatomite Deposit lay in the profits and investment return possible from full-scale operations. The objective in the analysis has been to establish potential for products from the crude - now the question becomes one of developing sufficient production information and investment requirements to answer the basic points of profits and returns.

Mr. Bollaert was retained to make these evaluations. His report was submitted on July 25, 1962, (with a supplemental report made on October 11, 1962) and is available for detailed examination. The prime points in his study cover market potential, sales estimates, plant and equipment requirements, operating requirements and cost data.

A. PLANT AND OPERATING INVESTMENT ESTIMATED AT $650,000.

The following schedule shows the investment requirement to fully develop the Mammoth Deposit (condensed Mr. Bollaert's report dated July 25, 1962)

1.	Plant and Site		
	Property	$ 5,000	
	Property Inprovements	9,500	
	Rail Siding	10,000	
	Building & Equipment	25,000	
			$ 49,500
2.	Processing Equipment		365,750
3.	Quarry Facilities		22,600
			$437,850
4.	Reserve for Contingencies (10%)		43,785
			$481,635
	Working capital estimated at		150,000
			$631,635

The plant covered by the above estimates would have a 25,000-ton capacity.

B. CAPACITY OPERATIONS SHOULD YIELD BETWEEN 21% AND 50% RETURN ON INVESTMENT.

Crude yields will determine plant capacity and, in turn, profits and returns. Mr. Bollaert in his report of July 25, 1962, estimates yields on two crudes:

North - "About 25% of tailings will have to be removed to yield fillers acceptable to the paper, insulation, paint, and fertilizer trade."

South - "This crude has more extraneous material and it is felt that the average filler would require a removal of 35% tailings."

With an average of 30% tailings - giving a crude yield of 70% - plant capacity would be 25,000 tons on a 3-shift day for 250 days. Based on capacity operations, sales of about $1,000,000 would result (see page 15, A. R. Bollaert report of July 25, 1962).

Trial profit and loss calculations would show the following results:

	Plant Capacity
	25,000 tons
Sales	$1,014,000
Cost of goods sold	549,660
Gross profit	$ 464,340
Operation expenses including depreciation	156,584
Net profit before federal income taxes, depletion and loss write-off	$ 307,756

(Figures based on A. R. Bollaert reports of July 25, 1962, and October 10, 1962)

It is important to note at this point that $1,000,000 estimated sales represents less than 10% of the estimated

potential for Mammoth products.

Based on the $650,000 investment as estimated above, capacity operations would show a 47% return.

To estimate breakeven points for the crude yield range, the estimated costs can be broken down as follows:

	Fixed	Variable
Processing	$ 96,480	$453,180
Marketing	89,060	-
Technical	44,868	-
Administrative	22,656	-
Total	$253,064	$453,180
Cost per ton	-	$18.13

The chart on the next page reveals a breakeven point at at 11,200 tons, or $450,000 in gross sales.

The figures used in these calculations are felt to be conservative. Mr. Bollaert in his report of July 25, 1962, (page 15) estimates breakeven on the 25,000 ton operation at 9,900 tons. The changes reflected above are based on minor variations in the operating cost calculations (such as, the addition of $25,000 for advertising and promotion).

C. SALES AND PROFITS PROJECTIONS INDICATE AN INVESTMENT RETURN WITHIN 5 YEARS.

Previously, a plant with 25,000 tons was established as minimum size based on a 70% yield to crude. With reasonable success, capacity sales should result during the fourth year of operations. On this basis, breakeven ($450,000 sales) should be achieved during the second sales year and total investment would be returned in about 5 years. (Chart VIII)

D. DEPLETION AND DEVELOPMENTAL COST WRITE-OFF HAVE AN IMPORTANT BEARING ON INVESTMENT RETURN.

The analysis above covers profits and returns before any

consideration is given to depletion and developmental cost write off. These will have an important bearing on investment considerations.

Diatomite qualifies for 15% depletion allowance according to the Internal Revenue Service Code, Section-613(b)(6). The deduction can be no greater than 50% of net income before the deduction.

The exact figure to which the 15% is to be applied is somewhat open to speculation. The term - "Gross Profit from the property" has been interpreted to mean many things by the Bureau of Internal Revenue. Theoretically, it could be applied to Gross Sales, but experience indicates that the allowance must be applied to the sales value of the "first marketable product". In the case of diatomite, bulk material could be interpreted to be the first such product.

For the purposes of this analysis, it seems appropriate to establish a range of depletion allowances.

