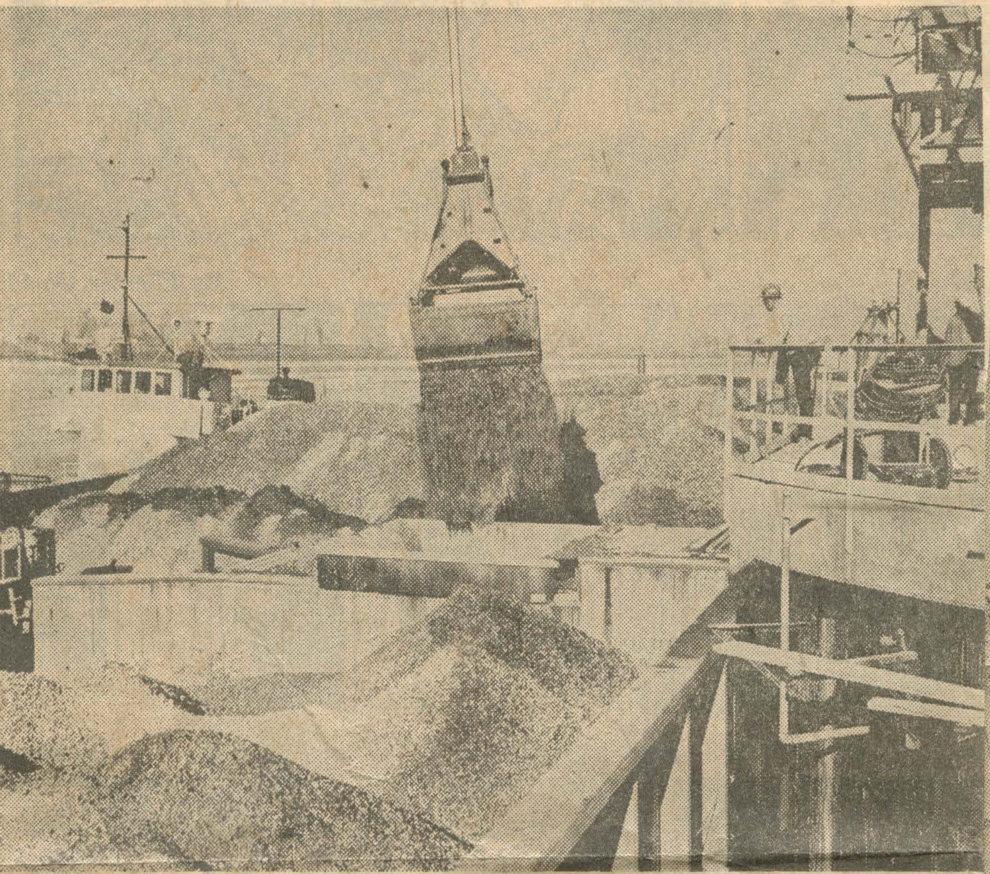
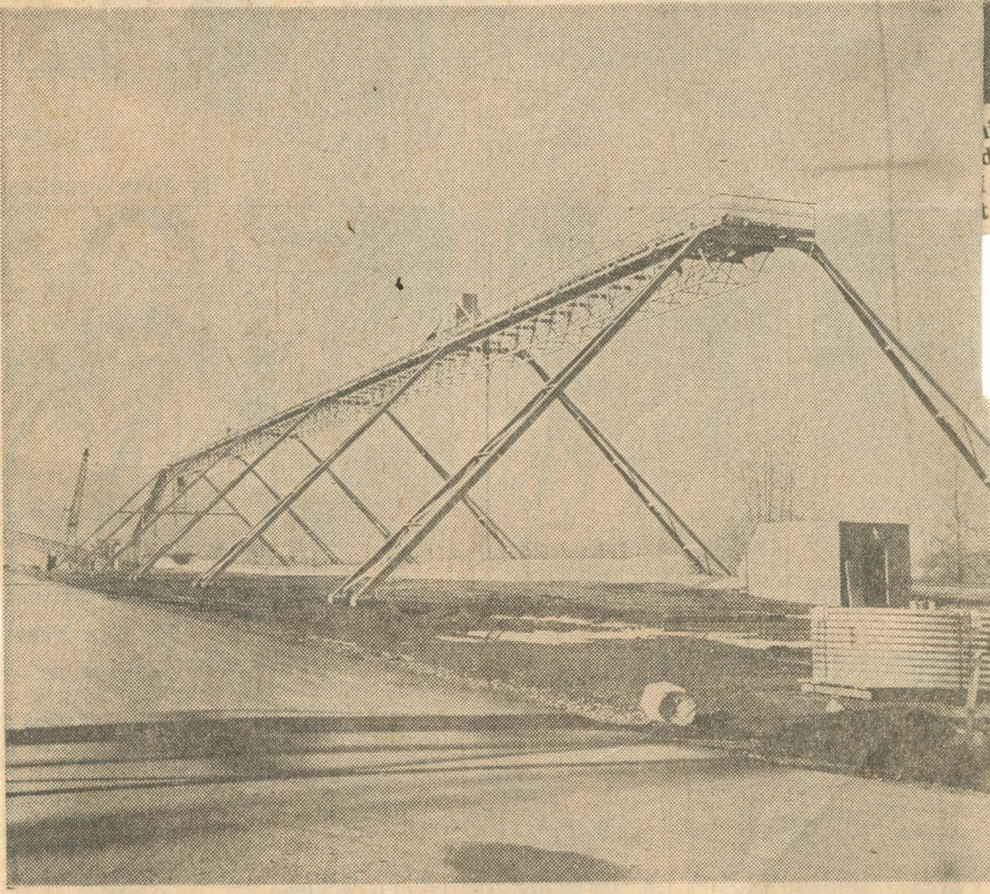
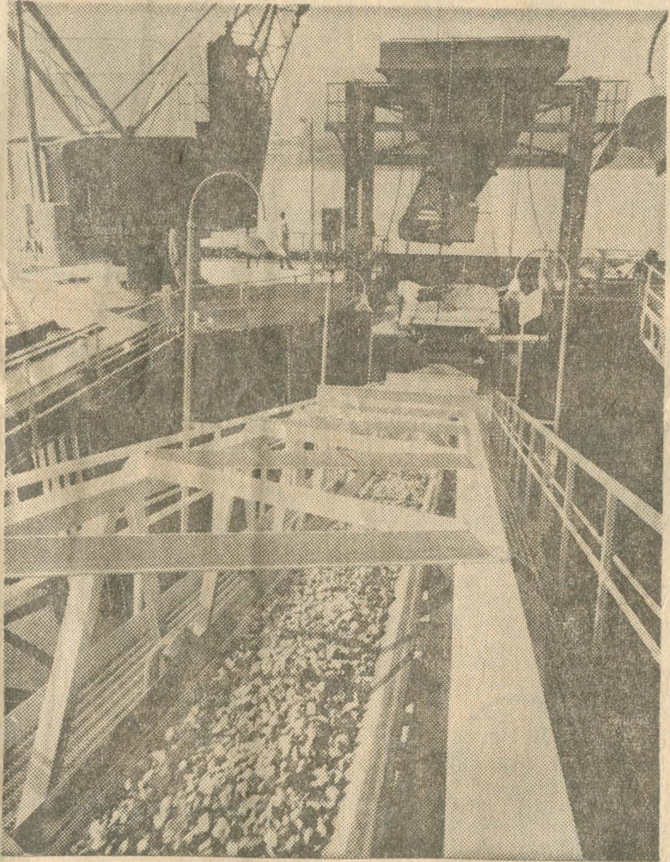
First Limerock Load Arrives



