

First Limerock Load Arrives



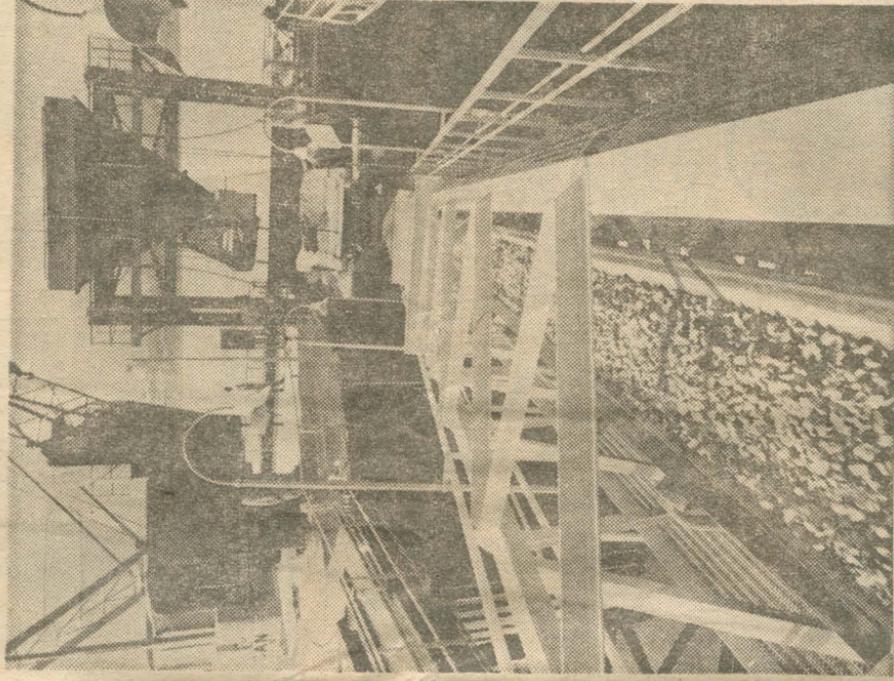
FIRST BIG GULP of limerock for new Ash Grove Lime & Cement plant in Rivergate district is dropped by bucket into hopper over the unloading conveyor. Barge

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.

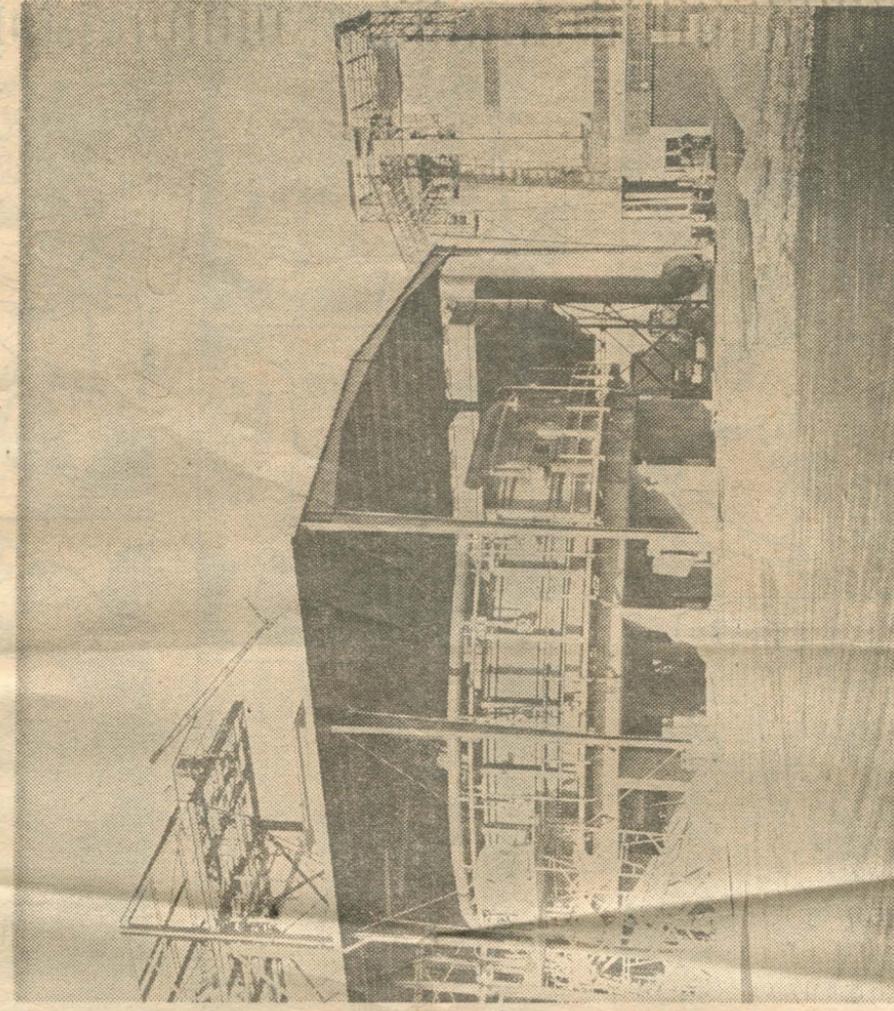


HUGE STOCKPILE of limerock will be built beneath this overhead conveyor, shown dropping the initial barge shipment in long pile. Ash Grove expects to stack

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.



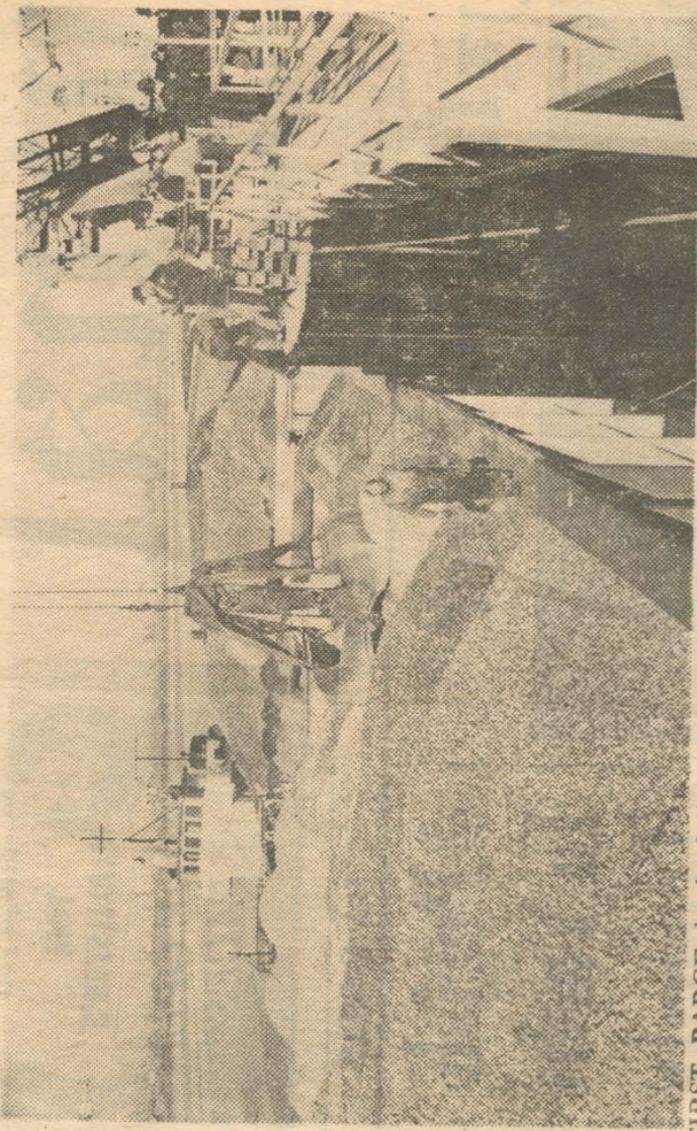
ON ITS WAY, limerock travels up inclined conveyor from barge to stockpile. Derrick and hopper are parts of new barge berthing and unloading complex recently completed for Ash Grove Lime & Cement Co.



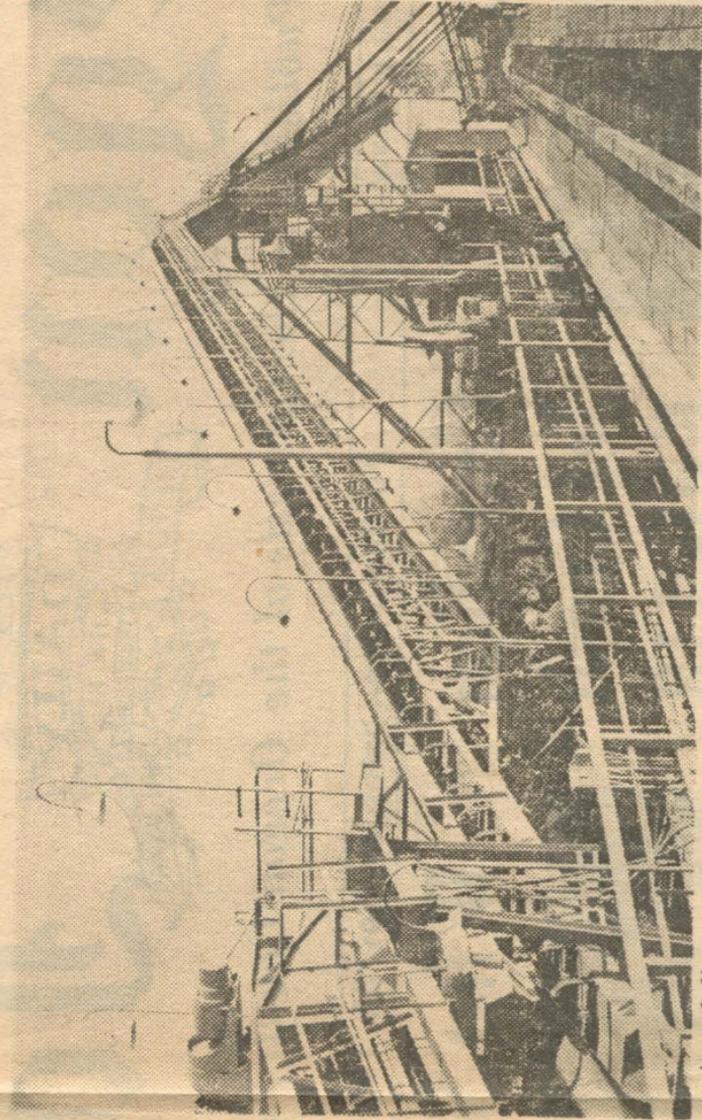
ROTARY HEARTH KILN of revolutionary type is being built for processing limerock into industrial lime. At right is towering storage bin to hold lime and load it into

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 Line 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 North-



west. 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 Texada 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 $4\frac{1}{2}$ 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.

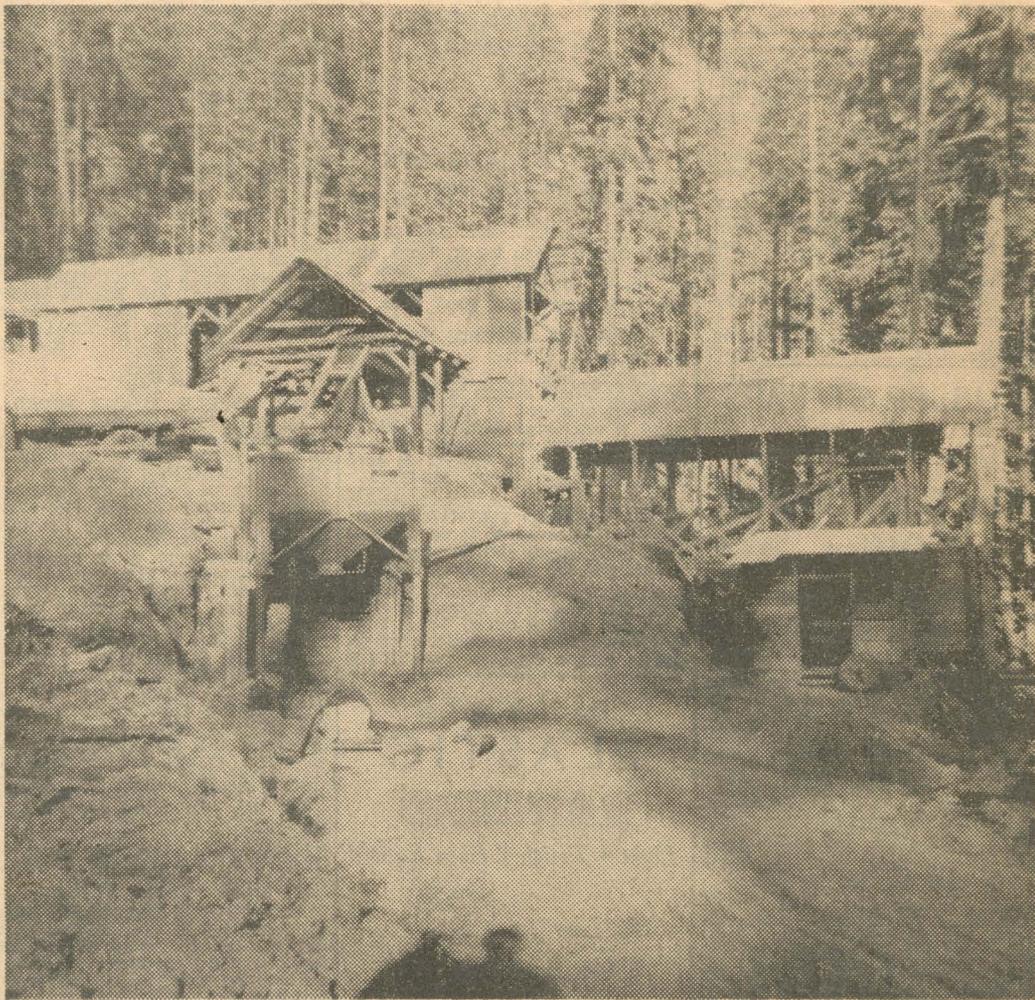
He will be producing chicken grits, gravel for roads and landscaping, and rock for roofing material.