Gross Sales at capacity	$1,014,000
Less Royalty @ 50¢/ton	12,500
Depletion Base	$1,001,500
Net Profit from page 37	307,756
Depletion @ 15% or 50% of profit	150,225
Adjusted profit for tax purposes	$ 157,531

Depletion Base (above)	$1,001,500
Less bag costs @ $6.25/ton, packing and warehouse labor *	200,400
Revised Depletion Base	$ 801,100
Net Profits	307,756
Depletion @ 15% or 50% of profit	120,165
Adjusted profit for tax purposes	$ 187,591

* See A. R. Bollaert report July 25, 1962, page 10

From the above calculations, depletion allowance can be estimated at $120,000 - $150,000. These deductions would reduce Federal Income Taxes proportionately.

CHART VII AMERICAN DIATOMES, INC. - BREAKEVEN ANALYSIS

Based on 70% crude yield - 25,000-ton plant capacity

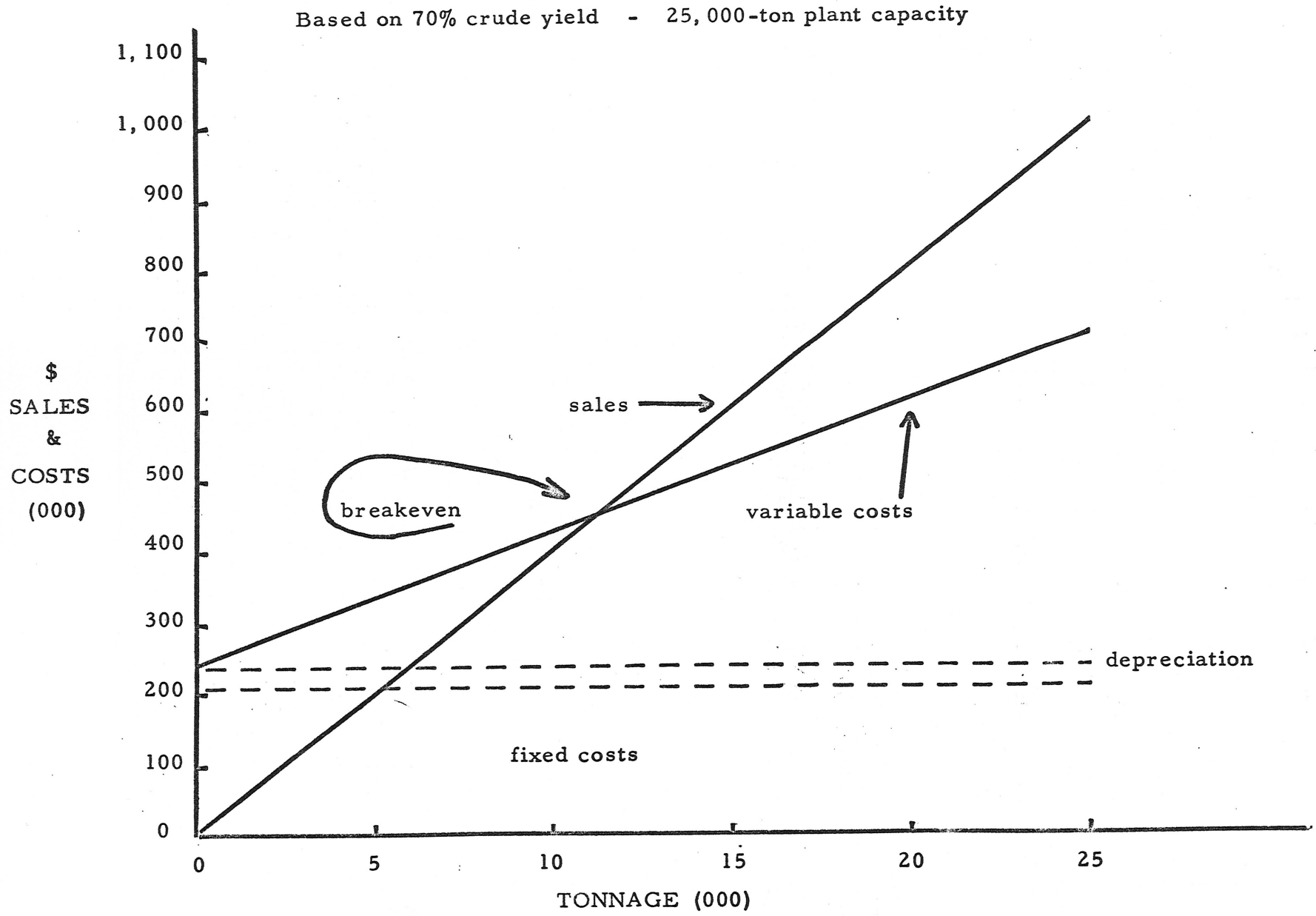
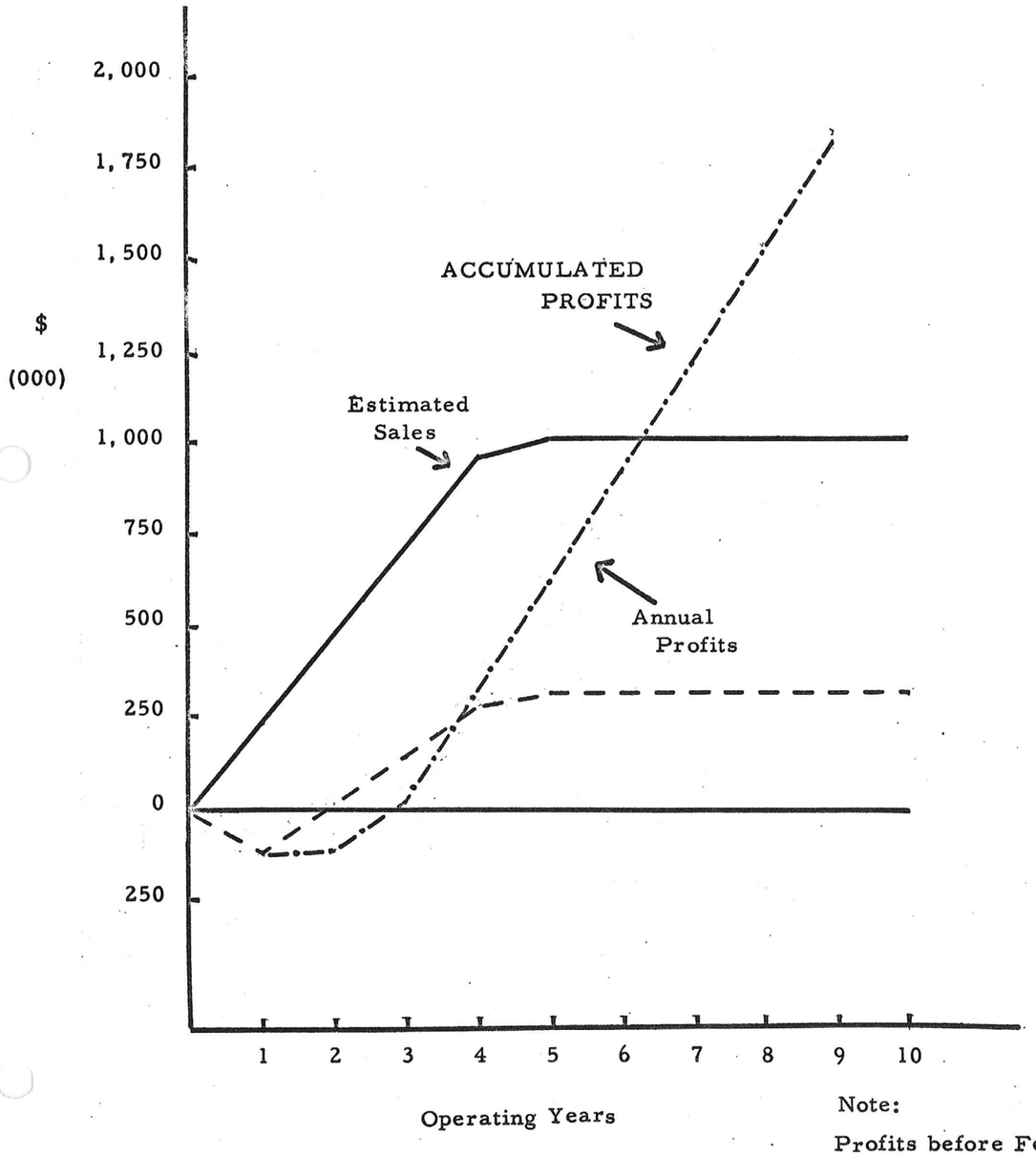