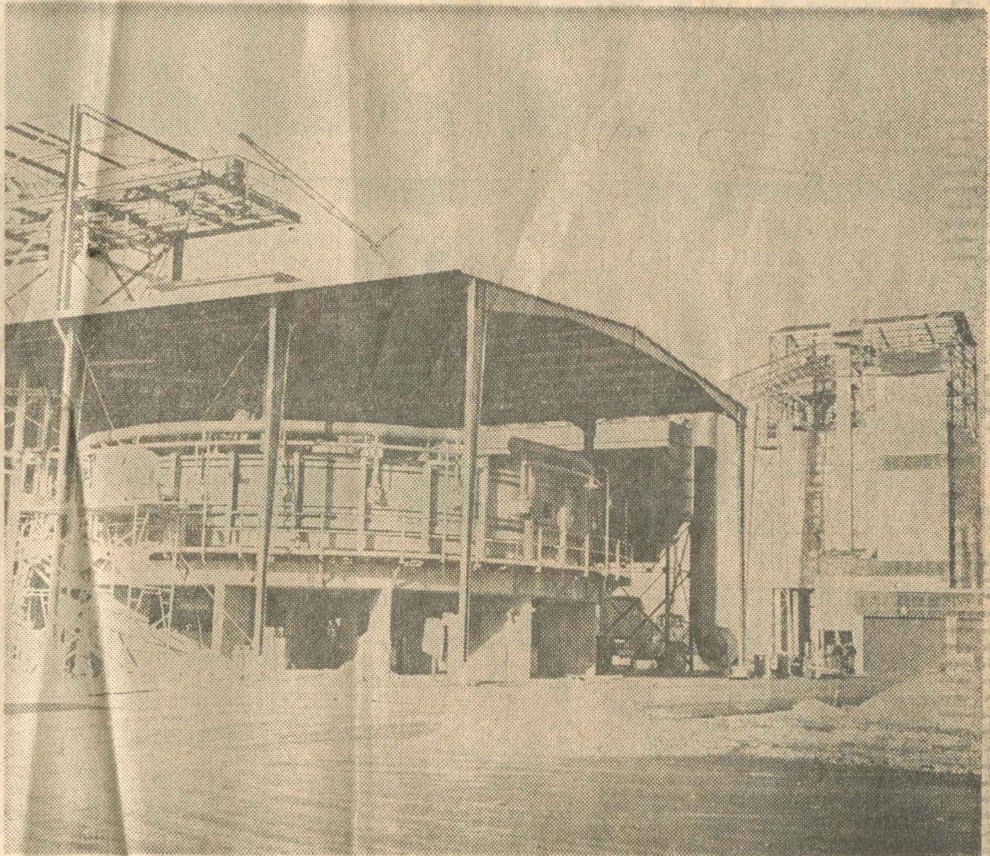
FIRST BIG GULP of limerock for new Ash Grove Lime & Cement plant in Rivergate district is dropped by bucket into hopper over the unloading conveyor. Barge brought 6,800 tons of rock in initial shipment, to be followed by 175,000 tons a year. Limerock is quarried on Texada Island, B. C., is reported worth $5 a ton on arrival.



HUGE STOCKPILE of limerock will be built beneath this overhead conveyor, shown dropping the initial barge shipment in long pile. Ash Grove expects to stack 50,000 tons of rock here, between sprawling legs of conveyor before plant starts operation in February. Conveyor is designed to handle 700 tons of rock an hour from barge.



ON ITS WAY, limerock travels up inclined conveyor from barge to stockpile. Derrick and hopper are parts of new barge berthing and unloading complex recently completed for Ash Grove Lime & Cement Co.



ROTARY HEARTH KILN of revolutionary type is being built for processing limerock into industrial lime. At right is towering storage bin to hold lime and load it into cars and trucks for shipment. Kiln is one of two, which will produce 250 tons of lime a day from 500 tons of raw rock. Plant represents an investment of $3.5 million.

Canadian Lime Rock Raw Material For Portland Cement

FIRST BARGE load of lime rock from Texada Island, British Columbia, arrived at new Ash Grove Lime Rock and Portland Cement Co. plant, River Gate Industrial Park, Friday. Plant, which cost more than $500,000 will produce 250 tons of lime a day for use throughout Northwest. Although considerable deposits of lime rock exist near Spokane, company says it is more economical to barge twice-a-month loads (7,500 tons per trip) from Texanda Island, 70 miles north of Vancouver, B.C. Vancouver Tugboat Co., which will haul barges here, hopes for backhaul business, even from as far away as San Francisco. Picture on left shows barge being unloaded. Other picture shows elaborate conveyor belt system used to transport lime rock to processing plant.

New Agricultural Limestone Plant Now Operating in Illinois Valley

By MRS. FRITZ KRAUSS

SELMA — A new industry is getting into production in the Illinois Valley.

E. W. "Jiggs" Morris, who started building an Agricultural Limestone plant just off the Caves Highway has the building finished and running.

The plant is located about two miles from the Oregon Caves. He located the mining claims some time ago. Another party owned some of the claims and Morris said he bought out the other party for "a good electric skillet." He estimates that he has perhaps 4½ million tons of limestone ore in the quarry and when he gets into full production he has set as his goal 100 tons per day of various products.

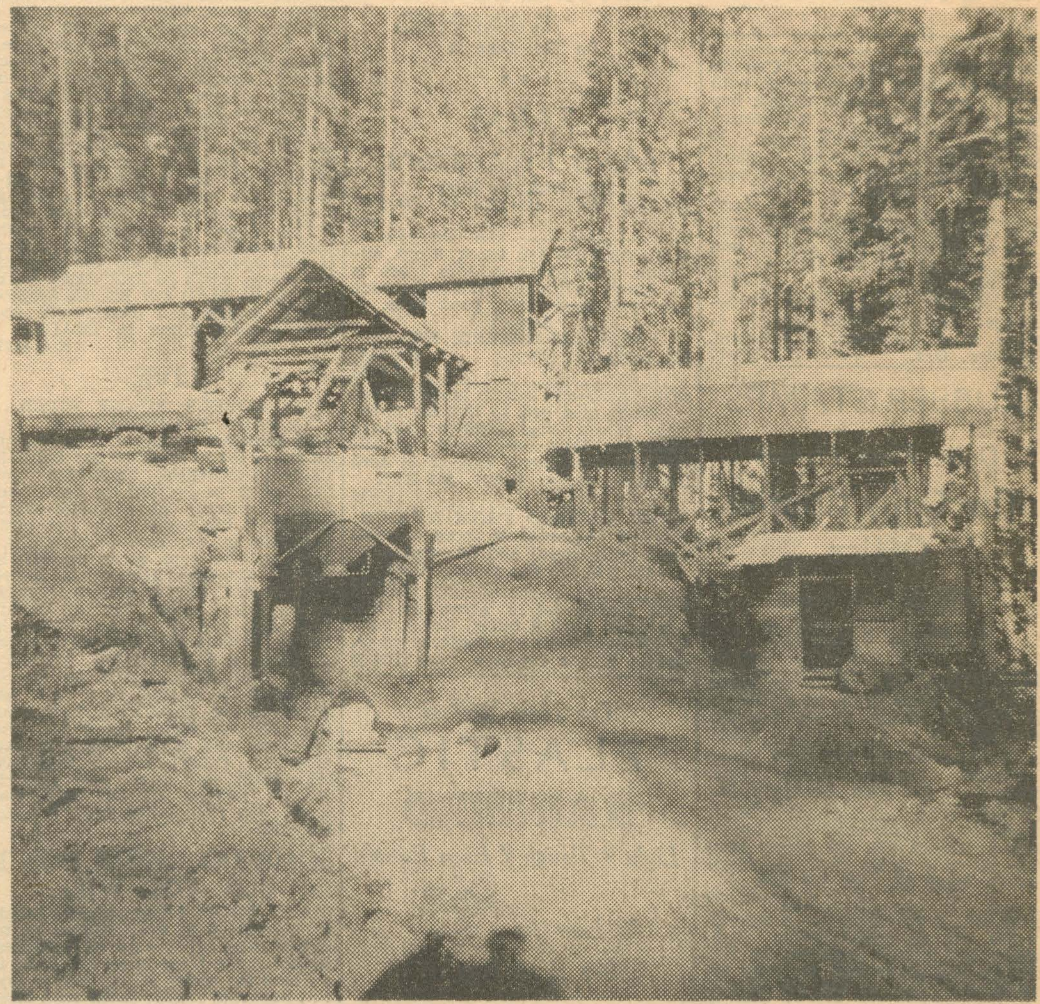
He will be producing chicken grits, gravel for roads and landscaping, and rock for roofing material.

