State Department of Geology and Mineral Industries

702 Woodlark Building
Portland, Oregon

Terrill Silica — Clackamas County

Confidential Report

This deposit is definitely not a deposit of silica, sand, or otherwise. The only bed which has any possibility of commercial use is the 3.5 to 5.0 ft. bed of pumicite. It is of exceptional uniform quality and dimension, and does not contain gritty material that would scratch if used for an abrasive or scouring material. Comparison of this material with that used in "Old Dutch Cleanser" shows that it has superior quality of flake and purity. However, the average particle size is much smaller than that of "Old Dutch". The only feasible way of extracting the pumicite is by underground mining.

The present treating plant is 20 years old and has not been operated for 15 years. It is out of date and in such a state of disrepair, that a new plant would have to be constructed.

Other beds exposed in the cut are common clay-diatomite, and gritty (arkosic) sand. Willamette River contains a larger percentage of quartz, and smaller percentage of clay, making it superior for furnace flux, cement admixture, etc. No excuse is seen for mining the Terrill sand for such purposes.

CONFIDENTIAL

Mr. Terrill stated that the mine is open for lease now, and that he would not make an excessive charge for any material mined by the buyer.

Mr. Terrill is an active man of seventy years. He seems to have some "horse sense", and is definitely not old prospector type. We found him able and willing to speak in a detailed but concise fashion.

State Department of Geology and Mineral Industries

702 Woodlark Building
Portland, Oregon

Terrill Silica — Oregon City, Clackamas County

Owner: Frank S. Terrill, 3622 S.E. 49th Street, Portland, Oregon.

Operators: The plant was last operated by Mr. Terrill, Sr., in 1926, when one ton was taken out for the Zeno Laboratories of Portland. Since that time, some of the white clay band has been air dried and hand screened.

Location: Part of Blocks 15 and 16, Nob Hill, situated in the Ezra Fisher D.L.C. Clackamas County, Oregon, T. 2 S., R. 2 E., Sec. 32.

Area: Approximately 2.2 acres in an irregular polygon somewhat triangular in shape.

Development: Is by an open cut in a steep bank (see map). From the top of the cut to the level of water in the drainage ditch is 60 ft. ( ). Maximum depth of the cut from original surface is 10 ft. The cut extends laterally about 40 ft. Material removed may be estimated at 400 tons or 212 cu. yds. A deep drainage ditch is cut through the edge of the pit and is about 12 ft. deep.

Equipment: The building housing the treating plant is in fairly good shape. It is a frame structure, 40 x 75 ft. in size, set upon concrete blocks. The west half has a wooden floor, the east half a dirt floor. The clay was hauled from the pit, up an inclined ramp on wheelbarrows. The machinery consists of a drying furnace of three steel tubes 18 inches in diameter, which rotates in brick furnace. The discharge from the drying tubes was raised by conveyor to a "Forester" (Tacoma, Washington) balanced rod mill. This mill has an 80-mesh screen completely covering its periphery, and the finished product falls into a storage bin directly below it. See sketch for flow sheet. Of all the equipment, only the rod mill might possibly be operated again. The drying furnace and the conveyor system have been partially dismantled.

History: As related by Mr. Terrill, Sr., the history is roughly as follows: In 1916, the United States Government (?) recommended and financed the use of Terrill "Silica" as a filler in asphalt pavements. The material was dried, screened and shipped from the plant as a finely-divided powder (-200 mesh). The entrance of rough top or non-skid asphalt into the field forced discontinuation of the operation.

In 1924, the Zeno Laboratories, Inc. of Portland, Oregon, took one ton of the white clay for which they paid $100.00. This material was used by that company for the base of a tooth powder. It is reputed that the finished product netted $14,000.

U. Ernest Nelson compiled a report from an investigation for the Zeno Laboratories in 1919.

702 Woodlark Building
Portland, Oregon

History: (Cont.)
During the last war, some of this sand was used for molding sand. Also it was used by a Portland Soap company. (P and G, ?)

Geology: The cut is in a curving escarpment forming one side, a gulch which is cut in the flat upland around Oregon City. Several strata of varying color, each conformable with the other are exposed in the pit. The dip is 3° - 4° to the North, where weathered by wind and rain the beds are thinly banded, but on fresh surfaces, the beds are massive. The color when wet, varies from dirty white to soil gray; when dry, chalk white to dark gray. The joints are at right angles; are spaced 3 - 4 feet apart, and are normal to the bedding. The beds are indurated to the point where they stand without sluffing, but may easily be broken out with a pick. High iron content is indicated by bands of limonite and lighter colored iron oxides.