CHART VIII AMERICAN DIATOMES, INC.

SALES & PROFIT PROJECTIONS - 25,000-ton plant

(Based on 70% crude yield)



Source: Appendix, Table H

Note:
Profits before Federal
Taxes, Depletion & Interest

Developmental cost write-off would also reduce the Federal Tax base. As of December 31, 1962, these costs (reported as loss for income tax purposes) amounted to $283,000.

However, before either of these adjustments for tax purposes can be finalized an investigation of depletion and developmental cost write-off experience must be made - preferably through the Los Angeles office of the Bureau of Internal Revenue.

E. CASH FLOW ESTIMATES REVEAL A MAXIMUM INVESTMENT RETURN OF 5 YEARS.

Based on the plant investment of $450,000 and a working capital need of $200,000, the expectable investment return can be calculated.

If the new plant goes on stream in 1964 (the first operating year becomes 1964) and if projected sales estimates are achieved, the projected cumulative cash flow would be as follows:

Year	25,000-ton plant
1964	-
1965	$ 49,379
1966	219,975
1967	504,480
1968	744,889
1969	985,198
1970	1,225,507
1971	1,465,816
1972	1,706,125
1973	1,946,434

(Projected cash flow is the sum of 1. Estimated profits after taxes, 2. Estimated depletion, 3. Estimated loss write-off, and 4. Estimated depreciation. Table K in the Appendix shows the complete details of these calculations.)

The estimated cash flow shows a return of investment ($650,000) in the 5th operating year.

The cash flow estimate has been developed on a relatively conservative basis. On page 39, the depletion allowance was estimated in the range $120,000 - $150,000. In developing the cash flow estimate, $120,000 was used as the depletion figure. If the higher figure were used, the cash flow estimate would be showing a faster investment return.

VIII PRESENT OPERATIONS

The efforts of American Diatomes have been directed toward the full-scale development of the Mammoth Diatomite Deposit, near Mammoth, Arizona. A brief review of these efforts will serve as a guide to the future course of the entire project.

American Diatomes was incorporated in 1959 as an Arizona Corporation. One of its purposes was to attempt to develop the Mammoth Deposit as a full-scale diatomite facility. A pilot plant was built in 1959, to produce experimental products in the diatomite filler field. At the same time, a research program was established to find uses for the products and to develop exact information about the deposit itself.

A program to develop sales for the pilot products was instigated in 1962.

A. PRESENT PRODUCTS INCLUDE A NATURAL FILLER, TWO REFINED FILLERS AND A MIXED PRODUCT FOR PAINT APPLICATION.

Developmental efforts have uncovered markets for two products and an experimental product. The base diatomite line carries the brand name "Ari-Lite":

"Ari-Lite 98" - a refined natural diatomite grade with reasonably broad mineral filler applications.

"Ari-Lite 75" - a natural, ground crude grade (unrefined) with a sound potential in less critical filler applications.

"Ari-Lite 200X"- a highly refined natural grade, developed for experimental applications (see page 33).

Another material, "Ari-Lite 100", fits into the refined markets, but results as a by-product of the other operations.

The data sheets on the following pages show typical characteristics of the basic diatomite product line.

AMERICAN DIATOMES, INC.
2602 E. Thomas Road
Phoenix 16, Arizona

ENGINEERING DATA
Specification Sheet 661B
June 1, 1961

"ARI-LITE 75"

DIATOMITE, NATURAL(not calcined)not REFINED
DIATOM TYPES, Major: Boat & Needle Shape Pennatae
Other: Radial Centricae
PROCESSING: Natural ground
COLOR: Off White
SPECIFIC GRAVITY: 2.0
MOISTURE, when packed maximum %: 1%
OIL ABSORPTION G-C: 140-150
BULK DENSITY U.S.GAL.(DRY): -
" " " " " " -
REFRACTIVE INDEX: 146
MAXIMUM retained on 325 mesh screen: 19.0%
" " " 200 " " 16.75%
" " " 150 " " 9.84%
SURFACE AREA: -
AVERAGE PARTICLE SIZE: -
pH: 7.5 - 8

CHEMICAL ANALYSIS (TYPICAL)

Silica SiO_2	81.20
Aluminum Oxide Al_2O_3	3.90
Iron Oxide Fe_2O_3	.84
Calcium Oxide CaO	.84
Magnesium Oxide MgO	1.43
Sodium Oxide Na_2O	.25
Potassium Oxide K_2O	.24
Manganese MnO_2	1.00
Copper CuO	.01
Vanadium V_2O_5	.002
Titanium TiO_2	.2
Zirconium ZrO_2	.01
Strontium SrO	.01
Ignition Loss	6.60
Undetermined	3.468
	100.000

AMERICAN DIATOMES, INC.
2600 E. Thomas Road
Phoenix 16, Arizona

ENGINEERING DATA
Specification Sheet 662A
September 1, 1961

"ARI-LITE 98"

DIATOMITE, NATURAL (not calcined) REFINED
DIATOM TYPES, Major: Boat & Needle Shape Pennatae
Other: Radial Centricae
PROCESSING: Dried, milled & refined
COLOR: White
SPECIFIC GRAVITY: 2.0
MOISTURE, when packed % maximum: 1%
OIL ABSORPTION G-C: 140-150
BULK DENSITY U.S. GAL. (DRY): 2.56 lb. before compacting
" " " " " 2.97 lb. after compacting
REFRACTIVE INDEX: 146
MAXIMUM retained on 325 mesh screen: 1%
" " " 200 " " 0%
" " " 150 " " 0%
SURFACE AREA: 40 Sq.M/gram
AVERAGE PARTICLE SIZE: 5 micron
pH: 7.5

CHEMICAL ANALYSIS (TYPICAL)