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. and 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 ₂ O ₃	
. . . . .	.19
Al ₂ O ₃	
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

MAR 2

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

SSM:lk
Encl.

PENNSYLVANIA GLASS SAND CORPORATION

BERKELEY SPRINGS, W. VA. 25411

December 14, 1976

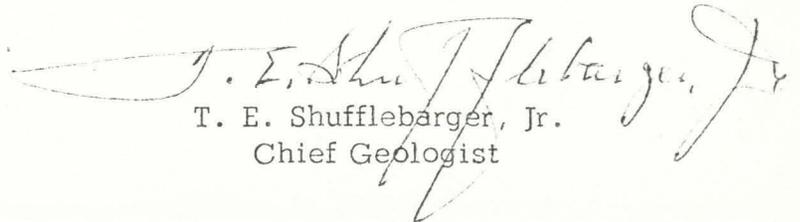
State of Oregon Dept. of Geology and
Mineral Industries
1069 State Office Building
Portland, Oregon 97201

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.
Chief Geologist

TES:rj

RECEIVED-PTLD
DEC 20 1976
DEPT OF GEOLOGY
& MINERAL INDUS.

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 data 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

May 22, 1972

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.

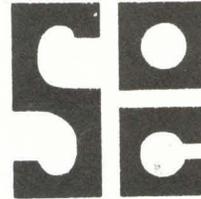
The Ideal Cement Company operated the Marble Mt. quarry south of Wilderville for many years as a source for stone for their Gold Hill plant. I would presume that Ideal found that their costs for delivered stone plus their great distance from markets made the decision to close down imperative. As I mentioned 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.

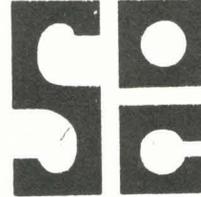
The first area of concern is the present competition from British Columbia. I obtained some further information in this regard from Mr. Ray M. Broughton, who is the Director of Economic Market Research at the First National Bank of Oregon. He indicates that the majority of limestone which is being imported 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 discrepancy 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.



Mr. Mason
May 15, 1972
Page 2

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
Assistant Professor

bjc

Sept 19-1990 (4)
J.E.H.

Oregon Lime Products Co Quarry

Quarry extended as indicated on map.

Strike E-W, dip $8-10^{\circ}$ S! (not N-S?)

Major beds (6-10') well defined.

Work slipshod. 4 men breaking up rock by hand & loading trucks by hand. Recommend bench cutting & bulldozers 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 $1\frac{1}{2}$ 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 $3\frac{1}{2}$ 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^{vey} 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 ^{or} and 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

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

*Probably stated
clarify how?*

at present producing agstone, the third has been tested but has never produced. All other properties visited ^{or located} seem to be eliminated from the ^{present} economic picture, -- either ^{because of very} 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 <i>7.30 based on 65%</i>
Oregon-Portland Cement Oswego (Eastern-Oregon ^{high grade} 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 -- ^{through large volume buying through farmers cooperative association.} (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.

Write

State how?

write argument on policy states

Proof?

5. *Beneficiation*

Purification of Willamette Valley limestone by flotation is not economically feasible because freight and handling ^{ed}savings 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 southwest Oregon
Limestone shipped from ~~Grants Pass~~ 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
This can't be T. 27*

SKETCH MAP
OF
LIMESTONE QUARRY
OF
LIME PRODUCTS CO

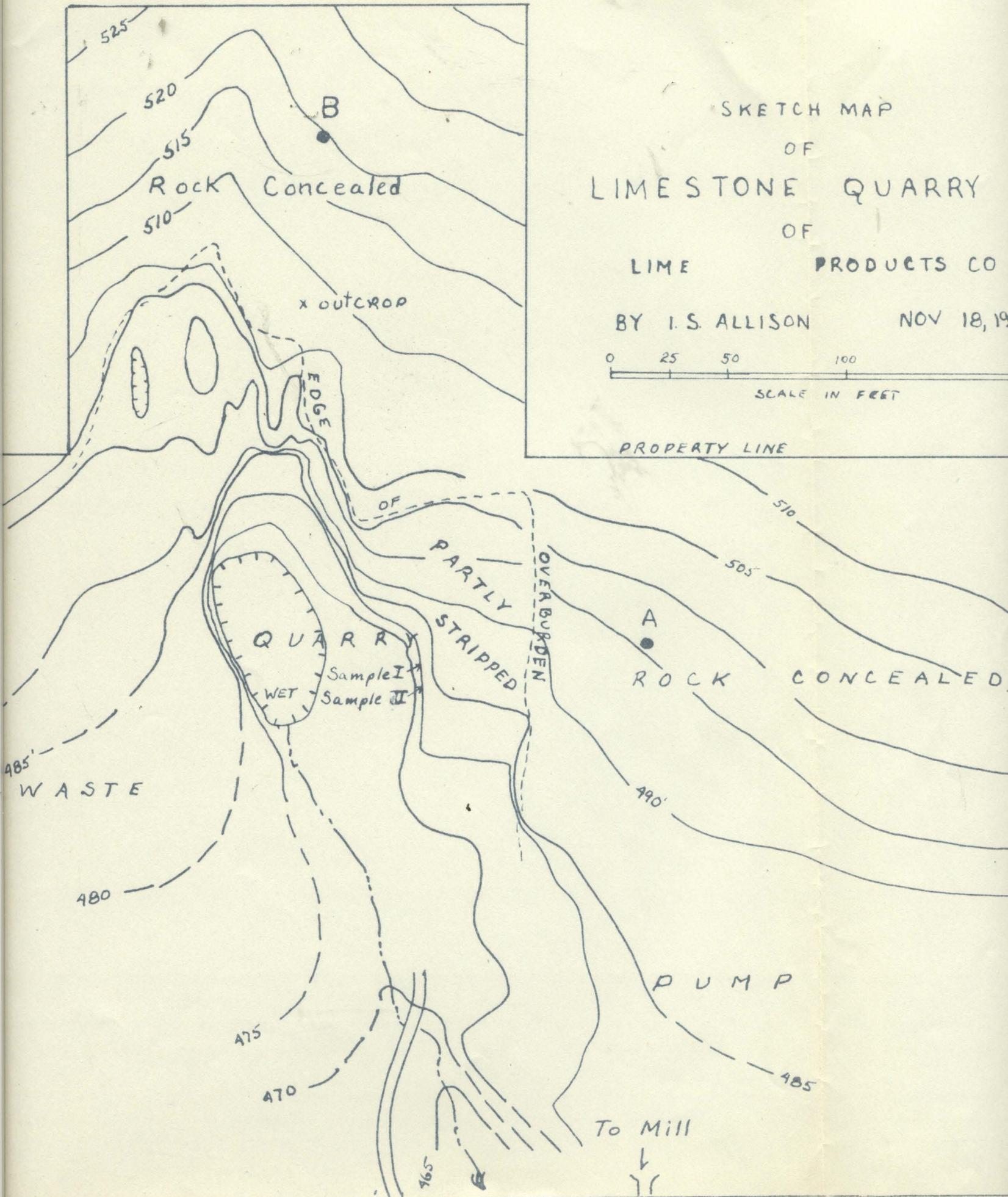
BY I. S. ALLISON

NOV 18, 19

0 25 50 100

SCALE IN FEET

PROPERTY LINE



Polk

Dallas
Buell

HODGE

Willamette Valley Limestone

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 well holes, ave. 44' deep, CaCO₃ 27.16%

~~Vicinity of Kings Valley.~~

Report on the

Property

of

Line Products Company

near

Dallas, Oregon

By Ira S. Allison
November 21, 1933

SUMMARY

The quarry of the Lime Products Co. is situated about $6\frac{1}{2}$ 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 SE $\frac{1}{4}$ 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 SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 11, six and one-half 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., Fuel for heating purposes is supplied by wood, which locally is abundant and cheap, and by petroleum products. Labor experienced in quarrying 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 NW $\frac{1}{4}$ of NW $\frac{1}{4}$ 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, 1928, 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 volcanic 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 carbonaceous 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 to crystalline 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 ~~excess~~ extent below the floor of the quarry is not known. Similar rock with some inter-beds of less purity are said to have been penetrated 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. broken 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 broken 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% CaCO₃ respectively, or an average of 70.13%. The exact source, size and other data on the samples however, 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% CaCO₃.

A sample sent in about the same time by Mr. J. R. Beck, County Agent of Polk County, showed 72.50% CaCO₃ (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
17,712	-----	77.30		farms
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% CaCO₃. 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 and 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% CaCO₃, 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% CaCO₃. If only the upper 21 ft. of Hole B is included, the average is 78.11% CaCO₃.

Since the analyses reported above showed variations principally from about 60 to about 80% CaCO₃, 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% CaCO₃
Sample II ----- 75% CaCO₃

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% CaCO₃. 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% CaCO₃ 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%

Weathering The rock weathers to a porous, 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 corroded 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.

Workability. 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 therefore rates high in workability

Structure. 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 71.3% 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 quarrying; 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 $\# 9 \frac{3}{4}$ 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

85/100

lime - finely ground carbonates
- more properly: calcined

$900-1200^\circ C \rightarrow CO_2 \uparrow$ fine, grain size, xltly

quicklime CaO

hydrated or slaked $Ca(OH)_2$ + $CaO \pm$ - dry to liquid
~~calcined~~ 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

precipitated calcium carbonate - PCC; $CaCO_3 \rightleftharpoons CaO + CO_2$

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 \rightarrow cementitious bond

water & sewage treatment - pptn; pH

fillers - paints, putties, plastics (e.g. PVC) charcoal briquets

environmental - pH control, e.g. lakes

(B)

chemicals - e.g. calcium carbide \rightarrow acetylene \rightarrow

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 compounds - trona, nahcolite, soda ash

forms sodium sulfate

"Consolv" - Union Carbide \rightarrow 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 fine ground

Columbia River Carbonates

must be low abrasive

PIC - coating, cigarette papers

ground - filling



gold mining
~~pH control~~

SO₂ 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 Mine

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

ABOUT MOUNDS BY A. J. COLLIER (CIRC. 1914, MENTIONED
IN PROO V. 1 N. 7

William Holmes 228 1833

L.S. IN OAK IRS WILLIAMS

2255 NW OVERTON ST.

CAVE IN LIMESTONE IN TILLAMOOK COUNTY

OCT 18 1963

Plans To Mine Onyx In Area Announced

Plans to start mining operations northwest of Diamond lake for travertine onyx have been announced by Troy Cardine, Azalea, Ore.

Cardine, who has claims on 40 acres of the property near Clearwater camp and Toketee Falls, said that he plans to start operations in the spring. Prior to that time, he said, he hopes to dispose of some carving quality onyx on the property and rockhounds are welcome in the area. He noted that the travertine onyx is available on top of the ground.

The onyx ranges in color from white to green and brown. The property is south of the Umpqua river and signs will be installed for directions, Cardine said.