Description of individual members of the formation:

Sample No. 1 - Pumice with very little kaolin (-1%). It is composed of 90% volcanic ash shards that are fresh and are not decomposed. Less than 1% of the mass is diatoms. The remaining 8 - 10% is unidentifiable fines. This is the material which was used for tooth powder. It forms a bed 3.5 - 5 ft. thick, gray to white, without variation in article, size, or color. Average particle size is .014 mm.

Sample No. 2 - Channel sample 4 ft. long. Blue clay immediately overlying white clay. There is a marked increase in impurities such as fine sand (quartz). Diatoms form 30 - 40% of the material. Glass shards form 40%. Iron oxide content is higher.

Sample No. 3 - A two foot channel sample immediately above the blue clay of sample No. 2, similar to blue clay, but more sandy. Consists of massive glass shards, some of them perlitic (30%). Diatoms are not over 1 - 5%. Sand fragments of quartz, plagioclase and horneblende .1 to .2 mm. in size from the remainder.

Sample No. 4 - Grab sample halfway up the pit, light tan in color, particle size .1 to .2 mm. Consists of: 50% diatoms; 20% quartz, felspar sand; 30% clay minerals.

Sample No. 5 - Top of pit. Composed of diatoms mixed with coarse sand. Diatoms, 50%; quartz, felspar, muscovite mica sand 50%.

Molding Sand Sample - A on sketch. Light tan in color, it is composed of 60% very angular quartz .1 to .3 mm. average diameter. The remainder is felspar, muscovite mica and about 10% clay minerals.

702 Woodlark Building
Portland, Oregon

Plastic Clay - B on sketch. Light in color, highly plastic. See clay report from Lewis, attached.

THE CONCLUSION arrived at from the above analyses is that this deposit represents a pumice, diatomite, sand sequence of deposition in a fresh water lake.

Microscopic examination of the Finished product of the Terril "Silica" mine: the material examined was from the white clay bed, and is the same as that used for tooth powder. It is cream in color and uniform in size. The particles are extremely angular and elongate. The pumice origin of the material is indicated by tubules and bubbles, flake-like habit of breaking up, striations on fragments and optical is otropism. Size of average particle is slightly over .02 mm. The ratio of the length of the particle to the width is over 2:1. Many (10%) of the particles have a ratio up to 5:1. Solid crystalline material is less than .5% of the volume. Ferro-magnesium minerals .1% of volume.

For commercial possibilities, see attached report by James A. Adams of State Department of Geology.

ATTACHED:

(1) Economic Report by James A. Adams
(2) Property plate and Topographic map by U. Ernest Nelson
(3) Analyses, core logs and volume of various strata by U. Ernest Nelson
(4) Clippings from "Oregon City Banner", August, 7, 1919
(5) Sketch of Pit showing location of samples
(6) Flow Sheet of treating plant, by James A. Adams