Morris declares that the limestone tests between 90 and 98 per cent pure calcium carbonate. He will handle bag and bulk agricultural limestone.

He had several men employed helping put up the mill but now he and his wife operate the plant. They and their four children live in a house trailer at the plant.

Morris is no newcomer to the mining game. He was born and reared in the mining country in Nevada and took his first underground mining job at the age of 15.

He has lived in the Valley for 18 years and for several years operated a charcoal factory near Takilma.



THIS NEW LIMESTONE PLANT located near the Oregon Caves is expected to produce nearly 100 tons of limestone products per day. It is operated by Mr. ad Mrs. W. W. "Jiggs" Morris. —Photo by Mrs. Fritz Krauss.

Name: Washington Gulch

Owner: Chemical Lime Company, Baker

County: Baker

Location: Sec. 10, T. 9 S., R. 39 E.

Nearest railroad shipping point: Baker

Reserves, tons: 1,900,000

Analysis:

CaO	98.20*
Fe_2O_3 / Al_2O_3	.19
SiO_2	.69
MgO	.32
P	.0129

*Burnt lime basis

Remarks: Explored by diamond drilling.

Marble

March 14, 1972

Mr. D. L. Swingle
Marketing Consultant
Watts Marketing Research Ltd.
Suite 3 - 904 Helmcken Street
Vancouver 1, British Columbia
Canada

Dear Mr. Swingle:

Thank you for your letter inquiring about marble in Oregon.

Oregon currently has no marble production, although many years ago small amounts of it were quarried in the Lostine country of Wallowa County. We have no information on the amount of marble consumed in the State since this movement is directly between producer and local distributor and does not involve our Department in any way. We would like to suggest that some of the firms shown on the attached sheet might be able to provide you with information that would be helpful to you.

We have not observed any trends in the use of marble locally. Currently the 40-story First National Bank Building is being skinned with Italian marble, and a small amount of marble chips goes into terrazzo for flooring.

Sincerely yours,

Ralph S. Mason
Deputy State Geologist

RSM:lk
Encl.

WATTS MARKETING RESEARCH LTD.
SUITE 3-904 HELMCKEN STREET, VANCOUVER 1, B.C.
Telephone: 682-6571
Area Code: 604
Cable Address: "WATTSMARK"

29 February 1972

Oregon Department of Geology and Mineral Industries
1400 S. W. 5th
Portland, Oregon
U.S.A.

Gentlemen:

Our firm has been engaged to conduct a market analysis on marble and marble products on the Pacific Coast of North America. We are seeking information with regard to the following points:

1. the total quantity of marble produced in Oregon
2. the quantity of marble, both domestic and imported, consumed in Oregon
3. the quantity of marble exported from Oregon
4. the forms of marble produced or used, i.e. chips, slabs
5. the sources of marble imported into Oregon

In addition, we hope to identify any trends in marble consumption or production, so we are interested in any comparative statistics available for the above points.

We require your assistance to complete our market analysis and would appreciate any information or statistics your department may be able to furnish.

We would appreciate the earliest possible reply to our enquiries.

Thank you for your attention.

Yours truly,

WATTS MARKETING RESEARCH LTD.

D. L. Swingle

D. L. Swingle
Marketing Consultant

December 21, 1976

Mr. T. E. Shufflebarger, Jr.
Chief Geologist
Pennsylvania Glass Sand Corporation
Berkeley Springs, West Virginia 25411

Dear Mr. Shufflebarger:

At the present time there is only one high-calcium limestone producer in Oregon. Oregon Portland Cement Company operates an open pit near Lime, Baker County, in the northeastern part of the state, in connection with their cement plant. The company may be reached at 111 S.E. Madison Street, Portland, Oregon 97214. Their phone number is: (503) 232-3116.

Here is a copy of our monthly newsletter, The Ore Bin, which lists all of the known high-calcium deposits in eastern Oregon.

Sincerely yours,

Ralph S. Mason
Deputy State Geologist

RSM:lk
Encl.

PENNSYLVANIA GLASS SAND CORPORATION
BERKELEY SPRINGS, W. VA. 25411

December 14, 1976

State of Oregon Dept. of Geology and
Mineral Industries
1069 State Office Building
Portland, Oregon 97201

Gentlemen:

I am interested in obtaining a list of high-calcium limestone and high-purity dolomite producers in your State. The list should include location of operations and type of mining - open pit or underground.

Many thanks for your help in this matter.

Sincerely,

T. E. Shufflebarger, Jr.

T. E. Shufflebarger, Jr.
Chief Geologist

TES:rj

Limestone

May 22, 1972

Dr. John E. Simmons
Assistant Professor
Business Division
Southern Oregon College
Ashland, Oregon 97520

Dear Dr. Simmons:

This is in response to your letter inquiring about limestone production in southern Oregon. Although we are not in a position to offer detailed information we hope that the following date will be helpful in the preparation of your engineering report for your client.

When the first Texada Island shipments began about 10 years ago it was announced that the laid down cost would be about $3.50 per ton. Very probably the figure is now $4.00 or thereabouts. I cannot reconcile the figures you give unless they refer to costs either f.a.s. or f.o.b. Texada Island. If the latter is true then the figures I gave you over the phone last week are in the ball park. My data stem from various cost studies published in the professional journals and the U.S. Bureau of Mines in recent years.

The statistical branch of the U.S. Bureau of Mines announced several years ago that they were no longer canvassing sugar beet mills for limestone consumption since most of them had installed their own kilns for recycling stone. As for pulp and paper companies, I should imagine that Publishers Paper or Crown Zellerbach might be able to advise you on their buying practices.

The California Division of Mines and Geology, 1341 Resources Bldg., 1416 9th Street, Sacramento, California 95814, can, I am sure, assist you in limestone market information on that state.

There is a rule-of-thumb figure of $2500+ for each daily tone of capacity for estimating capital outlay costs for mines and mills. An open pit operation with limited beneficiation of the stone would lower this figure somewhat unless unusual costs, such as difficult road construction, high stripping ratios and plant construction were encountered. Daily production must necessarily depend upon availability of markets, but too small a throughput increases unit costs, while an increased size greatly ups the capital required for construction. Anything much less than 1000 tons per day would tend to raise production costs out of sight.

The Ideal Cement Company operated the Marble Mt. quarry south of Wilderville for many years as a source for stone for their Gold Hill plant. I would presume that Ideal found that their costs for delivered stone plus their great distance from markets made the decision to close down imperative. As I mentioned over the phone last week, the basic problem faced by a limestone producer in southwestern Oregon is the lack of sufficient local markets (which could be supplied without competition) and the considerable distances to markets nearly all of which are supplied by competitors.

Sincerely yours,

Ralph S. Mason
Deputy State Geologist

RSM:lk

SOUTHERN OREGON COLLEGE

Ashland, Oregon 97520

Business Division
Phone (503) 482-6483

May 15, 1972

Mr. Ralph S. Mason
Oregon State Department of Geology and Minerals
State Office Building
5th and Jefferson Street
Portland, OR 97201

Dear Mr. Mason:

It was a pleasure talking to you yesterday regarding the various problems involving limestone quarrying in Southern Oregon. Your comments were quite helpful and brought to mind many of the problems which might be encountered. However, in order to help my client, I would like to review some of the topics which we discussed.