AGRICULTURAL LIMESTONE SURVEY¹

County	Western Oregon ²		Maximum That Could Be Used	Maximum Price Estimated for Maximum Consumption
	Used Last Year	Used This Year		
Clatsop	75*	300**	1,000	\$5.00-6.00
Tillamook	1,000	1,000	20,000(1)	
Lincoln	900	700?	5,000/	
Columbia	800	800?	11,500	
Multnomah	Not reported			
Washington	8,000	7,000?	13,500	
Yamhill	1,464	1,400?	5,000	
Polk	4,500?	4,544	11,000	
Benton	1,000	1,500?	9,000	
Lane	922	1,164	4,500	
Douglas	500?	500	1,500	
Coos	1,500	500	5,000	
Curry	500	500	1,000/	\$5.00 delivered
Josephine	Nil	Nil	Nil	
Jackson	Not reported			
Clackamas	6,000	6,000	22,500	
Marion	3,266	3,000?	25,000	
Linn	275	300?	900	
Hood River	1,000?	955	2,000	Now paying \$10.00-16.00
Totals	<u>31,702</u>	<u>30,163</u>	<u>138,400</u>	

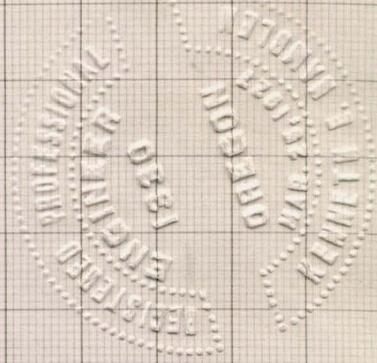
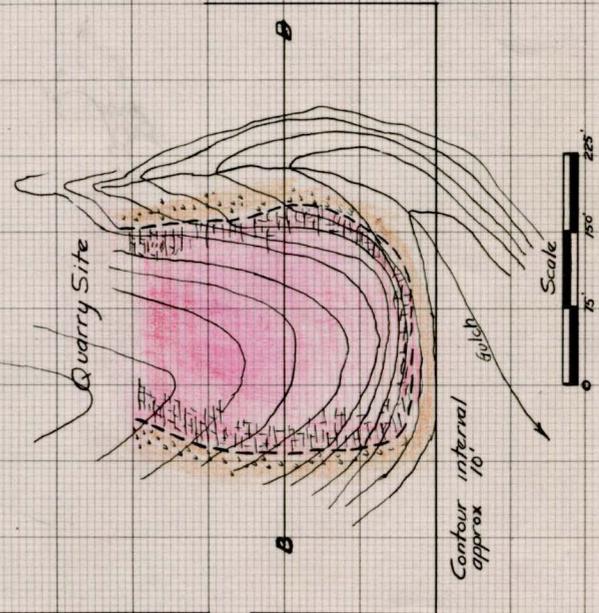
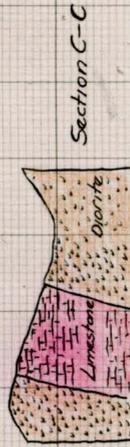
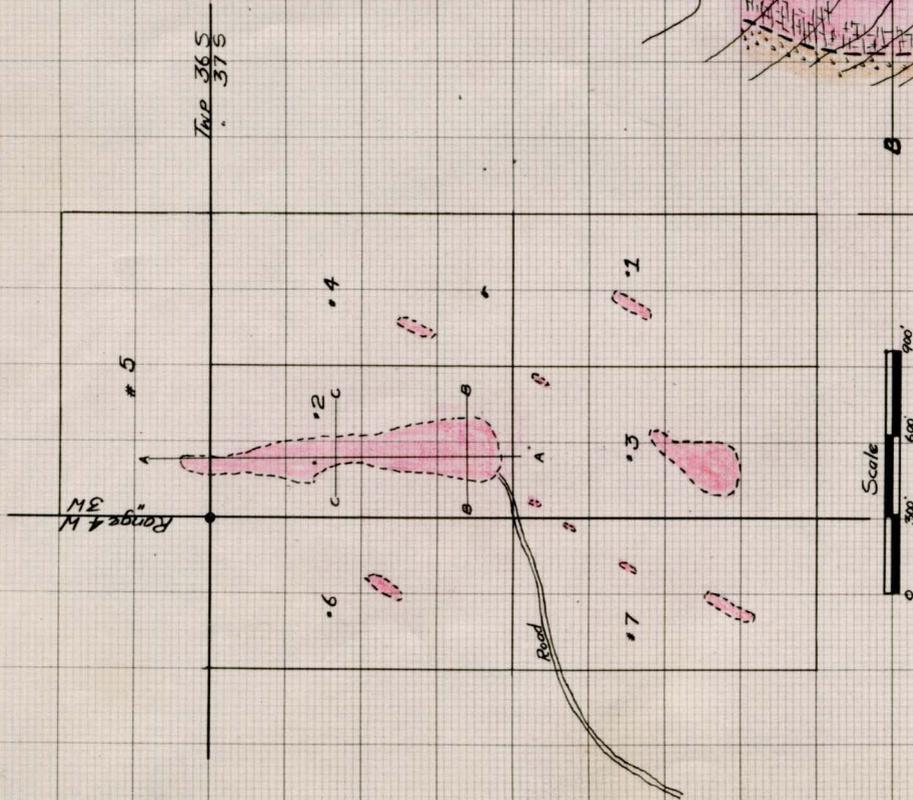
* 1936 - 132 tons
 1937 - 448 "
 1938 - 558 "

** 8-year average.

¹ Information supplied by county agents.

² No limestone used in eastern half of state.

SKETCH
 PIKES PEAK LIMESTONE DEPOSITS
 JACKSON COUNTY OREGON



May 2, 1939

The Pike's Peak Limestone Deposits are situated in Jackson County, Oregon, in the Foot's Creek Mining District, approximately one and a quarter ($1\frac{1}{4}$) miles from the Pacific Highway at Bolt, by air line, and approximately three and one-half ($3\frac{1}{2}$) miles by air line from the town of Rogue River, which is a station on the Southern Pacific Railroad. The distance by road to the deposits is a fraction over six miles. This can be reduced to five miles or less by relocation of the branch road from the county road which runs along Foot's Creek. The property lies at an elevation of about 1700 feet, which is about 700 feet above the level of the highway and railroad. The climate in this section is moderate. Snowfall is rare, and never enough to interrupt quarry operations or transportation throughout the year.

There are seven adjoining claims which cover the limestone deposits. These are located according to legal subdivision of 20 acres each, comprising 140 acres in all, and are held by annual assessment. The claims are located as Limestone No. 1 to No. 7 inclusive, and recorded as follows in the Mining Records at Medford:-

1. Limestone No. 1, recorded book 35, page 626, Jackson Co. Records of Mining at Medford as follows:

"East one-half of the southwest quarter of the northwest quarter section six, Twp 37, Range 3 West."

2. Limestone No. 2, recorded book 35, page 627.
Record of Mining of Jackson County as follows:

"West half of the northwest quarter of
the northwest quarter of section 6,
Twp 37, Range 3 West."

3. Limestone No. 3, notice of Amended location, re-
corded book 35, page 627 as follows:

"West one-half of the southwest quarter
of the northwest quarter of section 6,
Twp 37, Range 3 West."

4. Limestone No. 4, recorded book 35, page 629
as follows:

"East one-half of the northwest quarter
of the northwest quarter of section 6,
Twp 37, Range 3 West."

5. Limestone No. 5, recorded in book 35, page 630
as follows:

"South half of the southwest quarter of the
southwest quarter of section 31, Twp 36,
Range 3 West."

6. Limestone No. 6, recorded in book 35, page 640 as
follows:

"East half of the northeast quarter of the
northeast quarter of section 1, Twp 37,
Range 4 West."

7. Limestone No. 7, recorded in book 36, page 1,
as follows:

"East one-half of the southeast one-quarter
of the northeast quarter of section 1,
Twp 37, Range 4 West."

GEOLOGY:

There are two major outcroppings of limestone on the property, and eight minor ones. The principal cropping is exposed for a distance of over 1200 feet in a north south direction, and will average 200 feet in width. (Note accompanying sketch.)

It rises sharply from the gulch at the quarry site recommended for a distance of 150 feet, and thence the slope is 22 degrees, the remaining distance to the apex. (Note section AA). The exposure is more prominent on the eastern flank along the gulch. This will afford a very economical site for quarrying, which can be extended progressively along two dimensions of the deposit, thus permitting a long face and low cost mining.

The limestone was first located in the summer of 1929. In November of that year, the writer retained Dr. E.W. Lazell, of Portland, Oregon, to make an inspection. The following is a transcript of his letter, together with an analysis of a composite sample of the surface croppings, the original of which is on file:-

E. W. LAZELL, Ph.D.
Chemical and Efficiency Engineer
CHEMICAL AND PHYSICAL LABORATORIES
537 Railway Exchange Building
Portland, Oregon

August 17, 1937

Mr. Kenneth E. Hamblen,
Portland, Oregon.

Dear Sir:-

In November 1929 I examined a limestone deposit on Pikes Peak in the Foot Creek mining district, near Gold Hill, Oregon.

The deposit is quite extensive and to the best of memory there is sufficient limestone exposed to warrant development.

The analysis given below was made from a composite sample taken at that time and represents the largest body of limestone exposed. In my opinion the deposit contains over 1,000,000 tons.

ANALYSIS

Silica and Insoluble -----	1.64%
Alumina and Iron Oxide -----	.66
Lime -----	54.78
Magnesia -----	trace
Loss on ignition -----	43.02

Calcium Carbonate (calculated) 97.82%

These figures should be checked before extensive development work is done.

Very truly yours,

Signed:-E. W. Lazell.

PROGRESS REPORT

on

POTENTIAL LOCAL MARKET FOR AG-ROCK

*Limestone
Ag-rock*

Attention: Mr. F. W. Libbey

By N. S. Wagner
November 15, 1944

In line with my endeavors to determine the potential market for Ag-rock in Eastern Oregon and Southwestern Idaho, I have interviewed or corresponded with many people such as County Agents, Soil Conservation Survey officials, Agricultural experts, nursery men, etc. from Milton, Oregon to Moscow, Idaho.

The overwhelming consensus of opinion obtained from these sources is that calcium carbonate is not needed or recommended in the territory mentioned.

In view of this conclusion it would appear that the Willamette Valley is the nearest outlet for the Durkee travertine and as a consequence of this, it would seem that any expensive drilling program on the deposit to augment the information already at hand would hardly be justified unless it would be demonstrated that the transportation cost of delivering the finished product to the Willamette Valley is such that the deposit could be worked profitably. Obviously, the cost of mining and processing the travertine should be low indeed considering the nature of its occurrence and its physical properties as compared with crystalline limestone. Because of this an operation here should be able to compete with another working in limestone, even under somewhat adverse conditions. Thus, in the last analysis, transportation costs of delivering to the Willamette Valley appear to be the factor controlling the attractiveness of this occurrence.

I am not qualified to offer any personal opinion concerning the need for lime in Eastern Oregon and Southwestern Idaho, but for several reasons I do question the conclusions as expressed by the authorities mentioned. They base their conclusions entirely on the lack of acidity in the soil, but as I understand it, alfalfa uses calcium in its stalks and as one very intelligent college trained farmer here points out, the continued harvesting of alfalfa here must necessarily have depleted the soil of its calcium content which is a logical sounding consideration in favor of ag-rock quite apart from the acidity aspect of the problem. This same rancher also points out that the farms in Lower Powder Valley which are situated in the valleys of the tributaries streams which have eroded back into the limestone lenses bordering the Wallowas, are far more productive than those on the tributaries which have no eroded limestone fragments in their alluvium.

Many farmers believe that lime is needed, but by and large they are not qualified to speak from a scientific standpoint and their conclusions carry little weight accordingly. However, as two men pointed out, the bulk of experiments conducted by the State Extension Service have centered around livestock breeding and feeding, etc., and also, that most of the soils tests which the officials base their opinions on were taken about 20 years ago and they were few and far between at that. From my interviews

Progress Report - Continued

with County Agents, I have been impressed by the lack of any tangible data on the subject they had or seemed to know of, and by the rather unconvincing manner in which they expressed the opinions they did. To a certain extent this bears out the farmers' contentions, and after all, ~~in this~~ as one of them stated, the farmers in this State have been accustomed to living off of livestock and off the fat of this land so long that both they and the agricultural experts are a decade or two behind times in comparison with Eastern farmers who have had to employ modern practices, and employ them hard, in order to maintain profitable farming.

As I said before, I am not qualified to express any personal opinions on the subject of fertilizer needs for this country or any other, but all things considered I do feel that the facts are by no means settled and I rather suspect that ultimately it will be recognized that a greater need for lime exists here than is currently believed.

In support of this belief and to show that the State Agricultural Department is cautiously hedging on the score, I quote the following letter from Dudley L. Sitton, Manager, Malheur Experiment Station, Ontario:

"Re: your letter of Nov. 3, according to soil scientist, the area East of the Mountains does not need lime as applied in the form of Agriculture limestone. We believe that peculiar conditions in Malheur County may be improved by the use of limestone. However this is not for the record, because our work is of a very elementary nature. I feel sure that there never will be a demand anywhere near equal to that of the Willamette Valley."

In conclusion I can say that since there is no immediate prospect of an operator's being able to work up an appreciable local market to augment that of the Willamette Valley, that undue promotion of this occurrence in the form of drilling as I originally recommended is unwarranted at this time unless it can be demonstrated that the cost of shipping to the Willamette Valley is such that the economics of an operation here is of more than ordinary attractiveness.

Sincerely,

N.S.
N. S. Wagner

P.S.

Marion Hewlett has arranged with Prescott to get 5 tons of travertine which he will pulverize himself and he plans to run 16' strips through some of his fields by way of doing his own experimenting.

*Keep record of Hewlett's experiment
so can be published*

14 October, 1943

Mr. B. C. Taylor
Southern Pacific Company
715 Pacific Building
Portland 4, Oregon

Dear Mr. Taylor:

Herewith is information you requested on limestone deposits in Oregon. I thought that the essential facts could be assembled in tabular form. If more detailed data is desired on any particular deposit, we may be able to furnish copy of report by our field men.

If I can be of any further service, please let me know.