Report by: Wessley W. Paulsen and James A. Adams
Informant: Mr. Terrill

State Department of Geology and Mineral Industries

702 Woodlark Building
Portland, Oregon

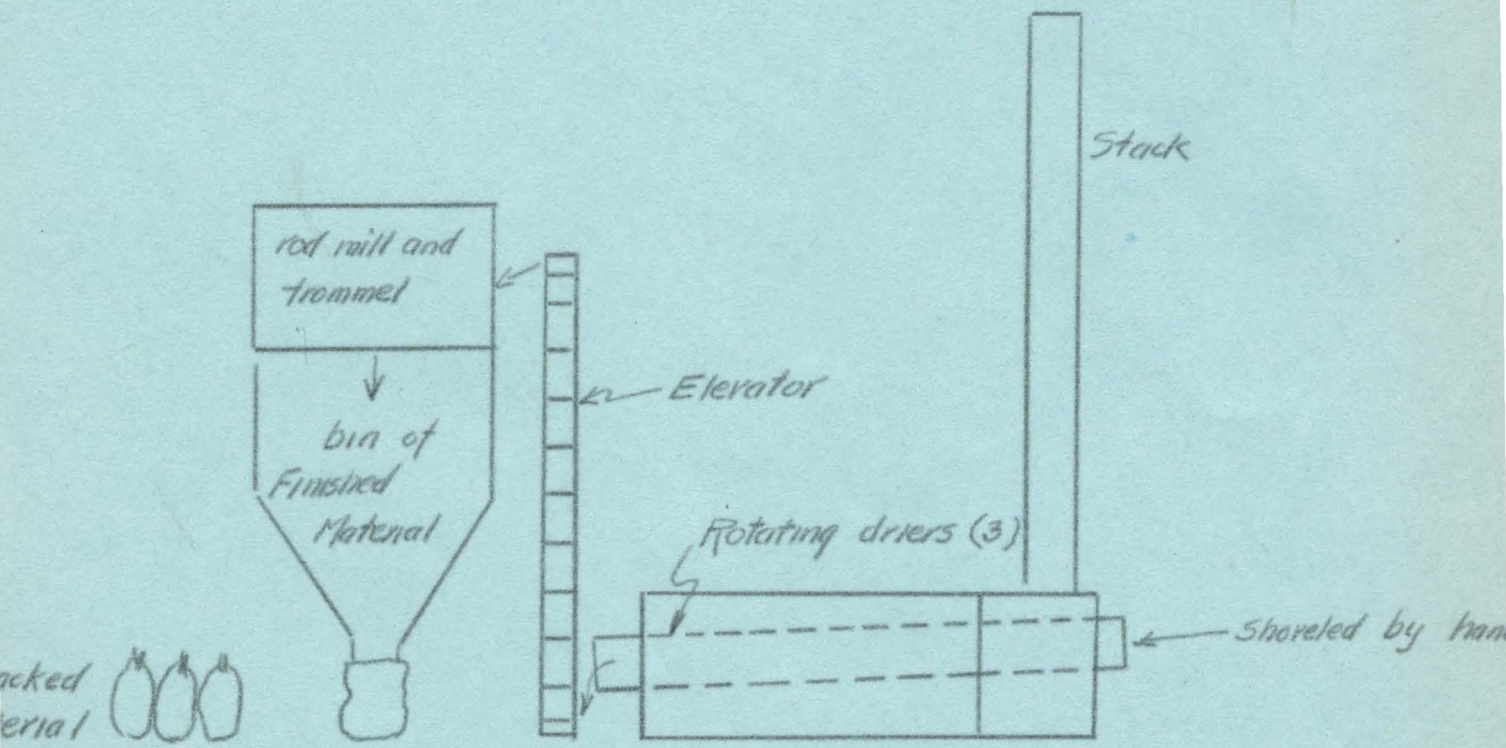
ECONOMICS OF TERRILL'S SILICA DEPOSIT

The most valuable stratum in the deposit lies 60' underground. This material when dried and pulverized, has the appearance of ground pumice under the microscope. This fact suggests its use as a polishing or cleansing agent. Probably 20 - 25 tons per year could be consumed locally by soap makers and electroplaters, because this material would have the advantages of lower shipping costs over similar products shipped in. Some of this material could probably be used to advantage in water paints, calcimine, etc., in colors ranging from light tan or grey to brown. White, blue, some shades of red, green, and yellow can not be obtained with this material. Possibly 5 tons per year could be utilized in the paint business. Apparently 30 tons per year is the largest amount that could be consumed in this area. Outside areas have more economical sources for supplying equivalent material.

The overlying beds apparently have no special or unique qualities of economic value. The sand found in one of the layers is not a pure silica sand. It is not suitable for glass making, the percentage of iron is too high. The sand is not superior for foundry use to ordinary sand found in large quantities near the Columbia and Willamette Rivers.

Since the beds overlying the more valuable white layer are of no special economic value, the white layer should be removed by underground mining, rather than by open pit methods. This will add to the cost of producing the product, but it is possible that a profit of $10 per ton could be realized on the limited tonnage which would be consumed in this area.