The first area of concern is the present competition from British Columbia. I obtained some further information in this regard from Mr. Ray M. Broughton, who is the Director of Economic Market Research at the First National Bank of Oregon. He indicates that the majority of limestone which is being imported comes from Texada Island, British Columbia. He furnished me with the following data. There are three grades of limestone and the following are figures for 1971:

GRADE	TONS	$VALUE
#1 Ground	22,736	$ 26,829
#2 Chips	396,082	467,377
#3 Crushed	123,284	314,429

This material is being shipped to the following customers: Pacific Carbide, Ashgrove Lime, and Oregon-Portland Cement.

As you can see, it is easy to arrive at a figure per ton which averages out to $1.18 per ton. This is a discrepency between the figure of $4.00 per ton in Portland, that you furnished me. Do you have any suggestions as to how I could confirm your figures? You also stated that it costs the British Columbia Firm 75¢ per ton to load limestone into barges. How did you arrive at this figure and is there some way which I could confirm it?

In rechecking my figures, I find that my client feels that he would have to charge $4.00 per ton at a rail head here in Southern Oregon. Based on this, it does not appear to be feasible for my client to become involved in this project.

SOUTHERN OREGON COLLEGE

Ashland, Oregon 97520

Business Division
Phone (503) 482-6483

We also discussed various users of limestone products. You indicated that sugar beet processors would not be interested in large quantities of lime since they are presently recycling their lime. Is there some source of which I can confirm this fact? Also, you stated that the paper industry is another poor project, since they require long term commitments. Do you have any suggestions on how I could confirm this problem? Possibly you know of a user.

We discussed the problems of marketing in Oregon as well as in California. Is there a similar agency to yours located in California with whom I might correspond? It is possible that they have been confronted with this problem before and I could get their opinion regarding the California marketing of this product.

In addition, you indicated that a large capital investment somewhere in the neighborhood of a quarter of a million dollars would be necessary to undertake a project which would be competitive. On what basis do you make this assumption?

Finally, could you furnish me with the name of the company which operated for some time in the Gold Hill-Grants Pass area? I would like to correspond with them in order to find out what some of the problems were which brought about their decision to close down their operations in this area? I appreciate your time in this matter since it has been of great assistance. I would appreciate an answer as soon as possible on the above matters since my client is pressing me for some research results. What you have told me does confirm what I have heard from other sources. This would be a very poor venture for my client. My concern at this time is that we furnish him with as much data as possible as soon as possible, in order to prevent any rash, unwise investment on his part.

I thank you again for your time and help in this matter.

Yours truly,

John E. Simmons

John E. Simmons
Assistant Professor

bjc

Sept 19 - 1940 (4)
J.E.H.

Oregon Lime Products Co Quarry.

Quarry extended as indicated on map.
Strike E-W, dip 8-10° S! (not N-S?)
Major beds (6-10') well defined.

Work slipshod. 4 men breaking up rock by hand & loading truck by hand. Recommend bench cutting & bulldozer loading? Glory hole tunnel from below? Drive shaft & get thickness, & then back off and go in lower go E. & pick up end, & go in there?

. Roads all shale. Some basalt on crests, shown by red soil. Dalles = Lower Tertiary.

Oswego Portland Cement Quarry
Bedding striking approx N-S, 10°E dip
55% J.B. Bywaters in charge.

(Buell Ls. highgrade at Surface.)

Quarry 50' thick average.
"See Bill Loughlin at Willamette U. for fossil collection from quarry."

W.D.S. has report —

RECONNAISSANCE NOTES

November 20, 1944

W.D. Lowry

Polk County, Dallas Sheet -

County basalt quarries about half a mile west of Ellendale, 2 miles W. N.W. of Dallas, elevation about 500 ft.

The basalt is badly fractured and altered along the fractures. The basalt is fine-grained and hard or flinty. "Slickentite" is common and calcite fills some cracks and fractures. This rock is much more altered dynamically than any Columbia River rock and I think it may be of Umpqua age. Sample taken. The greenish-gray color of portions of the rock suggests chloritization. The basalt is overlain by a clastic limestone or limy rock made up in part of shell fragments. In that respect it resembles the Marquam limestone.

Lime Products Quarry, about 4 miles S.W. of Dallas, Oregon, elevation 500 ft.

The quarry is about 200 ft. long and 180 ft. wide. It is located on a south slope. The rock is a massively bedded arenaceous limestone which strikes about N. 75°-80° W. and dips 13°-14° S. A number of very steeply west-dipping, mainly north trending faults are discontinuous and probably represent adjustments. Well defined slickensides are characterized by horizontal striations indicating the adjustments were mainly horizontal. Relative movement varies with the faults. The main quarry face is into the hill and up dip. The working face is about 30 feet, with some 15 feet of unleached limestone. Leaching by weathering has followed fractures and fault surfaces and the bedding. It converts the limy rock into a rather sharp brown sand.

An apparently stratigraphically younger stratum is exposed in the road cut about 1 mile south of this quarry and 1½ miles north of Bridgeport. It is tuffaceous siltstone which seems to be rather common in this area. Two samples of the rock being quarried were collected.

Oregon Portland Cement Company quarry, about 3½ miles S.W. of Dallas, Oregon, elevation 600 ft.

This quarry is now reached only by a road which takes off from the main road at the Oakdale School. It leads east and then south to the machine shop which is nearly a mile by road from the school. A narrow gauge railroad leads west and northwest to the quarry. The massively bedded limestone strikes about N. 30°-35° W. and dips 6° to the northeast. The rock is probably the same strata as that at the Lime Products quarry. This quarry appears to be located on the northeast limb of the same northwest trending anticline as the Lime Products quarry which is on the southwest limb. However, the lower dip at, and the greater elevation of the Oregon Portland Cement quarry suggest it is nearer the crest of the anticline. Fossil wood, crabs, clams and probably others were noted. Possibly Solen, Crepidula, and an echinoid are also present.

About 2 miles S.W. of Burns Corner on new Kings Valley highway, elevation about 600 feet, and on north side of drainage divide.

Road cut in dark gray, slacking shale. Examine sample collected for forams. Might be Umpqua age; more like Keasey.

McTimmonds Valley, road cut about 1 mile south of McTimmonds School and in front of house and north of intermittent east-draining creek, elevation 300 ft.

Limy carbonaceous, micaceous sandstones. They are lousy with muscovite and resemble the lower portion of the Helmick beds at Helmick Hill which are also quite limy. The McTimmonds beds may possibly be the same age as the Dallas limestone and all may belong to the Helmick beds.

AGRICULTURAL LIMESTONE IN THE WILLAMETTE VALLEY, OREGON

INTRODUCTION:

Can "agrock*" be produced in the Willamette Valley at prices farmers can afford? In an effort to answer this perennial problem, the State Department of Geology and Mineral Industries has undertaken a coordinated survey of the problem, utilizing several means of attack. A field survey of all reported occurrences of limestone in the valley has been made, and a geologic report on them is included in this paper. A number of metallurgical tests have been made by this Department and by the United States Bureau of Mines, in order to determine, if possible, whether the low-grade limestones of the valley can be beneficiated economically. A cost survey of the possible sources of agrock has been made, in an effort to determine the possible cost to the farmer, or what it might be under optimum conditions.

ABSTRACT:

Statement of the problems involved: In answering the question "Can agrock be produced in the Willamette Valley at prices farmers can afford?" there are a number of subsidiary problems that must first be solved. Some of the most important of these may be listed as follows:

1. Are there any deposits of commercially usable high-grade limestone within the Willamette Valley or close by?

2. Are there any large deposits of low-grade rock within the valley that might compete with higher grade deposits located outside the valley?

3. What are the costs of limestone used within the valley at the present time for agricultural purposes?

4. Is it possible to bring the cost of limestone being brought into the valley from outside points down to a figure that will ~~permit the farmer to use substantial~~ amounts?