Very truly yours,

F. W. Libbey
Acting Director

FWL:ff
Enclosure

LIMESTONE DEPOSITS IN OREGON

NAME	OWNER	LOCATION				RESERVES Tons	ANALYSIS	REMARKS
		County	Sec.	T.	R.			
Lestine R Deposits	Mr. R. Green Imperial Hotel Portland, Ore.	Wallowa	3	25	43E		SiO ₂ 0.92 Al ₂ O ₃ 0.34 Fe ₂ O ₃ Trace MgO 0.52 CaO 54.50 Na ₂ O Trace K ₂ O Trace H ₂ O 0.10 TiO ₂ Trace CO ₂ 43.18 P ₂ O ₅ Trace FeS ₂ 0.24 Total 99.80	Spec. gravity 2.7%. Relatively accessible. In places contains pyrite. Three quarry sites.
Black Marble Quarry	Northwest Lino Company, James Cole, Atty Couch Bldg. Portland, Oreg.	Wallowa	19	25	44E	2,000,000 to 3,000,000 tons	SiO ₂ 1.17 Al ₂ O ₃ 0.17 Fe ₂ O ₃ 0.12 MgO 1.22 CaO 53.15 Na ₂ O 0.08 K ₂ O 0.08 H ₂ O 0.10 TiO ₂ Trace CO ₂ 42.05 P ₂ O ₅ Trace SrO 0.4 FeS ₂ None Organicl. 75 Total 100.54	Spec. gravity 2.70 Elev. 7000 ft. Formerly quarried and hauled to lime kilns on RR at Enterprise. Burning produced high calcium lime-about 96.25% CaO.

LIMESTONE DEPOSITS IN OREGON

NAME	OWNER	LOCATION				RESERVES Tons	ANALYSIS	REMARKS
		County	Sec.	T.	R.			
Hurricane Creek Deposits	Mr. R. Green Imperial Hotel Portland, Ore.	Wallowa	10	33	44E	20,000,000 Approx.	SiO ₂ 0.12 Al ₂ O ₃ Trace Fe ₂ O ₃ Trace MgO 0.28 CaO 55.62 Na ₂ O 0.11 K ₂ O Trace H ₂ O 0.10 CO ₂ 43.67 <u>Total 99.90</u>	Spec. Gravity 2.71. All parts of deposit do not contain such high-grade stone. Pyrite shows in places.
OFC Quarry at Line	Oregon-Portland Cement Co. Portland, Ore.	Baker	27	133	44E	Large - in excess of 40,000,000	SiO ₂ 1.99 R ₂ O ₃ 0.47 CaO 54.07 MgO 1.03 Loss on ignition 42.88 <u>Total 100.44</u>	Supplies stone for cement kilns at Line and Oswego, Oregon. Also sells sugar-kill rock & ag. stone.
Connor Creek Deposits (Marble Mts.)		Baker	5 27 28 29 32 33 34	125 115	45E 45E	Very large; in excess of 300,000,000	SiO ₂ None Al ₂ O ₃ None Fe ₂ O ₃ None MgO 0.52 CaO 55.65 Na ₂ O Trace K ₂ O Trace CO ₂ 43.93 Organic None <u>Total 99.84</u>	Spec. Gravity 2.68. Considered to be one of largest bodies of easily accessible high-grade limestone in state.

LIMESTONE DEPOSITS IN OREGON

NAME	OWNER	LOCATION				RESERVES Tons	ANALYSIS	REMARKS	
		County	Sec.	T.	R.				
Dallas Quarry	Oregon-Portland Cement Co. Portland, Ore.	Polk	1 2 11 12	8S	6N	On spur of Southern Pacific 3 mi. from Bridgeport	Fairly large; in hundreds of thousands of tons	<p>Has produced cement rock for Oswego plant for number of years.</p> <p> SiO_2 24.08 Al_2O_3 15.66 Fe_2O_3 CaO 31.58 MgO 2.74 CO_2 26.24 H_2O 3.56 Undet. 2.14 Total 100.00 </p>	
Lime Products Co. Quarry	T.T. Leonard, Silverton, Ore.	Polk	11	8S	6W	Dallas - 4 mi.	Approx.- 500,000	Stone is quarried and crushed for ag. stone	
Marquam Quarry	T.T. Leonard, Silverton, Ore.	Clackamas	2	6S	1E	Melalla - 6 mi.	Approx.- 500,000	Shell-Marl beds. Some stone has been used as ag. rock.	
Oden-Hatfield Property	R.V. Hatfield, Roseburg, Ore.	Douglas	33	27S	4W	Roseburg - 11 mi.	?	Marble saved for County Court House at Roseburg.	
Harrington Deposit	W.K. Harrington, Roseburg, Ore.	Douglas	21	28S	5W	Roseburg - 11 mi.	Possibly 12,000 tons per foot of depth	"Good grade" (No analysis)	
Bristol Quarry	F.I. Bristol Grants Pass, Ore.	Jackson	6	37S	3W	Regue River - 5 mi.	?	Lenticular deposit undeveloped. Reserves could be fairly large.	

LIMESTONE DEPOSITS IN OREGON

NAME	OWNER	LOCATION				RESERVES Tons	ANALYSIS	REMARKS
		County	Sec.	T. R.	Nearest R.R. Shipping Point			
Marble Mtn. Quarry	Pacific-Portland Cement Co. 417 Montgomery, San Francisco.	Josephine	19	37S 6W	On leased spur track to Grants Pass - 12 mi.	Considered large in millions of tons.	SiO ₂ 0.87 Al ₂ O ₃ 0.35 Fe ₂ O ₃ 0.31 CaO 54.60 MgO 0.80 Ig. loss 43.41 Total 100.34	Most of production goes to cement kilns at Gold Hill, Ore. but paper mill rock and ag. rock are also sold.
Washington Brick and Lime Quarry	Washington Brick and Lime Co., Spokane, Wash.	Josephine	22	38S 5W	Grants Pass - 26 mi.	?	SiO ₂ 0.05 Al ₂ O ₃ 0.21 Fe ₂ O ₃ } 0.28 FeO } CaO 55.61 MgO 0.34 Ig. loss 42.68 Total 99.37	Lenticular deposit. Stone is sorted and most of production is burned to "chemical lime".
Jones Limestone Quarry	F.I. Bristol, Grants Pass, Ore.	Josephine	31	38S 5W	Grants Pass - Approx. 26 mi.	?	SiO ₂ 0.13 Al ₂ O ₃ } 0.38 Fe ₂ O ₃ } CaO 55.55 H ₂ O 0.26 CO ₂ 43.63 Total 99.95	Lenticular deposit. Unexplored. Some marble monuments formerly produced. Analysis shows quality of the pure marble.

Other deposits which may be less important because of accessibility, size, or grade are as follows:

Innaha River deposits,	Wallowa County	Lively property, near Gold Hill,	Jackson County
Eagle Creek	Baker	Seattle Bar property, on Applegate River,	"
Sisley "	"	Briner deposit, southwest of Phoenix,	"
Durkee region	"	Bear Gulch deposits, near Little Applegate River,	"
Suplee "	Creek	Millionaire Mine deposit, east of Gold Hill,	"
Fisher property, south of Roseburg,	Douglas County		
Dodson "	"		
Byron "	Northeast of Clalls,		

References: Moore, E.N., Non-Metallic Mineral Resources of Eastern Oregon; U.S.G.S. Bulletin 875, Hedge, E.T., Market for Columbia River Power Using Northwest Minerals, Sec. III, Northwest Limestones; War Department Office of Division Engineer, Portland, Oregon; Mines Handbook, Bulletin 14, State Dept. of Geology and Mineral Industries, Portland, Oregon.

ELECTRO METALLURGICAL COMPANY
Portland Works

COPY

Report of Analysis of limestone
Date analyzed 3-23-45
Sample No. 1# Section 30
Investigation No. _____

Mark:
Grade:

From A. A. Muck Property
Southern Oregon in
Wilderville District

	Dry Basis	Burnt Lime Basis
CaO	55.39%	98.82%
MgO	.43	.76
SiO ₂	.11	.20
Al ₂ O ₃ x Fe ₂ O ₃	.10	.18
P	.003	.005
CO ₂	43.93	

COPIES TO DCD CJD ANALYST

ELECTRO METALLURGICAL COMPANY

PORTLAND WORKS

REPORT OF ANALYSIS OF
 DATE ANALYZED
 SAMPLE NO. 3
 INVESTIGATION NO.

Limestone
 5/16/45
 Upper Quarry Face, 12' -6" Surface
 Chips

MARK:
 GRADE:

From A.A. Muck Property
 Southern Oregon
 Wilderville District

	Dry Basis :	Burnt Lime Basis
CaO.....	55.65% :	99.37%
MgO.....	.34 :	.60
SiO ₂.....	.03 :	.053
Al ₂ O ₃.....	.024 :	.043
Fe ₂ O ₃.....	.016 :	.028
P .....	.008 :	.014
CO ₂	44.04 :	

CJD ANALYST

Specimen 7015

Mr. Muck

1

Sec. 30, T. 37 S., R.6 W
south of Wilderville.

Calcium oxide (CaO)

55.28

Carbon dioxide (CO₂)

9885

43.57

Water (H₂O)

.50

Silica (SiO₂)

.23

Alumina and iron oxide ($[Al, Fe]_2O_3$)

.28

Magnesia (MgO)

.03

99.89

Mr D Earle Stewart
2428 N.E. 47th street
Portland, Oregon

Dear Sir:

Your letter of March 10, 1941, to Mr. MacBain indicated you would like to know analytical results on a sample of limestone from Grants' Pass which you had shipped us at the request of Mr. Kenneth Mackay.

The material is a black carbonaceous limestone containing 1.42% fixed carbon. Complete analysis is as follows:

CaCO ₃	96.24%	
MgCO ₃	2.07	- 9831
P	0.005	
S	0.003	

Very truly yours,

ELECTRO METALLURGICAL COMPANY

C
O
P
Y

E.W. LAZELL Ph.D.
Chemical & Efficiency Engineer
Chemical & Physical Laboratories
537 Railway Exchange Building
Portland, Oregon

Member
American Institute Engineers
American Society Mechanical Engine
American Society for Testing Mater

July 14th, 1926

Mr. J.J. Cusack
1328 S.W. 3rd Avenue
Portland, Oregon.

Dear Sir:

I report the analysis of a sample of Limestone
submitted by you.

Laboratory #23195	Limestone
Silica & Insoluble	0.06%
Alumina & Iron Oxide	.90
Lime	55.10
Magnesia	Trace
Loss on Ignition	43.88
Calcium Carbonate	98.39

The limestone is a very pure suitable for use
in the manufacture of Cement or Lime.

Respectfully submitted

E.W. Lazell

The original was handed to Mr. Raymond Miller by A.A. Muck when Mr. Miller
published his book on the feasibility of a steel plant on the Columbia
river.

TAKEN FROM:

WAR DEPARTMENT CORPS OF ENGINEERS, U.S. ARMY
OFFICE OF THE DIVISION ENGINEER NORTH PACIFIC
DIVISION PORTLAND, OREGON

MARKET FOR COLUMBIA RIVER HYDROELECTRIC
POWER USING NORTHWEST MINERALS
SECTION III Northwest Limestones

by Edwin T. Hodge, Consulting Geologist

Polk County

DALLAS DEPOSITS

Limestone is quarried 3 miles southwest of Dallas. The rock is being quarried by the Oregon Portland Cement Company, which own 687 acres on the deposit, for use in their plant at Oswego. The approximate mixture used at Oswego has been reported 50 per cent rock from this source with 50 per cent of rock from the quarries at Lime, Oregon. A spur track brings stone from the quarry to the Southern Pacific at Dallas. The cost at Oswego is \$0.60 per ton.

The limestone is quarried according to the needs of the Oswego plant. Quarry production in 1935 was 16,207 tons; in 1936 production reached 32,000 tons.

Analysis

Silica -----	24.08	Magnesia -----	2.74
Alumina and iron oxide	15.66	Carbonic acid (CO ₂) -----	20.24
Lime -----	1.58	Water at 105° -----	3.56
Undetermined -----	2.14		

Reserves are estimated to be nearly 11,000,000 tons.

OTHER LIMESTONE

A similar limestone deposit, $\frac{1}{2}$ mile west of the Cement Company quarry, is said to be in excess of 1000 feet wide, with northeast strike and low dips.

Information lately received from Mr. D. A. Leche of the Oregon Portland Cement Company, reports two other deposits of limestones, one each in Polk and Benton Counties. One, in Sec. 19 and 20, T. 6 S., R. 6 W., south of Willamina and due west of Buell, is associated with sandstones. The property was investigated by the Oregon Portland Cement Company in 1932 and the average CaCO₃ content of 6 drill holes, drilled to an average depth of 44 feet, was 27.16 per cent. Mr. Leche also reports and occurrence of limestone in the vicinity of Kings Valley in Benton County. No other information is given on this deposit.

Clackamas County

MARQUAM DEPOSITS

Limestone outcrops in Sec. 2 and 3, T. 6 S., R. 1 E., about one mile northeast of Marquam. Information from Mr. D. A. Leche indicates that one exposure in the NW $\frac{1}{4}$ Sec. 2 and the NE $\frac{1}{4}$ Sec. 3 covers 10.38 acres. Another exposure in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 2 covers 3.96 acres. Fourteen drill holes, to an average depth of 14 feet indicates an average thickness of 9 feet of limestone. Reserves are estimated at about 5,000,000 tons, but the limestone is reported

to be highly siliceous, and averages less than 70 per cent CaCO_3 . The distance to the nearest railroad is 6 miles. Past production is reported to have been valued at \$3,000, mainly for agricultural use.

Tillamook County

Limestone reported in Sec. 9 and 10, T. 2 S., R. 9 W., about $7\frac{1}{2}$ miles southeast of Tillamook was examined by the Mineral Survey.