Silica SiO_2	85.92
Aluminum Oxide Al_2O_3	3.70
Iron Oxide Fe_2O_3	.20
Calcium Oxide CaO	.84
Magnesium Oxide MgO	1.00
Sodium Oxide Na_2O	.25
Potassium Oxide K_2O	.24
Manganese MnO_2	1.00
Copper CuO	.01
Vanadium V_2O_5	.002
Titanium TiO_2	.2
Zirconium ZrO_2	.01
Strontium SrO	.01
Ignition Loss	5.20
Undetermined	1.418
	100.000

A mixed product, combining "Ari-Lite 98" and other ingredients, was developed in 1961, market-tested in 1962 and presently gaining in acceptance. Called ADITE Blok-Fill, it finds application as a concrete block primer in the new construction field. It is expected to gain a prominent position during 1963 and contribute a reasonably large sales volume.

B. ARI-LITE PRODUCTS FIND FAVORABLE APPLICATIONS

Initial efforts to sell the products of the pilot plant have developed favorable sales indications.

At the present time, materials are being sold for the following applications (essentially, in Arizona):

1. Fertilizer anti-caking agent - "Ari-Lite 98" has been successfully adapted to ammonium nitrate production since July 1962. (Sales in 1962 amounted to 34 tons).

2. Insecticides - a Phoenix based company is presently developing a non-toxic insecticide technique using "Ari-Lite 98". (Sales in 1962 totaled 50 tons).

3. Foundry Mold Washes - one of the prime copper smelters in Arizona has purchased "Ari-Lite 75" for incorporation in a mold precoat to facilitate the removal of the copper anoide (January 1963).

4. Foundry Sand Molds - a local Phoenix foundry purchased "Ari-Lite 75" as a replacement for bentonite clay in low-grade iron casting molds. (December 1962)

5. Oilwell Cementing - two dominant factors in the oilwell cementing field have approved "Ari-Lite 75" as an additive to their concrete mixes. (Negotiations are presently under way to become a continuing supplier.)

6. Concrete Application - general use concrete application is somewhat difficult to predict. However, one Phoenix ready-mix company has purchased "Ari-Lite 98" (for use in prestressed beams) and "Ari-Lite 75" (for application in general use concrete). These applications are still in the field-experimental stage.

"ARI-LITE" DIATOMITE IN CONCRETE

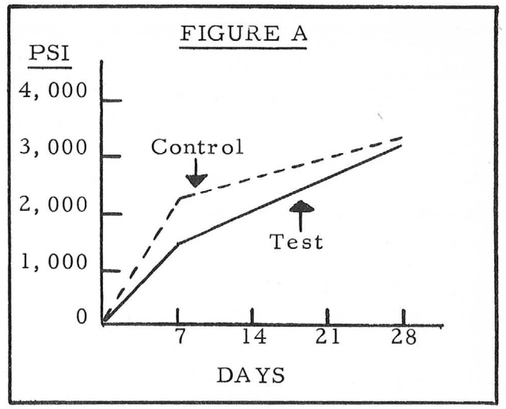
(all test data conducted by independent companies)

1. TEST REPORT C1-62

Mix design (per cu.yd)	Control	"Ari-Lite 75" mix
cement (lb)	470	420
water (gal)	7.8	8.7
"Ari-Lite" (lb)	-	50
sand (% aggregate)	42%	42%
slump	5"	3-1/2"
compressives (psi)		
7-day	2255	1695
28-day	3330	3210

(See Figure A)

FIGURE A

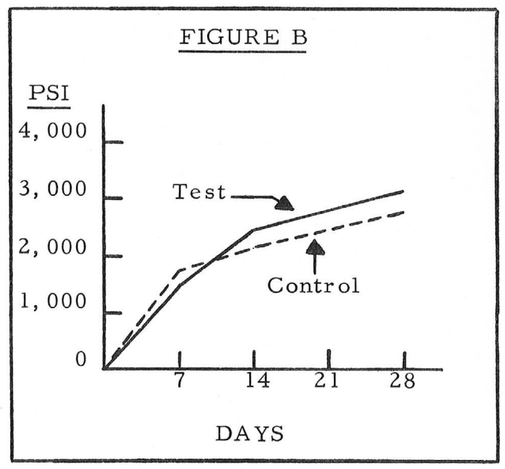


2. TEST REPORT C2-62

Mix design (per cu.yd)	Control	Test
cement (lb)	470	445
water (gal)	8.4	8.8
"Ari-Lite" (lb)	-	50
sand (% aggregate)	42%	41%
slump	7-1/2"	5"
compressives (psi)		
7-day	1700	1660
14-day	2165	2425
28-day	2790	3120

(See Figure B)