5. Is it possible to decrease costs by means of beneficiation or by larger scale operations so that calcium carbonate can be furnished to the farmers at a low enough cost to permit them to use substantial amounts?

CONCLUSIONS REACHED:

1. All deposits of lime now known to exist within or immediately adjacent to the Willamette Valley are either of relatively low-grade (below 75% calcium carbonate content) or are in the form of narrow (less than 4 feet thick) calcite veins the mining costs of which would be excessive.

2. There are two ~~and~~ or perhaps three deposits of low-grade lime (from 30 to 75% calcium carbonate content) within the valley, which may be of sufficient size to compete with higher grade deposits located outside the valley. These deposits are located near Dallas, Marquam, and Buell. The first two are

Poorly stated

Complete how — clarify

* The Terms "Agrock" and "Agstone" are abbreviations commonly used for agricultural rock and agricultural limestone.

at present producing agstone, the third has been tested but has never produced. All other properties visited seem to be eliminated from the economic picture,--either by their extreme low-grade and small size, or by their heavy overburden and distance from market.

3. The costs of agricultural limestone used within the Willamette Valley in 1940 were:

Source	Cost per ton of stone at plant	% $CaCO_3$	Transportation & spreading 50 mile radius.	Cost per ton of $CaCO_3$ spread on field
Limestone Products Co. Silverton, Oregon	$2.75	55-65%	$2.00	$7.30 within 50 mi. radius of plant at Dallas
Oregon-Portland Cement Oswego (Eastern-Oregon higrade lime)	5.00	98%	2.00	$7.15 within 50 mi. radius of Oswego
State Lime Plant, Salem	5.00	95%	2.00	$7.35 within 50 mi. radius of Salem

4. The cost of limestone can probably be brought down 25% below 1940 prices (Approximately $7.20 per ton of pure calcium carbonate spread on the field). This decrease in cost alone will probably not increase the lime consumption more than 25% over 1940's figure. Undoubtedly a much larger tonnage of lime could have been consumed profitably by the farmer even at the 1940 price. Evidently more wide-spread information regarding the benefits derived from liming is needed. This information in order to be of any practical use should deal with each farmer's own particular problem. Since the annual consumption in the valley is 15,000 to 25,000, and since this lime was consumed at a profit to the user, it is safe to assume this is a mere fraction of the tonnage that could be consumed profitably, because as quoted elsewhere in this report, over 100,000 tons are required to maintain satisfactory soil reaction in the valley. The amount that actually will be consumed is more dependent on sales effort than possible price reduction.

5. Beneficiation Purification of Willamette Valley limestone by flotation is not economically feasible because freight and handling savings effected ~~effectively~~ do not pay for the cost of treatment. Under what conditions?

Large-scale production from any source is justifiable only if:--

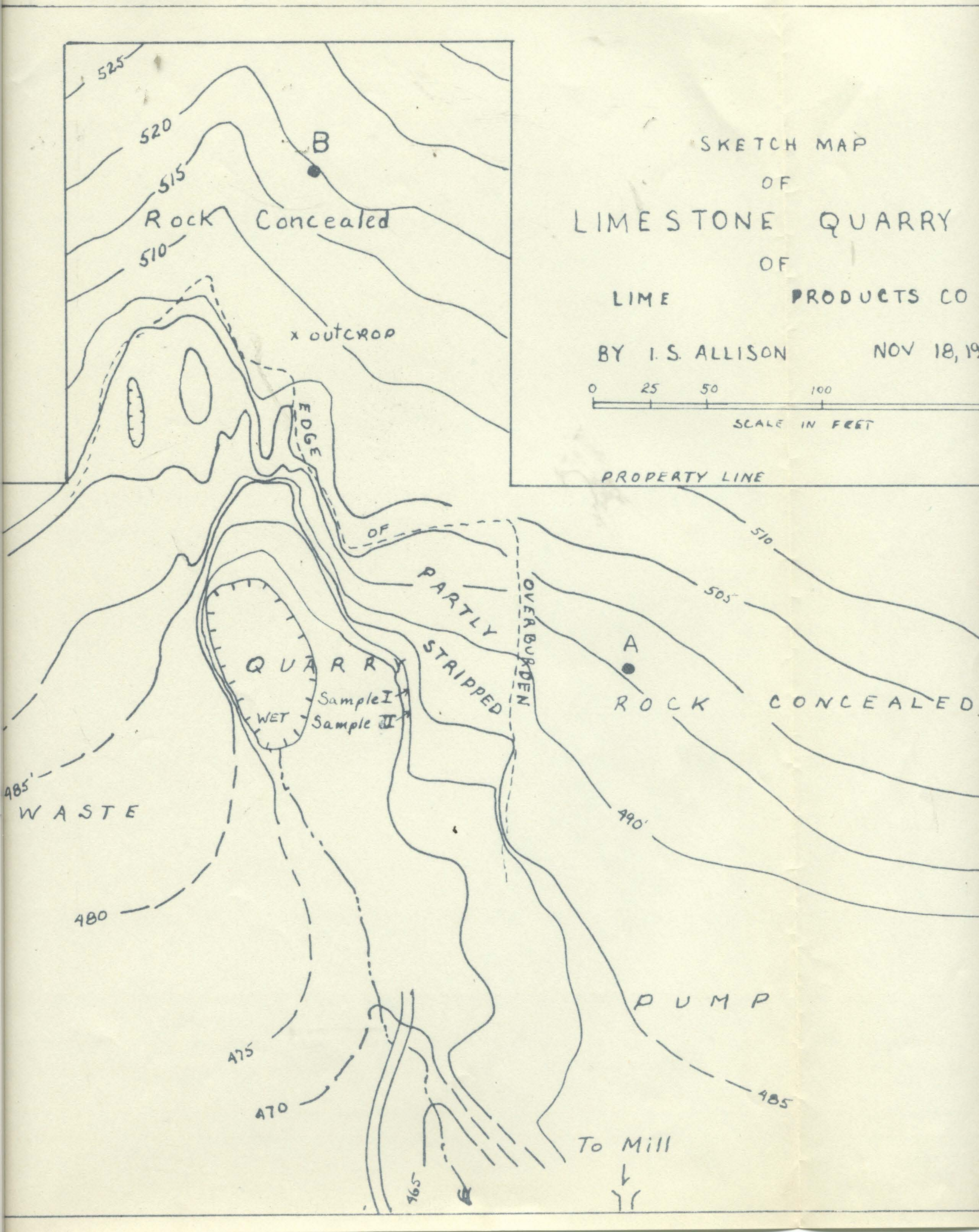
1. The character of the deposit permits low cost quarrying - which it is.
2. The size and purity of the deposit justifies the erection of a large plant which it may
3. The cost at which a ton of calcium carbonate can be quarried, milled, transported, and spread on the field is low enough to secure a satisfactory volume of sales for large scale operation.
4. (should be first) There is large demand.

The first and second factors listed above are more or less fixed. Once a deposit is located with these two qualifications, lime consumers in the area most economically supplied from that source should cooperate with the producers in an educational program on the benefits derived from liming and do their buying through some central cooperative distributing agency. The almost complete elimination of sales and advertising expense possible through cooperative effort would very probably affect a saving of 25% in the cost of the lime to the farmer.

In view of cheaper transportation charges than from other sources Limestone shipped from ~~Grants Pass~~ southwest Oregon in trainload lots and distributed from bunkers located at Tangent, McMinnville, and Silverton will undoubtedly prove to be one of the most economical and satisfactory sources for most of the farmers in the valley, and will probably be delivered at a cost low enough to insure a considerable sales volume.

If the argillaceous limestone near Dallas can be produced at the plant for less than \$2.00, and if this type of limestone reacts efficiently with soil, this deposit also offers an economical source of supply for the immediate area. It appears there is a large enough need for limestone in the Willamette Valley to insure a considerable market from both the Grants Pass and Dallas sources.

Your mind jumps all over the map. Be consecutive.