A 4 foot bed of dense gray limestone can be traced 300 feet along Faucet (?) Creek in the NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 9, T. 2 S., R. 9 W. The land is owned by a Mr. Owen. Very little of this bed is exposed above creek level making quarrying operation difficult. In 1914, 500 tons of limestone was quarried in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 10, owned by Charles Nelson. Twelve 6-foot auger holes were bored by the Mineral Survey, but revealed no limestone. The overburden, said to be 10 feet thick, has been artificially placed by logging operations. Collier (A. J. Collier, Oregon Bureau of Mines and Geology, 1914) estimated a reserve of 10,000 tons. The limestone has been burned for lime and used as whitewash and mortar. An analysis showed 9.3 per cent SiO_2 , 1.8 per cent Fe_2O_3 , 46.1 per cent CaO , 4.7 per cent Al_2O_3 , 1.3 per cent MgO , 82.4 per cent CaCO_3 (calculated), 2.8 per cent MgCO_3 (calculated).

OTHER TILLAMOOK COUNTY LIMESTONES

Limestone is reported in small quantities in Sec. 1, T. 4 S., R. 9 W., on the north slopes of Mt. Hebo.

Southwestern Oregon

The distribution of limestone in southwestern Oregon is indicated on plate 64, preceding the chapter on the limestones of California.

Douglas County

OAKLAND DISTRICT

Near Oakland there are three small masses of impure limestone. One is by the road nearly a mile northeast of Oakland, another at the head of Green Valley, 10 miles northwest of Oakland, and the third on Starr's ranch about 4 miles west of Stephens. A fourth reported as limestone 4 miles northeast of Oakland was found to be calcareous sandstone. The deposits are each less than an acre in extent. Plate 55.

----- (At this point in the original, Plate 55 occurs. It is deleted here.)

Northeast of Oakland

There is a small limestone area in Sec. 3, T. 25 S., R. 5 W., one mile northeast of Oakland. An exposure was found in a small pit near the present county road and an abandoned road to Sutherlin. The pit was shallow and the small amount of material that was removed was probably used as road metal.

Fragments of fossiliferous calcareous shale were found in the pit. The amount of shale is small and it is interbedded with layers of sandstone.

Green Valley

This locality is in Green Valley, 8 miles northwest of Oakland, in Sec. 21 and 22, T. 24 S., R. 6 W. The property is owned by C. H. Davison. Fossiliferous calcareous shale is said to have been mined and shipped to the Oregon Portland Cement Company over 30 years ago. Mining was underground, and the tunnel has been caved for 15 years. No estimate could be made on the thickness of the beds as none were exposed.

Several hundred tons of calcareous shale have been shipped from the previously abandoned quarry in Green Valley. The shipments represented loose material on the quarry floor and no further attempt has been made to develop the deposit.

Starr Ranch

The deposit on the Starr Ranch is hard brittle calcareous shale and much of its calcium carbonate is due to the great number of fossils.

The Starr Ranch seems to be a well known fossil locality in the Umpqua Formation, but as a limestone deposit it appears to be of slight importance, as the beds are small and thin.

The outcrop is located in the NW $\frac{1}{4}$ Sec. 22, T. 25 S., R. 6 W., or $\frac{1}{4}$ mile west of the Starr house, which is 5 miles, by gravel road, west from Sutherlin Station, on the Southern Pacific Lines.

ROSEBURG DISTRICT

A widely spaced chain of lenticular limestone bodies extends about 10 miles in a northeasterly direction from Roberts Mountain to the valley of South Deer Creek, about 8 miles to the south and east of Roseburg. Plate 56. They occur in the Shasta Series (Myrtle Formation) and are probably Cretaceous*. Only the deposit of the Oregon Portland Cement Company, in the SE corner of Sec. 20, T. 28 S., R. 5 W., has ever produced much limestone. The most northeasterly deposit in the NW corner of Sec. 33, T. 27 S., R. 4 W. was once worked in a small way for structural marble. None of the other deposits has been properly explored**.

(Plate 56 omitted)

* J. S. Diller, Description of the Roseburg District: Geol. Atlas U. S., folio 49, U. S. Geol. Surv., 1898.

** N. H. Darton, U. S. Geol. Surv. Bull. 387, 1909.
I. A. Williams, Min. Res. of Oregon, Vol. 1, No. 7, 1914.

The Fisher Property

An undeveloped deposit lies in the SW $\frac{1}{4}$ Sec. 30, T. 28 S., R. 5 W., on land belonging to Fred and Anna A. Fisher, who own $364\frac{1}{2}$ acres of surrounding land. It is at an elevation of 1650 feet on the northwest side of a spur from Roberts Mountain. In an air-line distance it is 2 miles southeast of Carnes and one mile southwest of the Oregon Portland Cement Company's quarries.

The limestone lens strikes NE-SW and appears to be similar to that of the Oregon Portland Cement Company. The outcrop is at least 40 feet wide and 175 feet long. A chip sample (U.S.E.D. 99B) gave the following analysis:

SiO ₂ -----	0.78	CaO -----	56.46
Al ₂ O ₃ -----	0.75	MgO -----	0.33
Fe ₂ O ₃ -----	)	Ignition loss -----	41.18
FeO -----	) 0.78	Total -----	100.28

The wall rock on the north is red chert containing small veins of calcite; the south contact is a seam of hematite 4 or 5 feet wide.

Transportation for this deposit will be difficult; it is $1\frac{1}{2}$ miles from and 1000 feet above the nearest road. An easy grade could be built to within $\frac{3}{4}$ mile to the northeast, making a total haul to Carnes of 4 miles. A gravity tram will be necessary for the remaining distance.

Quarries of the Oregon Portland Cement Company

One, or possibly two or three, separate lenses of limestone in the SE corner Sec. 20, T. 28 S., R. 5 W., striking northeast and dipping 50° to 70° to the southeast, have been extensively quarried at three closely adjoining places by the Oregon Portland Cement Company, for shipment to its cement plant at Oswego. During its activity, output averaged 250 tons per day. The company laid and operated a 4-mile standard-gage spur connecting with the Southern Pacific Lines at Carnes, 7 miles south of Roseburg, following the south side and a south fork of Roberts Creek to loading pockets in the gulch 500 feet below the quarries. The freight rate from quarry to Oswego was \$1.46 per ton.

Rock was quarried first by glory-hole and later by underground open stopes, delivering through cross-cut tunnels and surface trams to the tops of two gravity planes discharging into railroad cars. Each of the limestone bodies is bounded on the east by quartzite and chert, and on the west by intrusion of ultra-basic igneous rock. It was never clearly established whether the three limestone bodies were separate lenses or faulted segments of a single lens, although the limits of the individual bodies were accurately ascertained by drifting and diamond drilling.

In October, 1935, the company abandoned operations and caved the cross-cut tunnels to make the underground working inaccessible. The last of the spur track was taken up by the end of that year.

Average analysis

Average analyses of the limestone as delivered at the cement plant during two years, including unavoidable admixture of wall rock, were as follows:

Constituents	1929	1930
SiO ₂	3.92	4.11
Al ₂ O ₃	1.64	1.91
Fe ₂ O ₃	0.61	0.72
CaO	51.92	51.68
MgO	0.60	0.64
Ignition loss	<u>41.11</u>	<u>40.91</u>
Total	99.80	99.97

Before abandoning its quarries, the Company was convinced by systematic exploration that the deposits contained no more limestone that could be profitably extracted, in view of its other resources of cheaper and better rock.

Harrington Deposit

The W $\frac{1}{2}$ Sec. 21, T. 28 S., R. 5 W., adjoining the Oregon Portland Cement Company's property, is shown on the County Assessor's map as belonging to Regina W. (Mrs. A. E.) Harrington of Seattle. This area has been brought to our attention for investigation, but careful traversing failed to discover any body of limestone in place.

Dodson Deposit

This limestone deposit is located in the NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 14, T. 28 S., R. 5 W. It is about 400 feet south of the Roberts Creek road and 7 miles east from Carnes, by good gravelled highway.

The deposit is a lens striking N. 20° E.; the width is 60 feet and the length about 300 feet. The limestone is mainly gray, but some is pure white. The gray limestone seems to be quite pure, but ferruginous inclusions sometimes occur.

Proximity to a good road, and the situation of the deposit on a steep hillside both favor cheap operation; a glory hole quarry would easily be developed.

Hatfield Deposit

The deposit lies in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 31, T. 27 S., R. 4 W. The nearest railroad point is Roseburg, distant 10 miles by practically level road, of which 6 miles is paved.

The exposure in this locality does not show any large amount of limestone except some large blocks that have been quarried and some in place, largely hidden by overburden. The stone has a light fawn color, with calcite-filled fractures, and is similar to that on the nearby but larger Oden-Hatfield deposit. The strike of the lens is N. 75° East.

There is another outcrop of limestone in the fork of the South Deer Creek, near the Roy Hatfield house, but the amount of stone is small and operating conditions unfavorable.

Oden-Hatfield Deposit

This lies in the NW $\frac{1}{4}$ Sec. 33, T. 27 S., R. 4 W. It is 11 miles by excellent road from Roseburg, or 1 mile east of the Hatfield locality.

The County Assessor's maps in Roseburg (as of January, 1937) show the deposit to be on land belonging to R. V. Hatfield, but the name of Herman Oden, owner of adjoining land, has in some manner become connected with it.

The limestone is of a good grade, pale fawn in color, with seams of white calcite. It is massive and can be quarried in large blocks for dimension stone of monuments. In past years this stone has been quarried and sawn, but no such work has been done recently and only relics of the operations can be found.

The lens of limestone strikes No. 75° E. and dips almost vertically. It is 25 feet wide and can be followed for 225 feet along the strike. Former work was all done on the western end, where a pit 30 by 30 feet in area with a 25-foot face remains.

The outcrop is at an elevation of 1045 feet, or only a few feet above the valley floor of the south fork of Deer Creek. The south side of the lens is in contact with fine-grained sandstone while the contact on the north side is a red ferruginous chert. The lens pinched out toward the east end, judging by surface indications.

Coos and Curry Counties

INTRODUCTION

Limestone has been reported from various localities in Coos and Curry Counties near the Oregon Coast. Several reported deposits in these counties have been examined by the Mineral Survey, and commercial possibilities of the limestone were found to be limited to supplying purely local demands. Many of the deposits examined were not limestones, and the limestones that occur have a very limited tonnage, and are high in impurities.

A reported limestone in Sec. 28, T. 30 S., R. 14 W., east of Langlois, in Curry County, could not be found. Sandstone, in places partly cemented with calcareous material, is the dominant country rock.

Limestones reported in Coos County as occurring in the NE $\frac{1}{4}$ Sec. 36, T. 25 S., R. 12 W., owned by A. O. Rogers; in Sec. 27, R. 12 W., T. 25 S., at the Allegheny Rock quarries; in Sec. 13, T. 25 S., R. 12 W., owned by B. Mahaffey; in Sec. 3, T. 25 S., R. 12 W., on the P. J. Lunde Homestead, upon investigation proved to be weathered basalt containing calcite veinlets. Calcareous sandstone blocks were also found at the different localities.

W. C. MORGAN DEPOSIT

A small lenticular limestone body 10 by 25 feet wide, and traceable for 750 feet along the strike (N. 65° to 70° E.) occurs in sandstones and shales of the Pulaski (Eocend) formation in the NE $\frac{1}{4}$ Sec. 35, T. 25 S., R. 12 W., in Coos County. It is owned by W. C. Morgan, Coos Rural Route, Marshfield, Oregon.

The limestone is dull gray and amorphous, with many veins and pockets of calcite, and has a top soil overburden 5 to 20 feet thick. An analysis (U.S.E.D. Sample No 192C -- general grab sample over an area of 20 square feet of outcrop) follows:

SiO ₂ -----	10.57	Ca O -----	42.97
Al ₂ O ₃ -----	4.27	CO ₂ -----	33.47
Fe ₂ O ₃ -----	2.96	Total -----	95.59
MgO -----	1.35		

According to a test by J. J. Jones, Oregon Agricultural College Experiment Station, two surface samples contained 73.1 and 83.5 per cent CaCO₃, respectively.

This limestone has been used locally for mortar. Estimated reserves are 80,000 tons.

Josephine County

LOCATION

Josephine County is mountainous and drained principally by the Rogue River and its tributaries. The area is traversed by the Southern Pacific Railroad. The largest town of the area is Grants Pass, and the climatic conditions indicated in the following table are indicative of the southwestern Oregon area.

GEOLOGY

Limestone occurs in the Lower Applegate, the Waldo, and the Takilma districts in Josephine County. The rocks of the Lower Applegate district include Paleozoic and Jurassic sediments, intruded by tonalite of presumably late Jurassic age; the only later rocks are the recent alluvial deposits. The sediments dip at high angles and in places have been overturned. The Waldo district is occupied chiefly by Paleozoic and Jurassic sediments and by dark, sub-siliceous igneous rocks. Tonalite intrusives are not prominent in the Waldo area. The sediments of the district have been overturned and the whole of the Paleozoic series lies above the younger Galice formation (Jurassic) near Waldo and Kerby.

OCCURRENCES

The most important industrial occurrence, the quarries and operations of the Beaver Portland Cement Company at Marble Mountain south of Wilderville; the Jones Marble Quarry; and the Oregon Lime Products Quarry, all of which are indicated on plate 57, were examined by the Mineral Survey.