FIGURE B

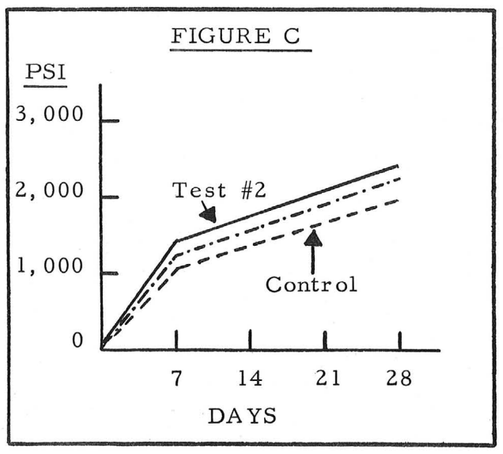


3. TEST REPORT C4-62

Mix design (per cu.yd)	Control	Test #1	Test #2
cement (lb)	456.0	410.0	385.0
water (gal)	43.7	38.3	41.6
"Ari-Lite" (lb)	-	-	25.0
sand (% aggregate)	45%	45%	45%
slump	9-1/2"	8-1/2"	7"
Pozzalith 3L	-	.9	.9
compressives (psi)			
7-day	1107	1310	1365
28-day	1992	2287	2398

(See Figure C)

FIGURE C



CONTROL TEST

4. TEST REPORT C5-62 (figure D)

cement (lb)	705	705
water (gal)	37.9	47.0
Ari-Lite (lb)	-	35
sand (% aggregate)	38%	38%
slump	3-1/2"	3-1/2"
PSI - overnight	1840	2230
7-day	4700	4620
28-day	6200	6090

5. TEST REPORT C6-62 (figure E)

cement (lb)	705	705
water (gal)	36.1	43.2
Ari-Lite (lb)	-	35
sand (% aggregate)	38%	38%
slump	3-1/2"	3-1/4"
PSI - overnight	3460 *	4160
7-day	4800 *	4740
28-day	5570 *	5500

* Based on weekly averages

6. TEST REPORT C7-62 (figure F)

cement (lb)	705	705
water (gal)	36.1	46.1
Ari-Lite (lb)	-	36
sand	38%	38%
slump	3-1/2"	4"
PSI - overnight	3260 *	3130
7-day	4470 *	4070
28-day	5600 *	5490

* Based on weekly averages

7. TEST REPORT C8-62 (figure G)

cement (lb)	705	705
water (gal)	36.1	43.1
Ari-Lite (lb)	-	36
sand	38%	38%
slump	3-1/2"	3"
PSI - overnight	3260 *	3190
7-day	4470 *	4180
28-day	5600 *	5420

* Based on weekly averages

CONTROL - - - - -

TEST ———

figure D

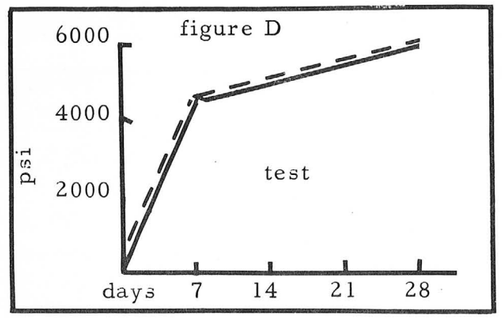


figure E

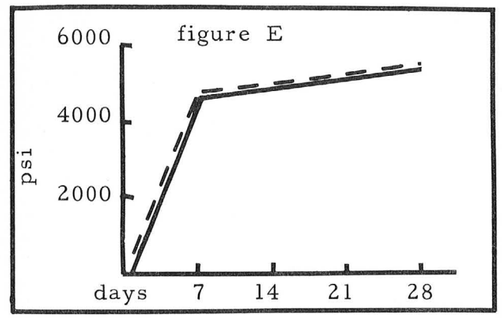


figure F

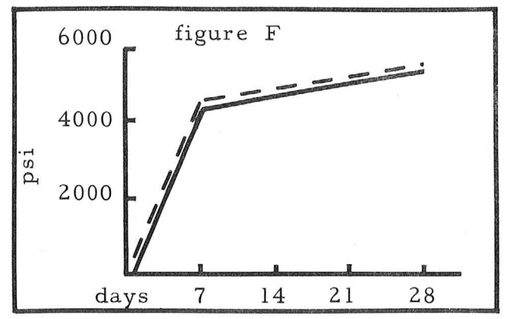
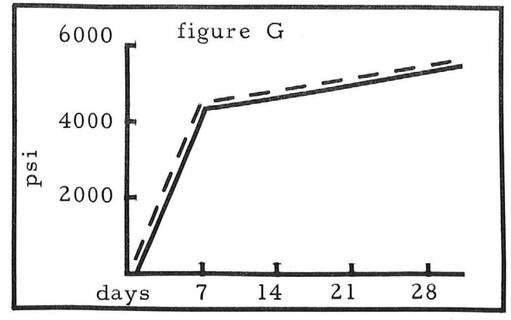


figure G



7. General Use Filler - a large eastern company has purchased 60 tons of "Ari-Lite 98" for a new product application. (It is impossible to determine the exact use because of the newness of the end product.)