SKETCH MAP
OF
LIMESTONE QUARRY
OF
LIME PRODUCTS CO
BY I. S. ALLISON
NOV 18, 19
0 25 50 100
SCALE IN FEET
PROPERTY LINE
525
520
515
510
B
Rock Concealed
x OUTCROP
EDGE OF PARTLY STRIPPED OVERBURDEN
510
505
A
ROCK CONCEALED
QUARRY
WET
Sample I
Sample II
485'
WASTE
490'
480
PUMP
475
470
485
To Mill
465

Polk

Dallas
Buell

HODGE — Willamette Valley Lime

Polk County

3 m. S.W. of Dallas Sec. 11 & 12. N-S, 7°E. 10' thick. Shales.
3/4 m. W. of quarry. 1000' wide, NW. strike, low dips.
Sec. 19-20, T. 6. S., R. 6 W. S. of Willamina, and
due W. of Buell. Assoc. w. ss.
~~Benton Co.~~ 6 drill holes, ave. 44' deep, $CaCO_3$ 27.16%
~~Vicinity of Kings Valley~~

Report on the

Property

of

Lime Products Company

near

Dallas, Oregon

By Ira S. Allison
November 21, 1933

SUMMARY

The quarry of the Lime Products Co. is situated about 6½ miles by road from Dallas, Polk County, Oregon, near the western edge of Willamette Valley and is accessible both by road and by rail. The rock is a tuffaceous, sandy limestone of marine origin. Beds aggregating twenty to thirty feet or more have an average composition of 70 to 75% calcium carbonate. The tonnage readily accessible near the present quarry is estimated to be 300,000 to 400,000 tons, with additional tonages in prospect as development proceeds. The overburden varies from less than 10 feet to more than 25 feet. The principal product is agricultural limestone for treatment of acid soils.

Location and Accessibility

The property of the Lime Products Co., an Oregon Corporation, includes about 186 acres, mostly in SE¼ sec. 11, T. 8 S., R. 6 W., in Polk County, Oregon. The legal description is as follows:

Beginning at a point 9.75 chains South of the Quarter section corner between Sections 11 and 12 in Township 8 South of Range 6 West of the Willamette Meridian, and running thence West 4.63 chains; thence North 2.83 chains; thence West 2.06 chains; thence South 2.78 chains; thence West 9.06 chains; thence North 12.50 chains; thence West 21.76 chains to the center of the Dallas-Falls City County Road; thence South 27 degrees West along said County Road 2.10 chains to the West line of the North-east quarter of the Southwest corner of the Southeast quarter of Section 11 aforesaid; thence East 20 chains; thence South to the North line of Wm. Gillian D. L. C. No. 50; thence East along said line to where it intersects a small branch Northerly through the Northeast quarter of Section 14, thence following said branch in a Northerly direction to where said branch crosses the East line of said Northeast quarter of Section 14; thence North along the East line of Sections 11 and 14 aforesaid to the place of beginning, and containing in all 186.35 acres, more or less, Polk County, Oregon.

The quarry is located in the northwestern part of SE¼ NE¼ SE¼ Sec. 11, six and onehalf miles by road southwest from the county courthouse at Dallas, and about 5 miles by road northeast from Falls City. Its position is shown on Figure 1. One road from Dallas passes within 1.1 miles from the quarry, and another within about 2.3 miles. These roads are surfaced with gravel or oiled macadam and can be traveled at all seasons of the year. The private road connecting with the quarry is graded and in fairly good condition; the addition of a little crushed rock to a few soft spots will be sufficient to maintain it through the wet season. A spur of the Southern Pacific Railway also extends to the quarry site, so that facilities are available for shipment either by rail or by truck.

General Information

Elevation and Topography.-- The quarry is situated at an elevation of about 500 feet above sea level in a small valley nestled within rolling hills along the eastern edge of the Coast Range and near the western margin of the Willamette Valley plain. The local relief is generally only 100 to 300 feet; the slopes in the immediate vicinity of the quarry are gentle. (See Figure 2). Drainage is furnished by small creeks which flow southward to Little Luckiamute River and thence to Willamette River.

Climate and Vegetation -- The region has a mild, temperate climate with rainy winters and dry summers. The mean annual temperature is about 50° F. and the annual precipitation 60 to 70 inches, mostly in winter. Snowfall is light and the snow does not stay long on the ground. Under these equable conditions outdoor work is possible the year around with little delay or inconvenience from unfavorable weather conditions.

Near the quarry the hill slopes are partly open grass-land, and partly covered with brush and small hardwood trees, chiefly oak, while fir predominates on other parts of the holdings.

Water - A small amount of surface water is available in a small branch passing thru the property and additional supplies of water are obtainable from wells.

Power, Fuel and Labor. Electric power is available at the plant from the distribution lines of Mountain States Power Co., Feel for heating purposes is supplied by wood, which locally is abundant and cheap, and by petroleum products. Labor experienced in quarring and crushing rock (chiefly for road purposes) is readily available.

History

Local property. The quarry was opened up by parties several years ago for the production of limestone for agricultural purposes. The last production was early in 1932. The exact causes of the shut-down are not known to the writer, but are thought to be associated with problems of management and marketing. No figures are available for the output, but according to the size of the quarry pit, the total may have been ten or twelve thousand tons.

Adjoining Property. The Oregon Portland Cement Co. owns a tract of land lying north of the area under consideration and periodically has produced stone for use in making cement. Their quarry is situated in NW¼ of NW¼ Sec. 12, T. 8 S., R. 6 W., a little more than a half mile north-northeast of the Lime Products Co. quarry, in what is believed to be a continuation of the same deposit. The quarry presents a 40-foot face and is estimated to have yielded more than 100,000 tons of rock.

Description of the Property

Holdings. The property consists of about 186 acres of land, a quarry, a spur track and right-of-way, a partially rebuilt mill for crushing the limestone, some used machinery, a shop, powder house, wood shed, bunk-house, out-buildings and miscellaneous equipment. Although not new, the improvements are serviceable or can be made so at moderate expense. The spur track was appraised at $9548.48 by the Standard Appraisal Co., Portland, Oregon, on February 27, 1828, and an agreement with the Oregon Portland Cement Co. for joint use of about three miles of railroad was valued at $45,000 by the same firm. Although prices have since declined, these assets still have considerable value.

Workings. The quarry is of the open, hill-side type, as shown in the map, Figure 2. Its present shape is somewhat irregular; its principal dimensions are about 75 by 150 feet, with the long axis trending north-northwest and with the opening to the southeast. The overburden had been stripped off the solid rock along the west side of the quarry during previous operations and additional stripping has recently been in progress over an area of about 400 sq. ft. along the east wall, where it is planned to renew operations as soon as the mill can be made ready.

The hillside position permits disposal of waste down the slopes and affords drainage. Although the quarry is now partly wet, mainly as a result of clogging of drains during a period of idleness, the condition is remediable.

Map. A part of the property near the quarry is mapped in Figure 2. The scale of the map is 50 feet to the inch and the contour interval 5 feet. The starting elevation was determined by means of an aneroid which was set at Dallas so the elevations stated are only approximate but the relative elevations were determined with the aid of an alidade and plane table and should be accurate within a range of a few feet.

Geologic Setting

The rock exposed at the quarry is a part of what is locally called the "Dallas beds" occurring in the midst of a thick series of east-dipping sedimentary beds of marine origin. Recent studies of the fossil fauna of these beds by Stokesbary (unpublished thesis, Oregon State Agricultural College, Dept. of Geology, 1933) suggest that they are of late Eocene age. Formation names however, have not been assigned and regional correlations have not been completed.