(Plate 57 omitted)

OPERATIONS OF THE BEAVER-PORTLAND CEMENT COMPANY

Location

The Beaver-Portland Cement Company's manufacturing plant is at Cold Hill, Jackson County, Oregon, on the Siskiyou Division of the Southern Pacific System, 31 1/2 miles south of Portland. Its whale quarry closely adjoins the plant, on a hillside rising above the level of its upper end. For a few years after the erection of the plant, limestone was supplied from quarries at three places

respectively 2,3,and 4 miles to the west. These sources soon proved inadequate or unsuitable, and the entire supply of limestone is now coming from the Company's quarry on the north end of Marble Mountain, south of Wilderville, in Josephine County; this involves a rail haul of 28 miles, of which 12 miles is on private and leased track to Grants Pass, and the remaining 16 miles by Southern Pacific. Plate 58.

(Plate 58 omitted)

Deposits

The limestone body now quarried is the most northerly of six, spaced at irregular intervals in a chain 2 miles long lying close to the range line between Ranges 6 and 7 W., in the S 1/3 of T. 37 S. Their shape and position are shown on plate 59. None of them except the northern one is now accessible for large production, though some development has been done on body C, a small output some years ago having been hauled by wagon road (now impassable) down a branch of Cheney Creek. When it becomes advisable to operate at C, a 1 1/2-mile tram route can be established on practically a level grade around the north end of the mountain spur, delivering to the present crusher and shipping bin. Limestone bodies C, E, and F are characterized by high precipitous cliffs, affording excellent opportunity for the rapid development of large tonnages with little attention to overburden. Bodies B and D occupy more gentle slopes, heavily timbered and covered with soil.

(Plate 59 omitted)

Reserves

The tonnages of limestone accessible in the several bodies above the level of the lowest present exposure in each have been estimated as follows:

Body	Area Square Feet	Tons of Limestone
A	590,000	20,000,000
B	53,200	440,000
C	450,930	12,000,000
D	324,000	3,600,000
E	534,600	9,000,000
F	333,000	3,500,000
Total	2,285,730	48,540,000

In all cases, including the present quarry, it would be possible to enter the limestone body 100 to 200 feet below the lowest croppings by a tunnel only a few hundred feet through wall rock. The downward extent of the limestone lenses has not been ascertained, but the massiveness of the exposures indicates bodies likely to persist to depths at least equal to their respective lengths.

Quality

The quality of the limestones from the several localities is shown by the following analyses of chip samples, except that of body A, which is an average of numerous shipments to the cement plant.

Analyses of Limestones from Marble Mountain

Constituents	1	2	3	4	5	6
SiO ₂	0.87	0.06	2.31	0.34	1.73	3.20
Al ₂ O ₃	0.35	0.01	1.72	0.06	1.69	0.93
Fe ₂ O ₃	0.31	0.31	0.33	0.32	0.30	0.30
CaO	54.60	55.85	54.06	55.44	54.16	54.05
MgO	0.80	0.33	0.41	0.25	0.40	0.36
Ignition loss	<u>43.41</u>	<u>42.09</u>	<u>41.53</u>	<u>42.07</u>	<u>41.57</u>	<u>40.74</u>
Total	100.34	98.65	100.16	98.48	99.85	99.58
	98	98	96	98	96	

- 1 Body A
- 2 Body B -- U.S.E.D. Sample 190A.
- 3 Body C -- U.S.E.D. Sample 184A, composite from middle and south ends.
- 4 Body D -- U.S.E.D. Sample 188A.
- 5 Body E -- U.S.E.D. Sample 182A, composite from middle, north, and south ends.
- 6 Body F -- U.S.E.D. Sample 186A, south end.

The limestone is uniformly fine-grained and dark gray in color, but sometimes mottled, probably due to admixture of light colored aragonite; a 2-foot seam of the latter mineral is exposed at locality C, and it also occurs in smaller segregations at the Marble Mountain quarry. Predominating wall rocks are metamorphic sedimentaries, conveniently called greenstones.

Quarrying and Shipping Practice

The northern limestone lens, Body A, is about 600 feet wide, stands nearly vertical, and rises rapidly to a height of 700 feet above the present quarry floor, at 2500 feet elevation. The northeastern end of the lens thus offers excellent opportunity for opening a high and wide quarry face, which is already 354 feet above the working level. Plate 60.

(Plate 60 omitted)

During suspensions at the cement plant, only a particularly high-grade portion of the deposit, occurring along its eastern margin, is worked for paper-mill rock, shipping about 100 tons a day. This is loosened from a projecting face by ordinary methods, using relatively light charges; the large blocks are reduced by sledging and bulldozing, and the hand-picked rock, in pieces between 6 and 18 inch size, is loaded by hand into 5-ton

Ford dump trucks. The haul is 1500 feet over dirt road down a gentle grade to the receiving bin at the top of the gravity plane, described later. By these methods a crew of 9 men and a foreman could produce 150 tons of paper-mill rock in 8 hours.

The deposit has been opened for cement rock by a modified glory-hole method which requires a minimum of hand labor after the rock has been broken. At the two points shown on plate 60, the limestone belt has been entered endwise by steep and narrow V-cuts. The bottom of each cut has been timbered with posts and cap of 18-inch or larger round timber, with heavy lagging along the top, reaching only from cap to cap, thus forming a tunnel 10 feet wide and of the same height. Plate 61. At present, each of these "tunnels" has advanced about 200 feet, and is laid with standard-gage track which is part of the main haulage system. The rock loosened from the sides and end of the cut thus buries the "tunnel" under broken rock and forms what is, in effect, a glory hole. The short lagging is then removed from between the sets just outside the toe of the pile, and the rock is barred down into 9-ton, flat-bottomed, side-dumping cars spotted underneath the opening. An 18-ton Plymouth gasoline locomotive draws a train of 6 cars a maximum distance of 2200 feet to the crushing plant, where the cars dump one at a time directly into the first crusher.

The top of the limestone is covered by overburden, up to 3 or 4 feet thick in places, consisting of strongly colored dark red soil containing about equal parts of lime, silica, and iron plus aluminum oxide. No particular care is taken to remove this except to clear a space for the uppermost row of blast holes, as the relatively small amount does not seriously affect the average composition of the rock output. Blast holes are drilled by jack-hammers; steel and explosives are transported by a light, one-cable tram making a single span from the blacksmith shop to a high point on the upper edge of the quarry face.

(Plate 61 omitted)

Crushing Equipment

The first crusher, set with its top just below and to one side of the haulage track, and receiving the 9-ton loads as fast as they can be dumped (plate 61) is a Worthington 30-inch McCully gyratory (rated capacity 3000 tons per 24 hours) belt-driven from a 150 H.P. General Electric induction motor. *These deliver together to a 30-inch belt conveyor 75 feet long (20 H.P. motor) carrying the rock across a bridge and into the larger, or 600-ton, compartment of the crib-work timbered receiving bin. The other compartment, of 200-ton capacity, is used for the lump paper-mill rock delivered to it by trucks crossing on another bridge from the hillside.

Transportation of Crushed Rock

The gin has two rows of bottom-discharge gates, one row over each of two tracks and loading into one or the other of two skips by which the rock is lowered to the railroad. The gravity plane has three rails except at a 600-foot passing section at the middle and a 200-foot section at the bottom. The total length is 4500 feet and the total descent is 1400 feet. The 1-1/8 inch cable makes four turns around a bull wheel controlled by band brakes and * This discharges directly into two Worthington No. 5 McCully gyratores set to about 1 1/2-inch size, each belt-driven by a 50 h.p. motor.

geared to a 40 H.P. braking motor. Each skip holds 15 tons of crushed cement rock and makes 4 round trips per hour; tram capacity is thus 960 tons of cement rock in 8 hours. For coarse lump rock, the capacity is less.

There is no storage pocket at the railroad; the skips discharge automatically through a chute to the cars which stand on a light down-grade to assist the hand spotting. When shipping paper-mill rock, a grizzly with 4-inch spaces is placed in the chute, and fines are discharged to another car standing on a parallel track under the tipple. The Beaver-Portland Cement Company owns a private track, 3 miles long, connecting at Wilderville with the California and Oregon Coast Railroad, which it leases and operates for 9 miles to Grants Pass. Remainder of the haul, 16 miles to the cement plant 1 mile west of Cold Hill, is by Southern Pacific Lines. Total cost of haul, loading point to cement plant, is \$0.53 per ton, of which one-half goes to the Southern Pacific System.

Costs

An estimate of the cost, exclusive of depreciation, depletion, interest, and taxes, of quarrying cement rock and delivering it to railroad cars, at the rate of about 525 tons a day, is:

	<u>Per Ton</u>
Labor (50 tons per man-shift @ \$4.50 -----	\$0.09
Explosives -----	.05
Other supplies -----	.03
Repairs -----	.05
Power -----	.05
Supervision -----	.02
Crushing -----	.03
Loading -----	.02
Indirect charges (insurance, legal, shutdown expense, general) -----	.10
Total -----	<u>\$0.44</u>

An estimate of the cost of paper-mill rock along similar lines would be:

	<u>Per Ton</u>
Labor (12 tons per man-shift @ \$4.50) -----	\$0.38
Explosives -----	.07
Other supplies -----	.05
Repairs -----	.10
Power -----	.10
Supervision -----	.05
Hauling and loading -----	.10
Indirect charges (insurance, legal, shutdown expense, general) -----	.10
Total -----	<u>\$0.95</u>

The railroad freight rate from the quarry at Wilderville to Oregon City is \$2.20. Should the proposed railroad from Grants Pass to Crescent City, California, be built, a competent authority states that the combined rail and water haul from the quarry to Portland would not be more than \$2.00 per ton.

JONES MARBLE QUARRY

This quarry is about 24 miles by road south of Grants Pass in Sec. 31, T. 38 S., R. 5 W., 4 miles west of Williams by poor dirt road. Plate 57.

The marble outcrops at 3400 feet elevation. The quarried blocks have been rolled down the steep hill to the old chromite road below, where it was loaded onto trucks and wagons. By this slow and laborious method only small amounts have been taken out.

The lower outcrops show a very pleasing black and white variegated marble, but that from higher up the hill varies from gray to white. It appears to be quite pure. The limestone occurs as beds of variable thickness, from 6 inches to upwards of 100 feet, in schists and slates. The general strike is about N. 40° E., the dip 45° S.E., nearly parallel to the mountain slope. The ridge summit is a bare limestone hogback forming a 50 foot cliff. In places there are numerous knots of pyrite and quartz which replace the limestone. Utilization of these deposits would necessitate construction of a tram one-third to one-half mile long and reconstruction of about three miles of road. The total truck haul to Grants Pass would be 26 miles.

OREGON LIME PRODUCTS COMPANY

Location

The plant and quarry of the Oregon Lime Products Company are in the SW $\frac{1}{4}$ Sec. 15, T. 38 S., R. 5 W., on the nose of the ridge south of Powell Creek at an elevation of 1600 feet. Plate 57. Production in 1936 consisted of raw lime products, chiefly agricultural lime, poultry grit, and lime flour for use in the fruit canning industry. All material is hauled by truck to Grants Pass, a distance of 26 miles, of which 15 miles is paved and the remainder good gravel road.

Occurrence

The quarry is at the northeast end of a narrow limestone belt which extends southwestward from the center of Sec. 15 through Sec. 31 of the same township. The general strike of the beds is N. 50° E., the dip 45° SE. The limestone is interbedded with schist and cut by basic igneous dikes. Plate 62. The thickest lens in the quarry is about 25 feet tapering to 10 feet or less. Waste amounts to about 60 per cent of all rock handled, and the quarry cost of rock in the storage bin is about \$1.85 per ton of limestone. The limestone is reported to be very pure, running over 99 per cent CaCO₃.

Quarrying Practice

The quarry lay out, shown in plate 62, has an opening 200 feet long, 35 feet wide, and the face is 40 to 45 feet high. The rock, after blasting, is broken to "one man" size and loaded by hand, then trammed about 400 feet by hand to the kiln or jaw crusher for grinding. The rock is crushed and screened, the oversize being returned by bucket elevator. The fines are carried by belt conveyor to vibrating screens, if it is to be used as poultry grit, or to a model 36 Fairbanks-Morse hammer mill, where it is ground, for agricultural lime or lime flour. The "Ag" rock passes 16 mesh, and 50 per cent passes 100 mesh; the flour passes 100 mesh.

(Plate 62 omitted)

The kiln, a 10-foot continuous feed stack kiln, fired with wood at \$3.50 a cord, was just being fired up at the time of the visit. The company intends to sell lump, pea, and ground lime, but not the hydrated product. From the kiln the rock passes over a sorting table where the large lumps are removed, then goes through a small jaw crusher, and is screened. The oversized material is returned to the crusher, and the fines are re-screened, the retained portion going by bucket conveyor to a steel storage bin for sacking, while the fines go to a F-M hammer mill, are ground to 16 mesh, and blown into a steel storage bin, from which it will be sacked by an automatic weighing machine. The plant capacity is 30 tons of raw rock per 8 hours, and 15 tons of burned lime per 24 hours. All power is supplied by two wood-burning steam boilers.