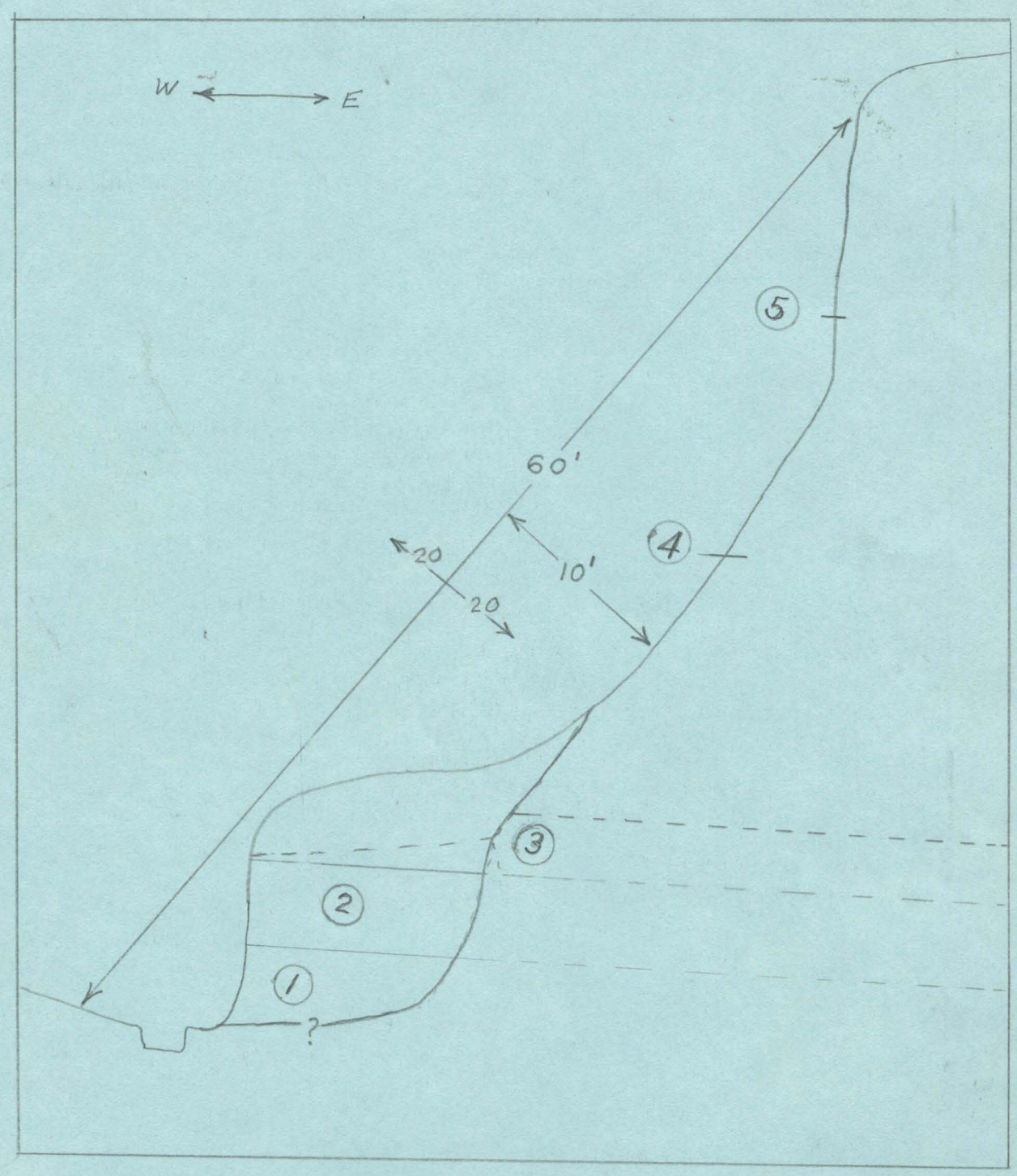
James A. Adams



Terril Silica Treating Plant. Capacity 1 ton / hr.

Condition of Plant: Motors gone.
Rod mill, trommel and bin usable. Building and stack fair.
Rest of plant missing or beyond repair.

J. H. Adams April 24 '41



Cross-section showing dimensions of cut and the points at which samples described were taken.

The mine has been opened through the 4 foot strata of white clay with the highest silica content of all. Open face workings extend up through the 5 foot blue sand strata and 30 foot grey clay strata. Blue clay and grey clay and sand stratas are exposed at several places on the property.