C. ESTIMATED SALES FOR 1963, TOTAL $50,000.

Since the operation to date has been essentially one of a pilot nature, an accurate potential for existing products is impossible to estimate. However, based on present customers and immediate prospects, a 1963 sales volume of $50,000 appears conservative. Based on an average selling price of $25.00 per ton, this dollar volume would represent 2000 tons of production.

If successful applications continue to develop, it is not unreasonable to expect sales of $150,000 in 1964 - representing 6000 tons of production.

As something of a gauge to the reasonableness of these estimates, Arizona cement consumption totaled an estimated 733,200 tons in 1962 (source: prime Arizona portland cement producer) and an estimated 16,800 tons of mortar cement (source: Portland Cement Association). Based on 5% diatomite addition, this market alone offers a total potential of 45,000 tons. To assume complete penetration of this market is not realistic; however, to achieve a 10% share of the potential seems a reasonable assumption.

D. BREAKEVEN IN PRESENT OPERATIONS SHOULD BE REACHED AT 3000-TON LEVEL.

An accurate estimate of production costs under the present pilot operations is an extremely risky figure. However, based on the 300 tons of material shipped during 1962, a production volume of 3000 tons with no change in present operating conditions is indicated. This figure must be confirmed and revised (upward or downward) based on actual experience during the coming months.

Present production equipment on a single-shift basis will turn out the following quantities of materials:

APPENDIX - TABLE A

WORLD DIATOMITE PRODUCTION - TONS

YEAR	TOTAL	U.S.A.	West Germany	France	Other
1949-1953*	600,000	278,000	45,044	60,194	216,762
1954	725,000	368,426*	53,666	68,092	223,816
1955	765,000	368,426*	62,575	70,025	263,974
1956	760,000	368,426*	72,890	69,546	249,138
1957	770,000	440,000*	76,561	86,240	167,199
1958	825,000	440,000*	115,319	111,884	157,797

* Annual Average - 3 years

1949 - 1958 Figures:
Mineral Facts and Problems 1961
U.S. Dept. of Interior

APPENDIX - TABLE B

BY PRODUCT TYPE

PRODUCT	TONS	%	PRICE Per Ton	DOLLARS	%
TOTAL	542,000	100	-	29,637,600	100
Natural	181,600	33	$36.00	6,537,600	22
Calcined	106,400	20	$50.00	5,320,000	18
Flux-calcined	254,000	47	$70.00	17,780,000	60

Source: A. R. Bollaert, letter 8-9-62

APPENDIX - TABLE C

1961 U.S. DIATOMITE DOLLAR VOLUME - BY PRODUCT USE

PRODUCT USE	TOTAL $	TOTAL %	NATURAL $	NATURAL %	CALCINED $	CALCINED %	FLUX-CALCINED $	FLUX-CALCINED %
TOTAL	29,637.6	100	6,537.6	100	5,320.0	100	17,780.0	100
Filteraids	18,377.6	62	597.6		1,400.0		16,380.0	
Fillers	7,850.0	26	5,400.0		1,050.0		1,400.0	
Other	3,410.0	12	540.0		2,870.0		-	

Note: Average ton prices f.o.b. mine: Natural, $36.00; calcined, $50.00; flux-calcined, $70.00

Source: A. R. Bollaert, letter 8-9-62

APPENDIX - TABLE D

U.S. DIATOMITE USE TRENDS - TONS

USE	1949	1955	1961
Filtration	167,000	184,000	278,000
Filler	97,000	129,000	191,000
Other	14,000	55,500	72,400
TOTAL	278,000	368,500	542,000

Source: U.S. Dept. of the Interior and Bollaert estimates.

APPENDIX - TABLE E

1961 U. S. DIATOMITE TONNAGE - BY PRODUCT TYPE

PRODUCT TYPE	TOTAL		PRODUCT USE					
			FILTERAIDS		FILLERS		OTHERS	
	TONS	%	TONS	%	TONS	%	TONS	%
Total	542,000	100	278,600	100	191,000	100	72,400	100
Natural	181,600	33	16,600	6	150,000	78	15,000	21
Calcined	106,400	20	28,000	10	21,000	11	57,400	79
Flux-calcined	254,000	47	234,000	84	20,000	11	-	-

Source: A. R. Bollaert, letter 8-9-62

APPENDIX - TABLE F

1961 U. S. DIATOMITE DOLLAR VOLUME - BY PRODUCT TYPE
(In thousands)

PRODUCT TYPE	TOTAL		PRODUCT USE					
			FILTERAIDS		FILLERS		OTHERS	
	$	%	$	%	$	%	$	%
Total	$29,637.6	100	$18,377.6	100	$7,850.0	100	$3,410.0	100
Natural	6,537.6	22	597.6	3	5,400.0	69	540.0	2
Calcined	5,320.0	18	1,400.0	8	1,050.0	13	2,870.0	98
Flux-calcined	17,780.0	60	16,380.0	89	1,400.0	18	-	-

Note: Avg. Prices f.o.b. Mine: Natural $36.00; calcined $50.00
Flux-calcined $70.00.