Quality of the Rock

Analyses of the rock (U.S. E. E. Sample No. 90) from the Oregon Lime Products quarry is given below:

SiO ₂ -----	0.05	CaO -----	55.61
Al ₂ O ₃ -----	0.21	MgO -----	0.34
Fe ₂ O ₃ -----)	0.28	Ignition loss -----	42.88
FeO -----)		Total -----	99.37

Ownership

The Oregon Lime Products Company was organized in 1934, with H. W. Bergman of Genoa, Ohio, as President (also chief stockholder), succeeding The Oregon Limestone Products Company. The manager is Glenn C. Hunter, of Williams, Oregon. The company owns all of the SW 1/4 Sec. 15, except the N 1/2 NE 1/4; it also controls, by virtue of mining claims, the N 1/2 NW 1/4 Sec. 22, and the E 1/2 NE 1/4 NE 1/4 Sec. 22 all in T. 38 S., R. 5 West.

An outcrop of limestone reported in Sec. 3, T. 38.S., R. 5 W., was carefully sought without success. Quartzite and talc float were found, but the only outcrop was a weathered andesite.

Other Limestones

A limestone deposit in Sec. 11 and 14, T. 39 S., R. 8 W. is owned by the Beaver Portland Cement Company. The limestone deposit on Elder Creek, near Takilma, was used as a source of lime flux when the Takilma smelter was operating. A limestone deposit, remarkable for its extensive caves, but not quarriable for obvious reasons, occurs in the Oregon Caves National Monument, southeastern Josephine County.

Jackson County

Location

Jackson County lies east of Josephine County, north of the California State boundary. The relief is mountainous and principal drainage is that of the Rogue River. The area is traversed by the Southern Pacific Lines. Ashland and Medford are the principal towns.

Geology

The rocks of this region are of many different types. Sedimentary types range from lower Paleozoic schists to Quaternary gravels. The limestone lenses are for the most part Paleozoic in age. Numerous igneous rock types are represented abundantly in the region, the Jurassic Siskiyou batholith being the most important.

Occurrence

Small limestone bodies occur in a number of places in this region. They are Devonian, Carboniferous, and Cretaceous in age. Some contain only 5 per cent or less of impurities and therefore are suitable for lime burning and chemical use.

The chief localities are in the vicinity of Phoenix and Talent, and include the William Briner limestone deposit, and locations on Anderson and Coleman Creeks, as indicated in plate 63; localities in the Upper Applegate River district include the exposures in Carberry Creek, Bear Gulch, and Seattle Bar, plate 58; in the vicinity of Gold Hill, at Kane Creek, and at Gold Hill. These were all examined by the Mineral Survey with the exception of those at Gold Hill.

NEAR PHOENIX AND TALENT

William Briner Limestone Deposit

This deposit is located in the NW $\frac{1}{4}$ Sec. 28, and the NE $\frac{1}{4}$ Sec. 29, T. 38 S., R. 1 W., 3.8 miles by road southwest of Phoenix, and the Southern Pacific main line. Mr. William Briner of Coquille, Oregon, has the property under lease.

At 2350 feet elevation an old quarry which has been opened reveals limestone dipping N. 20° and striking NE-SW. The bed is approximately 20 feet thick, and is exposed for a length of 50 feet. Discontinuous exposures can be traced north-eastward to 2800 feet elevation. Although the limestone probably occurs

as a series of lenses rather than a continuous bed, a probably extension of the bed is notes on plate 63. The direction of dip of the limestone favors quarrying.

(Plate 63, Page 301--"Limestone Near Phoenix & Talent, Jackson County, Oregon)

An analysis of limestone from this deposit follows:

SiO ₂ -----	0.61	MgO -----	0.34
Al ₂ O ₃ -----	0.21	Ignition lose--	42.05
Fe ₂ O ₃ -----	0.23	Total-----	98.88
CaO -----	55.44		

Assuming that the limestone bed in continuous for 300 feet into the hill, is 20 feet thick, and has an average height of 50 feet above the present quarry floor, it is estimated that 28,000 tons of stone are available. The quarry has not been worked for 40 years, and at that time the stone was burned in a kiln adjacent to the quarry. Mr. Briner has offered to deliver the stone f.o.b. cars Anderson Creek Deposits * at Phoenix for \$2.50 per ton.

Calcareous rocks may be observed 5.7 miles from Talent on the South Fork of Anderson Creek in Sec. 6 and 7, T. 39 S., R. 1 W. (plate 63), but of a poor quality and in small quantities. Two lenses of calcareous material are found, one lying near the north line of Sec. 7, and the other in the SW $\frac{1}{4}$ of the same section. It appears to be a black limestone with light colored calcitic spots. No definite contacts were located. The adjoining rocks are chloritic schist carrying some calcareous material.

Numerous float boulders of calcareous tufa were found in the canyon bottom, and a mass evidently in place suggests hot springs activity. This material effervesces violently in acid but not large mass of it could be found.

Limestone reported in anunnamed gulch in Sec. 36, T. 38 S., R. 1 W., southwest of Talent was not found. The rock appears to have undergone considerable alteration, and has some calcareous content, but not enough to class it as even an impure limestone.

Coleman Creek Deposits

Limestone is reported on Coleman Creek in Sec. 29, T. 38 S., R. 1 W. as having been used in Medford for making mortar. This "limestone" when found in the NE $\frac{1}{4}$ MW $\frac{1}{4}$ Sec. 29 on the southeast side of Coleman Creek, proved to be a calcareous slate thought to be too impure for economic use in the lower Columbia River area. A stratum of this rock extends northwestward 2 miles, with no apparent change in quality.

UPPER APPLGATE DISTRICT

Location

The limestone investigated in the Upper Applegate district*

"includes all that part of Jackson County which is drained by the Applegate River. On the north and east it extends to the divide between Rogue and Applegate Rivers, on the south it is limited b the California State line, and on the west by the Josephine County line. As thus limited

* A. N. Winchell, Petrology and Mineral Resources of Jackson and Josephine Counties, Oregon. Oregon Bureau of Mines and Geology, Mineral Resources of Oregon, v. 1, no. 5, pp. 124-127.

the district is a large one, being some 25 miles north to south, and the same distance east to west, on the south side....The region is very mountainous, varying in elevation from about 1200 feet where Applegate River enters Josephine County to 3000 to 5000 feet everywhere except along the water courses and to 7377 feet at the summit of Dutchman's Peak...about 20 miles south of Medford. The largest valley lands are near Ruch and Applegate... Elsewhere the region is used as a stock range, or for timber of mining."

The main road which serves the district extends south from Jacksonville, and up the Big Applegate River (called Middle Fork on Metsker's map, incorrectly) to the California State line. It is hard surfaced for about 10 miles and the remainder is gravel, narrow and crooked in part. A road extends up Little Applegate River a distance of 10+ miles, gravelled for 5 miles and the remainder dirt. Numerous side roads mostly constructed by the Rogue River National Forest, are known as "auto ways". An excellent road extends up Cariberry Creek, west of Copper Postoffice.

The district was organized by placer miners in 1853, and subdivided as new local areas developed. Most of the activity is placer mining, although some lode gold is produced. Some building stone, limestone, shale, and clay, graphite, mercury, antimony, copper, manganese, iron, have been reported, and in some instances, produced.

Geology

The area consists almost entirely of pre-Cambrian and Paleozoic metamorphic and igneous rocks. In the southern part, pre-Cambrian hornblende and mica schists have been intruded by andesitic and serpentized basic dikes and modified by intrusions of tonalite. The schists are referred to by pre-Cambrian by Hershey*.

Occurrences

Limestone occurs chiefly north of the Little Applegate River and in the southwest portion of the district adjacent to Copper Postoffice. In general, the limestone occurs as lenses of no great extent, with a general NE-SW strike and high-angle dips, and widths of 50 to 100 feet. The steep dip and poorly consolidated hanging wall in most cases will make quarrying difficult. The deposits are situated 25 to 40 miles from a railroad, over rather poor roads. For these reasons, and others set forth in detail later, none of the occurrences are considered as a part of the present economic picture.

Bear Gulch Deposits

A series of NE-SW trending limestone lenses occur north of the little Applegate River in Sec. 22, 23, 24, T39 S., R. 2 W. They are exposed chiefly on the ridges either side of Bear Gulch, and in Muddy Gulch. Plate. 57. The limestones in Sec. 22 and 24 are on government land, while those in Sec. 23 are in Oregon and California railroad grant land.

The limestone is black in color, and is cut by numerous stringers of white calcite and a few of quartz from $\frac{1}{4}$ inch to 3 inches in width. The dip approximates 45° to the northwest, and the strike N. 25° E. The limestone is usually interbedded in schists and shales, which weather rapidly, leaving the limestone as ridges. The limestone is somewhat banded and weathers fairly smooth surfaces

* Oscar H. Hershey, "Age of Certain Granites in the Klamath Mountains", (American Geologist, v. 27, pp. 258-259, April, 1901)

on the bedding planes. Each limestone bed usually contains small partings of schist.

Of the 3 occurrences noted, the most persistent and best exposed is the one lying on the ridge east of Bear Gulch in Sec. 23.

It is first exposed on the ridge between 2700 and 2950 feet elevation. Limestone exposed in the channel of Bear Gulch at elevation of 2350 feet may be a continuation of the bed higher on the ridge. The strike of the main body is N. 25° E., the dip 45° NW., the strike nearly paralleling the ridge which trends about N. 15° E.

The limestone bed averages 65 feet in width with one 5 foot schist parting near the footwall. The Sterling Ditch crosses the deposit at an elevation of 2800 feet, and gives excellent section.

Quarrying.

Quarrying would probably be started in Bear Gulch. As the dip of the bed is so nearly parallel to the hillside little overburden would have to be removed and a quarry face several hundred feet long could be maintained. As the quarry was extended northeastward, more and more overburden would have to be removed. An electric power line extends into Sterling Creek to the north and a 5 mile extension would place it at the quarry. Timber for fuel or construction would have to be trucked in.

The Sterling Ditch, at an elevation of 2800 feet follows the contour of the hill, and supplies water to the Sterling Placer Mine (now Yara Mining Company) from the upper portion of the Little Applegate River. This ditch is some 30 miles long, with a water right extending back to 1871. The quarry would interfere with the service of this ditch, if extended to the upper limit of the deposit. The distance to the nearest railroad at Jacksonville is 22 miles over county road, 10 miles of which is hard surfaced, 7 miles gravelled, 5 miles unimproved. The last 10 miles is narrow and crooked. A railroad up Applegate River from Jacksonville to Copper Postoffice has been projected for years. Should it ever be constructed, the haul would be 10 miles. A railroad spur up the Little Applegate would meet with few engineering difficulties.

Because of transportation costs, this deposit is not recommended as a source of limestone for lower Columbia River points.

The other two limestone exposures, in Muddy Gulch and on the ridge west of Bear Gulch are small, and would be hard to quarry on account of their topographic setting. Since even the largest one is of doubtful value, the other two were not mapped in detail. A reported occurrence at the head of Deming Gulch in Sec. 11, T. 39 S., R. 2 W., was not found.

Seattle Bar Locality

This area is in the Upper Applegate region, within a mile of the California line, in Sec. 2, 10, 11, T. 41 S., R. 4 W. Plate 57. The main limestone bed outcrops at Seattle Bar, and runs northeastward across Manzanita Creek to the top of the ridge. Its general strike is N. 30° E., dip 45° to 60° NW. The land in Sec. 10 is owned by the American Smelting and Refining Company; in Sec. 11, Oregon-California railroad grant land; in Sec. 2, by C. E. Wade.

The limestone outcrops in the river bed, and forms a bold outcrop up to an elevation of 2800 feet where it cuts across the ridge. Plate 62. It extends down into Manzanita Creek and up the other side to an elevation of about 2500 feet where

it appears to be cut off by an igneous intrusion. To the southwest across the river, the limestone is not exposed, although the area was traversed to the California line. It is reported that limestone float can be found on the ridge extending southwest, but no field confirmation could be obtained.

The wall rocks on both sides appear to be the schist so prevalent in this area, and the schists are apparently conformable at the river's edge. Farther up the hillside, they are reported as having a southward dip, opposite to that of the limestone. The sequence southward is schist, impure quartzite, and schist.

The limestone averages about 75 feet thick, is exposed for 3/4 mile to 1 mile in length, and has a maximum relief of 800 feet. The limestone is light colored, white, cream and gray, and in part well crystallized. Banding is quite marked in some instances, the bands containing a black mineral, perhaps magnetite, and occasionally mica. Weathering produces lamellar ridges across the banding, and the crystalline varieties weather to a coarse sand.

The steep dip, and comparative thinness of the bed would constitute a difficult quarrying problem. It would be necessary to shoot down a large amount of schist on the hangingwall in order to quarry the limestone safely. A quarry face only 100 feet wide could be maintained.

Transportation is 30 miles by gravelled road to Jacksonville. As stated before, a proposed railroad may at some future date be extended up the Applegate River to tap the mining area to the south. In such case, transportation problems would be largely solved.

The timber is of fair quality, and pine and fir of 1 1/2 foot diameter is reasonably plentiful. The other timber is manzanita and laurel, and could offer a limited supply of fuel. Electric power is not available. Water power might be developed at considerable expense.

Other Deposits

Winchell reports a number of limestone occurrences in this general area. None of these except the Seattle Bar, and the one west of Steamboat on Carberry Creek, described later, were examined. Winchell gives an analysis of limestone which he states is taken from a locality in Sec. 7, T. 41 S., R. 4 W. on the Applegate River. He does not mention this locality in the text. However, he does mention the deposit in Sec. 11, which is the Seattle Bar locality, and it is presumed that the designation of Sec. 7 is a typographical error.