Petrology

Character of the Rock. The rock is an impure tuffaceous, sandy limestone and grades into a calcareous, tuffaceous sandstone with which it is partly interbedded. It consists of 50 to 75% or more of Calcite (calcium carbonate) and scattered grains of quartz, mica and other mineral fragments presumed to be largely of colcanic origin. Evidently the rock was deposited on the floor of the sea at a time when volcanic origin. Evidently the rock was deposited on the floor of the sea at a time when volcanic explosions were taking place not far away. The marine origin is proved by the presence of shells of foraminifera (about the size of pin-heads), of nautilus, sea-urchins, and other marine animals. The rock is bluish white to dark bluish gray or locally almost black in color- the darker tints being due to finely divided car-bonaceous matter disseminated through the rock. Occasional waterworn pieces of carbonized wood occur here and there. The texture varies with the size of the crystals, from dense, finegrained limestone up tocrystalline limestone with crystals about an eighth of an inch in diameter, and with the abundance of the tuffaceous matter which tends to give the rock a sandy texture.

Thickness The rock exposed in the quarry is approximately 30 feet thick at the highest part of the face; its ~~excel~~ extent below the floor of the quarry is not known. Similar rock with some inter-beds of less purity are said to have been pen-etrated to thicknesses of 5 to 20 feet or more in exploration drill holes, whose positions are shown on the accompanying map. The log of hole A is said to show of 11 ft. of overburden, 14.5 ft. stone, 1 ft. sand, 6.5 ft. stone, 1 ft. sand, 5.5 ft. stone, 0.5 ft. sand, 6 ft. stone, 0.5 ft. sand, and 4.5 ft. stone — total depth 51 ft. The log of hold B is said to show 9 ft. of overburden, 5 ft. stone, 2.5 ft. dirt, 1 ft. stone, 4.5 ft. dirt and 50 ft. stone, total depth 72 feet.

Hole C is said to show 18.5 ft. clayey overburden, 9.5 ft. broker shale and stone, 3 ft. stone, 0 ft. sand and 23 ft. stone—total depth 55 ft. Hole D is said to have penetrated 17 ft. of clayey overburden and 13 ft. of broker shale and rock—total depth 28 ft. None of the cores were seen by the writer but the logs suggest that layers of hard limestone, more or less interbedded with thin sandy streaks, are present in thickness sufficient to justify active quarrying.

Chemical Composition. Samples of rock from this deposit, numbered 402, 461, 462 and 463, were analyzed by the Montana Assay Office, Portland, Oregon, under date of February 15, 1928, and showed 77.03, 70.2, 62.8, and 70.5% $CaCo_3$ respectively, or an average of 70.13%. The exact source, size and other data on the samples how-ever, are not known.

A series of samples analyzed for the Dallas Lime Plant, Harry M. Wirt, Mgr., by the Experiment Station Chemist, J. S. Jones, in June, 1929, gave the following results:

#17,680	66.00% $CaCo_3$
17,681	85.50
17,682	62.50
17,683	76.00
17,684	72.20
17,685	80.00

The average of these six analyses is 73.70% $CaCO_3$.

A sample sent in about the same time by Mr. J. R. Beck, County Agent of Polk County, showed 72.50% $CaCO_3$ (Ex . Sta. No. 17,688).

Another lot sent in by Mr. Beck in Sept., 1929, and analyzed by Mr. Jones, showed the following:

#17,710	77.25% $CaCO_3$	
17,711	77.25%	From stock piles on farms
17,712	77.30	
17,713	79.10	From the quarry
17,714	92.80	Labeled "Rock from new ledge."

The three analyses numbered 17,710 and 17,712, inclusive, are deemed to be of special value because they show the character of the rock which was actually being delivered to the farmers from the quarry at that time and because the sampling was done by the county agent, whose honesty and motives are unquestionable. The average of all the analyses listed above is 73.56% Ca Co_3. Excluding the extremely low analysis (51.75%) and the unusually high one (92.80%), the average is but little different--73.74%.

Analyses of the cores obtained from holes A, B anc C were made by the State Chemist in two series. The first tests were made on pieces taken at specific levels in the holes; the second tests were on sections of the cores, mostly in 10-foot lengths, which were crushed as a whole and then quartered down to convenient size. The writer did not see the cores and had no part in preparing the samples and therefore cannot judge their reliability except on the basis of consistency with the field exposures and the results of other tests. Because they seem to meet these requirements, they are included here as they were reported to me. The results are said to be as follows:

In Hole A

At 19 ft. level	61.56% $CaCO_3$	11 to 21 ft. section	70.875%
24 ft. level	75.55	21 to 31 ft. section	76.875
29 ft. level	73.06	31 to 41 ft. section	81.125
39 ft. level	67.65	41 to 51 ft. section	59.750
50 ft. level	44.32		
Average	64.43	Average 11 to 41 ft.	76.29
		Average 11 to 51 ft.	72.15

In Hole B

At 11 ft. level	52.18%	9 to 22 ft. section	69.875
26 ft. level	72.29	22 to 32 ft. section	66.875
37 ft. level	42.81	32 to 42 ft. section	56.37
		42 to 52 ft. section	54.50
		52 to 62 ft. section	45.375
		62 to 72 ft. section	40.0
Average	55.76	Average 9 to 32 ft. section	68.37
		Average of all	55.50

In Hole C

28 to 38 ft. section	80.5% $CaCO_3$
38 to 48 ft. section	79.5
48 to 55 ft. section	86.87
Average	82.29

Of these analyses those representing Hole A, averaging 76.29% $CaCO_3$, for 30 ft. and 72.15% for 40 ft., those representing the 9 to 32 ft. levels in Hole B., averaging 68.37%, and those representing Hole C, showing the unusually good average of 82.29% for 27 ft., are especially noteworthy.

The average of all the analyses of these core sections is 66.81% $CaCO_3$. If only the upper 21 ft. of Hole B is included, the average is 78.11% $CaCO_3$.

Since the analyses reported above showed variations principally from about 60 to about 80% $CaCO_3$, and an apparent average of somewhat over 70%, the writer on November 18, 1933 selected two samples to serve as a check. One was a composite consisting of twenty pounds of rock broken off in small chunks at vertical intervals of a few inches across a 12-foot face(and thus across the bedding) on the east side of the quarry. Both high-grade and somewhat sandy material were included in the sample without prejudice. The entire amount was crushed and quartered successively and the final portion of about 50 grams ground fine for analysis. This is Sample I. The other sample consisted of one thin slab of rock broken off parallel to the face, including parts of several beds, and weighing 39 pounds. This slab was broken down and quartered, and a finely ground portion of about 50 grams saved for analysis. This constitutes Sample II.

Analysis of these new samples were made by Dr. R. E. Stephenson, Soils Dept., Oregon State College, with the following results:

Sample I-----------------65% $CaCO_3$
Sample II----------------75% $CaCO_3$

These values accord very well with the other data.

The grand average of 32 analyses given above, including four made by the Montana Assay Office, thirteen by Prof. J. S. Jones, thirteen of the core sections by the State Chemist and two new samples by Dr. R. E. Stephenson, shows a content of 70.60% $CaCO_3$. In view of these analyses and the further fact that the quarry previously delivered material of 77.5% grade, it appears that production of rock running 70 to 75% $CaCO_3$ may reasonably be expected. Care in quarrying so as to exclude all weathered and apparently sandy rock and include only firm, fresh rock might raise the grade to a little better than 75%

<u>Weathering</u> The rock weathers to a poroux, brown sandy material, principally in the early stages by leaching of the calcium carbonate and in the later stages by alteration of the tuff grains. The leached sandy residue grades into sticky brown clayey over-burden, but the contact with the unleached rock is fairly sharp so that it is possible by simple inspection to segregate good rock from that which has been spoiled by weathering. On the other hand the contact between them is not a plane surface but is highly irregular with irregular peaks and hollows showing a relief of 5 or 6 ft. or more, as is characteristic of coroded limestone surfaces. Most of the hollows are located along joint fissures which have permitted ready access by surface waters. Differential leaching of the beds also tends to produce corrugations parallel to the bedding lines along the sides of joints or at other exposures. These irregularities require the use of some hand labor in clearing the overburden and weathered rock out of the hollows and recesses, although the greater part of the striping can be done by power machinery.