Source: A. R. Bollaert, letter 8-9-62

APPENDIX - TABLE G

MAMMOTH COMPETITION - 1961 TONNAGE

PRODUCER	TOTAL TONS	NATURAL FILLERS	CALCINED FILLERS	NATURAL FILTERAIDS	OTHER
Johns-Manville	86,500	37,000	12,000	7,500	30,000
Great-Lakes C.	71,400	46,000	6,000	5,400	14,000
Eagle-Picher	40,500	17,000	3,000	2,500	18,000
Kenite	17,600	14,000	-	1,200	2,400
Aquafil	20,000	12,000	-	-	8,000
Others	24,000	24,000	-	-	-
TOTAL	260,000	150,000	21,000	16,600	72,400

Source: A. R. Bollaert, letter 8-9-62

APPENDIX - TABLE H
AMERICAN DIATOMES, INC, - SALES & PROFITS PROJECTIONS
25.000-TON PLANT CAPACITY - 70% CRUDE YIELD

Operating year	Estimated Tonnage	Estimated Sales	Fixed Expenses	Variable Expenses	Total Expenses	Estimated Profits or (Loss) **	Cumulative
		$	$	$	$	$	$
1	6,000	240,000	253,064	108,780*	361,844	(121,844)	(121,844)
2	12,000	480,000	253,064	217,560*	470,624	19,376	(102,468)
3	18,000	720,000	253,064	326,340*	579,404	140,596	38,128
4	24,000	960,000	253,064	435,120*	688,184	271,916	310,044
5	25,000	1,014,000	253,064	453,180	706,244	307,756	617,800
6	25,000	1,014,000	253,064	453,180	706,244	307,756	925,556
7	25,000	1,014,000	253,064	453,180	706,244	307,756	1,233,312
8	25,000	1,014,000	253,064	453,180	706,244	307,756	1,541,068
9	25,000	1,014,000	253,064	453,180	706,244	307,756	1,848,824
10	25,000	1,014,000	253,064	453,180	706,244	307,756	2,156,580

NOTES

Sales estimated @ $40.00 per ton (average). Estimated sales at capacity taken from A. R. Bollaert Report, July 25, 1962, page 15.

* Variable expenses estimated @ $18.13 per ton (see page 38)
** Profits or (Loss) before Federal Income Taxes, Depletion and Interest.

APPENDIX - TABLE K

AMERICAN DIATOMES, INC. - ESTIMATED CASH FLOW ON 25,000-TON PLANT

Year	Estimated Profit or (Loss) *	Loss Write off	Estimated Depletion **	Adjusted Fed Tax Base	Estimated Profits aft. Taxes ***	Depreciation	Estimated Cash flow	Cumulative Cash flow
1959	$ (28,215)	-	-	-	-	-	-	-
1960	(80,284)	-	-	-	-	-	-	-
1961	(86,726)	-	-	-	-	-	-	-
1962	(87,358)	-	-	-	-	-	-	-
1963	(50,000)	-	-	-	-	-	-	-
1964	(121,844)	-	-	-	-	-	-	-
1965	$ 19,379	$ 19,379	-	-	-	$ 30,000	$ 49,379	$ 49,379
1966	140,596	140,596	-	-	-	30,000	170,596	219,975
1967	276,916	205,333	$ 33,291	$ 33,292	$ 15,981	30,000	284,605	504,580
1968	307,756	-	120,165	187,592	90,144	30,000	240,309	744,889
1969	307,756	-	120,165	187,592	90,144	30,000	240,309	985,198
1970	307,756	-	120,165	187,592	90,144	30,000	240,309	1,225,507
1971	307,756	-	120,165	187,592	90,144	30,000	240,309	1,465,816
1972	307,756	-	120,165	187,592	90,144	30,000	240,309	1,706,125
1973	307,756	-	120,165	187,592	90,144	30,000	240,309	1,946,434

* Profit and Loss estimated from Table H - Appendix

** Depletion assumed to be at minimum of $120,000 for capacity sales. Maximum depletion estimated at $150,000 (see page 44)

*** Federal Taxes taken at 52% of base