As shown on sections B-B, C-C, and F-F, bed rock slopes to the north on an angle of about 4 degrees; all of the clay and sand stratas are parallel and slope north on an angle of 3 degrees 40 minutes. About the middle of the property a slip extending nearly to bedrock has sloughed off to the south, and at the south central boundary the top deposits are mixed. However, the bulk of the material is in place, is accessible, and can be easily worked. Marketable material extends from bed rock to grass roots, and processing need not be expensive.

Core drilling was used on four holes to bed rock, and showed all stratas above white clay strata to be consistent in depth, pitch and texture. Samples of all stratas were saved and analysis were made of: No. 1, Grey Sand; No. 4, White Sand; No. 5, Blue Clay; No. 7, Grey Clay; No. 8, Blue Sand; No. 9, White Clay, and No. 10, Blue Clay.

The attached letter of Mr. E. P. W. Harding, Analytical Chemist, gives the result of samples that I submitted to him:

Zeno Laboratories,
Portland, Oregon

7/26/30

Gentlemen:

Following is the result of analysis of samples received from Mr. Nelson:

SAMPLE NUMBER	LOSS ON IGNITION	SILICA	ALUMINUM OXIDE	FERROUS OXIDE	CALCIUM OXIDE	MAGNESIUM OXIDE
1.	7.96	62.64				
4.	7.58	65.64				
5.	9.02	61.84	19.55	5.67	2.02	2.30
7.	9.58	60.20	19.40	6.56	2.32	2.26
8.	8.25	62.88				
9.	6.95	66.24	16.68	4.08	2.04	1.32
10.	10.14	59.94	18.88	6.74	1.86	2.24

All analyses were made on air dried samples, and the Loss on Ignition above reported includes hygroscopic moisture as well as any Water of Constitution in the minerals.

Respectfully submitted,

(Signed) E.P.W. Harding

(LOG OF HOLES)

Hole #1 - Elevation 389.8

20'	Top Soil	
13' 4"	Grey Sand	Sample #1
10'	Clay	Sample #2
9'	Red Sand	Sample #3
11'	White Sand	Sample #4
15'	Blue Clay	Sample #5
5'	Mixed clay & Sand	Sample #6
30'	Grey Clay	Sample #7
5'	Blue Sand	Sample #8
5'	White Clay	Sample #9
43'	Blue Clay	Sample #10

Bed rock at 148'

Hole #2 - Elevation 384.9

3'	Top Soil	
12'	Red Sand	Sample #1
15'	White Sand	Sample #2
24'	Grey Clay	Sample #3
6'	Mixed	Sample #4
26'	Grey Clay	Sample #5
9'	Blue Sand	Sample #6
4'	White Clay	Sample #7
36' 6"	Blue Clay	Sample #8

Bed rock at 135' 6"

Hole #3 - Elevation 218.5

1' 8"	Top Soil	
4' 4"	Red Sand	Sample #1
7'	Blue Clay	Sample #2
6' 6"	Blue Sand	Sample #3
3' 6"	White Clay	Sample #4
42'	Blue Clay	Sample #5

Bed rock at 65'

Hole #4 - Elevation 208.0

4'	Top Soil	
8'	Red Sand	Sample #1
16'	Blue Sand	Sample #2
17'	Grey Sand	Sample #3
3'	Blue Clay	Sample #4

Bed rock at 48'

In computing the quantities I have attempted to segregate the 10 well defined stratas in order from top down to bed rock. A pleasant surprise is the enormous strata of blue clay on bed rock. The following results were obtained:

Grey Sand		17,020 Cu. Yds.	(Analysis #1)
Light Clay	(37,200 Tons)	24,800 " "	
Red Sand		23,010 " "	
White Sand		34,700 " "	(Analysis #2)
Blue Clay	(74,490 Tons)	49,660 " "	(Analysis #3)
Mixed		20,490 " "	
Grey Clay	(225,712 Tons)	150,475 " "	(Analysis #4)
Blue Sand		32,060 " "	(Analysis #5)
*White Clay	(40,895 Tons)	25,930 " "	(Analysis #6)
Blue Clay	(506,310 Tons)	337,540 " "	(Analysis #7)
TOTAL		715,685 Cu. Yds.	

Respectfully submitted,

(Signed) U. Ernest Nelson

Registered Professional Engineer
406 - Oregon - Nov. 8, 1919

- -

* Tooth Powder