<u>Workability</u>. The rock is easy to drill, easy to blast, and easy to crush and grind. It is not appreciably harder than most limestones in spite of the impurities. It

It therefore rates high in workability

<u>Structure.</u> The rock is well bedded but the bedding is shown best by light and dark banding and not by bedding plane separations. Faint sandy streaks and corrugations on the weathered edges also indicate the bedding lines. The beds at the quarry strike somewhat east of north and dip southeast at a gentle angle. Readings taken at different places vary somewhat, possibly on account of local movements or slumping. The regional strike of the area is N. 10°E., and the prevailing dip 5° to 15° eastward. The extension of the quarry will carry the face mostly up-dip or parallel to the strike— both favorable directions.

The main joints in the rock are nearly vertical and strike nearly vertical and strike nearly N-S in one set and E-W in another. A few others do not conform to any system. The joints are spaced from a few feet to a few tens of feet apart. In general they are not abundant. Although jointing facilitates removal of rock, it also facilitates weathering and spoilage of the rock, so that in this case the weak to moderate development of joints is a favorable, rather than an unfavorable, condition.

Quantity of Rock Available

On the basis of the exposures in the quarry and the results of test drilling, together with the analyses quoted above, it appears that there is available in the immediate vicinity of the present quarry a thickness of at least 20 ft. and possibly 30 ft. more of rock of about 75% grade.

The rectangular block in which drill hole B is located, north of the quarry, is approximately 200 ft. square. On the conservative basis of 20-ft. layer of usable rock, this block would yield about 800,000 cu. ft. (200 x 200 x 20) of rock, or (allowing 12 cu. ft. per ton) about 66,666 tons.

On the basis of a 20-foot thickness, a strip east of the quarry, averaging 250 feet wide from north to south and extending say 550 feet east and west (approximately the distance from the quarry to drill hole C), would yield about 2,750,000 cu. ft. (250 x 550 x 20), or about 229,166 tons. A 30-ft. thickness in this block would increase the figure to 343,750 tons. The drill hole data tend to support the larger figure.

Additional rock lies west of the quarry and probably east of C also. Moreover there is additional acreage which has not been prospected, but present data do not justify inclusion of the outlying areas in an estimate of tonnage. It is sufficient for the moment to take account only of the rock readily available in the limited areas immediately north and east of the present quarry. As stated these include about 66,666 tons in the north of B block and 229,166 to 343,750 tons or more in the east block—or a total of 295,832 to 410,416 tons, or in round numbers 300,000 to 400,000 tons. At a production rate of 50 tons per day, 300 days a year, this quantity would last 20 to 26 years; at 100 tons a day, 10 to 13 years; and proportional periods at any other rate.

The estimate of the Standard Appraisal Co., Portland, Oregon, Feb. 27, 1928, gave "1,600,000 tons of limestone averaging 71.8% calcium carbonate on the total area of approximately twelve acres," but the basis of the estimate was not stated. It is possible that future developments may reveal substantial additions to the known reserves but at the present time predictions of enormous tonnages are scarcely warranted. That a very substantial supply is available however is reasonably certain.

Overburden

The overburden has been fairly well removed from an area of about 300 sq. ft. northwest of the quarry, and partially removed from an area of about 400 sq. ft. along the east side. It appears to be 3 to 10 feet thick in this section. The drill hole at A is said to have penetrated 11 feet of overburden, that at B 9 ft., whereas at C and D the overburden of clay and broken rock seemed to be 28 ft. Increase of overburden near C appears to be indicated, but the data are insufficient to show whether it may be expected to average 15 ft., 20 ft., 25 ft. or some other figure. Since A and B are not far from a small wash beside which the quarry was opened, it seems likely that the overburden in the vicinity of these drill holes probably does not exceed 10 to 15 feet except perhaps in local pockets along joints in the underlying rock. Thickness up to these figures will not preclude quarring; whether the removal of the thicker overburden will be economical will depend on future developments. The analyses, it will be recalled, seem to show a good grade of rock underlying the thick overburden at C.

Marketing

The principal use of the product will be for agricultural limestone, the great need of which in the Willamette Valley is attested by soil scientists of Oregon State College and the Agricultural Experiment Station. An area within 100 miles of this deposit could use profitably its entire output at a capacity rate. Outside the Dallas area there are no other limestone beds in Willamette Valley to supply this need. A deposit of vein calcite at Blackbutte, 17 miles south of Cottage Grove, Oregon, and 110 miles from Dallas, is the nearest substitute. Limestone deposits in southwestern Oregon and in extreme eastern Oregon can be supplied to Willamette Valley farmers only at rates which substantially limit consumption. Increased use of local material offsetting unnecessary transportation charges, is greatly to be desired.

The product should be sold on the basis of its content of calcium carbonate and at a sufficient discount to warrant the handling of the inert fraction

Preparation

For use in soil treatment the rock must be crushed and ground to fine sizes. At the time of the writer's visit to the property a size 2 9 3/4 Acme jaw crusher for primary breaking, a 2-foot Smith gyratory crusher and a 12 x 30 inch Union Iron Works roll, operated by 30-, 40-, and 20-horsepower General Electric motors using 220-volt current, together with appropriate conveyors and hoppers, all more or less used, were being installed and should be ready for operation within a short time.

Respectfully submitted

Ira S. Allison, Geologist

(A)

BLM Mineral Specialists Meeting
Bend OR April 15, 1993

LIMESTONE / LIME - most uses require high purity & high tech

carbonates - usually $CaCO_3$
- but also dolomite or dolomitic

$50/ton lime - finely ground carbonates
- more properly: calcined
900-1200 °C → CO_2 ↑ time, grainsize, xllnty

quicklime CaO
hydrated or slaked $Ca(OH)_2$ + CaO ± - dry to liquid
~~[illegible]~~ burnt lime - calcined
high calcium limestone + 95% $CaCO_3$
< 1% $MgCO_3$
inerts relatively less critical
except silica if abrasive sensitive
micronized - finely ground; impact, sand
precipated calcium carbonate - PCC ; $CaCO_3 \rightleftarrows CaO + CO_2$

USES

aggregate
steelmaking - decrease due to scrap; flux & slagging agent
cement
agriculture - Ca source, pH increase
glass - essential alkali in melt, fluxing agent
soil stabilization - reacts w clays → cementious bond
water & sewage treatment - pptn; pH
fillers - paints, puttys, plastics (e.g. PVC) chewing gum charcoal briquettes
environmental - pH control, eg. lakes

(B)

chemicals – e.g. calcium carbide → acetylene →

FGD – paper – gold mining

flue gas desulfurization – removal of SO_2
wet scrub – +150 megawatts, lime or limestone
dry injection of hydrated lime
both form gypsum
dry injection of sodium cmpds – trona, nahcolite, soda ash
forms sodium sulfate
"Consolv" – Union Carbide → elemental S
as yet – no industry standards
– no standard process

paper – pH, coating, filling
pH
filling – alkaline process only
– bulking agent; reduces pulp requirements
coating – smooth filled surface
– ink receptivity
– opacity; partially replacement for TiO_2
– major competitor is kaolin
PCC vs finu ground
Columbia River Carbonates
must be low abrasive

PCC – coating, cigarette papers
ground – filling

(C)

gold mining
~~pH control~~
SO_2 removal
pH control
flotation circuits
waste drainage
cyanide leach
maintain pH of 10-11
prevent formation of hydrogen cyanide gas
2-5 # / ton of ore [Echo Bay Round Mtn
3500 tons ore/day]

Deposit requirements — uniformity
one example: lime production
15 million tons proven (by drilling) reserves
+30' thickness
250 mile transport radius
small grain size
high calcium
exceptions: captive deposit could be smaller
transportation variable
product price
methods available
volume

chemistry
brightness/whiteness
grain size + calcined characteristics