The analysis is quoted herewith:*

SiO ₂ -----	0.53	CaO -----	55.05
Al ₂ O ₃ -----)		H ₂ O -----	0.50
Fe ₂ O ₃ -----)	0.52	CO ₂ -----	43.25
MgO -----	Trace	Total -----	99.85

Although the indications are that the limestone is very pure, the quarrying difficulties and excessive transportation costs will perhaps remove it from the economic picture.

* U. S. Geol. Surv. Bull. 380, p. 51, 1909.

CARBERRY CREEK LOCALITY

Limestone is reported at the junction of Steve Fork and Sturgis Fork of Carberry Creek, in Sec. 19, T. 40 S., R. 4 W. Plate 57. This limestone is mainly black in color, with considerable light colored areas, giving it a variegated appearance. The strike is nearly due north, and the dip practically vertical.

The limestone bed appears to form a veneer across the nose of the ridge between the two forks; the maximum width is not over 50 feet at the center, and the bed lenses out at both ends of an exposure not over 500 feet long. The limestone appears to grade into siliceous limestone, and then to a dark impure quartzite. The limestone itself may be siliceous.

Its limited areal extent, and transportation difficulties would probably not permit economical extraction. It is approximately 8 miles by Forest Service road to the highway at Copper Postoffice, and is the least favorably situated of any of the deposits examined. The land is Oregon-California railroad grant land.

Conclusions

The limestone of the Supper Applegate District is considered as not being economically available for use in the lower Columbia River area for the following reasons:

1. The limestone occurs in lenses of limited extent, narrow width, and with numerous impurities.
2. In every case, transportation by truck for distances of 25+ miles would be necessary.
3. The steep dip and poor hangingwall conditions would introduce a serious quarrying problem.
4. The narrow width would probably prohibit an economical quarry working face, with the exception of the Bear Gulch deposit.

Analyses of Some Limestones in the Applegate River District, Jackson County, Oregon

Constituents	1	2	3	4	5	6
SiO ₂	51.77	2.63	3.84	1.63	0.94	17.46
Al ₂ O ₃	9.80	1.18	0.95	0.45	0.50	0.49
Fe ₂ O ₃	3.96	0.68	0.68	0.30	0.37	0.55
CaO	27.56	53.13	52.78	54.73	55.15	37.02
MgO	4.19	0.60	0.59	0.28	0.78	8.47
H ₂ O	1.54	n.d.	n.d.	n.d.	n.d.	0.47
CO ₂	20.36	41.23	40.77	42.82	42.44	34.86
S	0.03	0.03	0.02	0.03	0.02	0.02
Total	99.21	99.48	99.53	99.74	100.20	99.34

- 1 U.S.E.D. Sample No. 77 -- Bear Gulch Locality.
- 2 U.S.E.D. Sample No. 75 -- " " "
- 3 U.S.E.D. Sample No. 76 -- Muddy Gulch Locality.
- 4 U.S.E.D. Sample No. 78 -- Seattle Bar Locality.
- 5 U.S.E.D. Sample No. 79 -- " " "
- 6 U.S.E.D. Sample No. 80 -- Carberry Creek Locality.

GOLD HILL DISTRICT

Of the limestone in the Gold Hill region only those of Kan Creek were examined by the Mineral Survey.

Kane Creek

This property, formerly owned by the Lively Lime Company, of Gold Hill, is now owned by a Mr. Hughes of the Oregon Portland Cement Company. It is situated in Sec. 11, T. 37 S., R. 3 W., on the east side of the south or principal fork of Kane Creek, 5 miles southeast of Gold Hill. The limestone is quite pure, especially on the southeast side of the quarry, but grades into a less pure variety on the north-west side. The quarry floor is connected to bunkers 350 feet away by well-graded track passing through a 200-foot tunnel. Overburden is less than 3 feet thick and forrect cover is light.

It is said that much of the limestone was shipped to Salem and Lebanon where it was used for paper manufacture at a price of \$1.50 per ton, f.o.b. Gold Hill, Oregon. Reserves appear to be large. Equipment includes track, two large bunkers adjacent to the county road, a 15 h.p., 220-volt electric motor, and a 6 by 6 inch compressor for drilling. Detachable drill bits were used in the quarry.

A quarter of a mile down the road the company has installed a vertically, wood-fired kiln having a capacity of 12 to 15 tons per 24 hours. The operators also supplied agricultural limestone. The whole plant has been shut down for several months.

Anglysis of a large chip sample (U.S.E.D. No. 89 gave:

SiO ₂ -----	6.27	CaO	52.00
Al ₂ O ₃ -----	0.59	MgO	0.23
Fe ₂ O ₃ -----)		Ignition loss	<u>40.67</u>
FeO -----)	0.36	Total	<u>100.12</u>
	CaCO ₃ 92.67%		

Gold Hill

The Beaver Portland Cement Company Plant at Gold Hill is the largest consumer of limestone in southwestern Oregon. As indicated on plate 58, several limestone deposits were mined in the vicinity of the plant. These sources were later abandoned in favor of deposits in Josephine County.

Other reported deposits in the vicinity of Gold Hill are found on Galls Creek, in Sec. 21, T. 36 S., R. 3 W., and on Wilson Creek, in Sec. 30, T. 36 S., R. 3 W. Both of these are lenticular bodies with widths approximating 300 feet and lengths about $\frac{1}{2}$ mile. Analyses indicated that the Galls Creek deposit was high in silica.

OTHER LIMESTONES

Deposits of calcareous tufa near Shepard Spring in Sec. 28, T. 39 S., R. 2 E., owned by Theodore Elliot of Ashland, are used locally as fertilizer.

C
O
P
Y

OWENS-ILLINOIS GLASS COMPANY
601 36th Avenue
Oakland, Calif.
June 9, 1945

761 limestone
247840 Bloch

cc: Mr. W. D. Miller
our file: 11.22.750.3

Mr. Fred W. Draper
U. S. Dept. of Interior
Bonneville Power Administration
Portland 8, Oregon

Dear Mr. Draper:

We are pleased to send you the following analysis of the sample of limestone which you recently submitted from a deposit at Grants Pass, Oregon, owned by Mr. A. A. Muck of Portland.

SiO ₂	0.08
Al ₂ O ₃	0.04
Fe ₂ O ₃	0.009
CaO	55.47
MgO	0.44
Ignition Loss	<u>43.94</u>
	99.98

This chemical analysis indicates that the material is a very high grade limestone and if it can be crushed to our screen specifications, it should be entirely satisfactory for use at our proposed Longview, Washington plant.

Thank you for submitting this sample for our examination.

Very truly yours,

/s/ W. A. Mahaffy

W. A. MAHAFFY
Gen. Eng. Dept.

WAM/ha

NOTE: This is a weighted average of Muck's samples 3, 4, and 5.

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ELECTRO METALLURGICAL COMPANY

Portland Works

Report of Analysis of limestone

Date analyzed 3-23-45

Sample No. 1# Section 30

Investigation No. _____

Mark:
Grade:

From A. A. Muck Property
Southern Oregon in
Wilderville District

	Dry Basis	Burnt Lime Basis
CaO	55.39%	98.82%
MgO	.43	.76
SiO ₂	.11	.20
Al ₂ O ₃ x Fe ₂ O ₃	.10	.18
P	.003	.005
CO ₂	43.93	

COPIES TO DCD CJD ANALYST

C
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ELECTRO METALLURGICAL COMPANY

Portland Works

Report of analysis of limestone

Date analyzed 3-23-45

Sample No. #2 Section 30

Investigation No. _____

Mark:
Grade:

From A. A. Muck Property
Southern Oregon
in Wilderville District

	Dry Basis	Burnt Lime Basis
CaO	55.42%	98.96%
MgO	.46	.82
SiO ₂	.04	.07
Al ₂ O ₃ x Fe ₂ O ₃	.06	.10
P	.01	.018
CO ₂	43.99	

copies to

DCD

CJD

ANALYST

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ELECTRO METALLURGICAL COMPANY

Portland Works

REPORT OF ANALYSIS OF Limestone
DATE ANALYZED 5/16/45
SAMPLE NO. 3 Upper Quarry Face, 12' 6" Surface Chips
INVESTIGATION NO.

MARK:
GRADE:

From A. A. Muck Property
Southern Oregon
Wilderville District

	Dry Basis	Burnt Lime Basis
CaO	55.65%	99.37%
MgO	.34	.60
SiO ₂	.03	.053
Al ₂ O ₃	.024	.043
Fe ₂ O ₃	.016	.028
P	.008	.014
CO ₂	44.04	

cjd analyst

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ELECTRO METALLURGICAL COMPANY

Portland Works

REPORT OF ANALYSIS OF Limestone
DATE ANALYZED 5/16/45
SAMPLE NO. 4 Upper Quarry Face 12' Surface Chips
INVESTIGATION NO.

MARK:
GRADE:

From A. A. Muck Property
Southern Oregon
Wilderville District

	Dry Basis	Burnt Lime Basis
CaO	55.43%	98.85%
MgO	.37	.66
SiO ₂	.13	.23
Al ₂ O ₃	.06	.106
Fe ₂ O ₃	.04	.074
P	.009	.016
CO ₂	43.89	

cjd analyst

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ELECTRO METALLURGICAL COMPANY

Portland Works

REPORT OF ANALYSIS OF Limestone
DATE ANALYZED 5/16/45
SAMPLE NO. 5 Upper Quarry Face 30' Chip Surface
INVESTIGATION NO.

MARK:
GRADE:

From A. A. Muck Property
Southern Oregon
Wilderville District

	Dry Basis	Burnt Lime Basis
CaO	55.55%	99.20%
MgO	.38	.66
SiO ₂	.05	.09
Al ₂ O ₃	.025	.045
Fe ₂ O ₃	.015	.027
P	.0065	.011
CO ₂	44.00	

cjd analyst

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ELECTRO METALLURGICAL COMPANY

Portland Works

REPORT OF ANALYSIS

SAMPLE NO. 7

DATE ANALYZED

INVESTIGATION NO.

Limestone

Sect. 30, West 70' Chipped Lower
Quarry Site Face

5/16/45

MARK:
GRADE:

From A. A. Muck Property
Southern Oregon
Wilderville District

	Dry Basis	Burnt Lime Basis
P	.0095%	0.017%
SAMPLE NO. 8	Lower Quarry Site Face	East 75'
CaO	55.31%	98.65%
MgO	.41	.73
SiO ₂	.13	.23
Al ₂ O ₃	.068	.121
Fe ₂ O ₃	.042	.074
P	.009	.015
CO ₂	43.84	

cjd analyst

June 11, 1948

Mr. L. L. Laws, Manager
State Lime Plant
2605 State Street
Salem, Oregon

Dear Mr. Laws:

This is in reply to your letter of June 10 with enclosure of letter received by you from Lime Products, Roseburg, together with copies of analyses of limestone in a deposit known as the Harrington.

The apparent conflict in percentages is because of the difference in reporting. Strictly speaking, the lime content is the CaO content which is only a fraction of the calcium carbonate content or the neutralizing value of the limestone. The report of analyses of limestone samples on one of the yellow sheets you enclosed gave a certain percentage of calcium oxide, a certain percentage of magnesium oxide, and a certain percentage of carbonic acid. The carbonate content of ~~of~~ neutralizing value would be obtained by adding together the calcium oxide, magnesium oxide, and carbonic acid.

On the other yellow sheet is given a series of CaO percentages as analyzed by Associated Laboratories. Theoretically, in order to obtain calcium carbonate content from the CaO content, you multiply the CaO by 1.79. The average of the analyses given by Associated Laboratories is 51.68 percent CaO. This would mean that this stone would analyze approximately 92.3 percent CaCO₃.

We do not have an up-to-date report on the Harrington limestone deposit. The one we have indicates that measurement of the surface area gives about 150,000 square feet of stone. This would mean about 12,000 tons for every foot of depth. Although I have not seen the deposit, I should think it likely that there would be some streaks of low-grade material mixed in with the better grade. On the other hand, it may be that the measured area of exposed limestone as given in our report may not represent all the possible limestone in the deposit.

If we can supply any further information, please feel free to call upon us.

Very truly yours,

Director

FWL: jr

STATE LIME PLANT
MANUFACTURERS OF AGRICULTURAL LIME

2605 STATE ST.
SALEM, OREGON

June 10, 1948

Mr. F. W. Libbey, Director
State Dep't of Geology
702 Woodlark Bldg
Portland 5, Oregon

Dear Mr. Libbey,

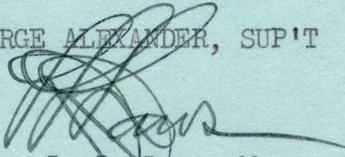
Inclosed is a letter and some data received from Mr. E.H. Weston of Roseburg in regard to some limerock deposits.

The reports seem to be conflicting in that he states in one of them that the limestone consists of about 95% carbonate of lime, and the highest calcium content shown in the list of tests is 53.42%.

You perhaps have the information in your office that would indicate whether these deposits would be of high enough quality to justify further inquiry. Will you kindly advise.

Yours very truly

GEORGE ALEXANDER, SUP'T


By L. D. Laws, Manager

JUN 11 1948

STATE DEPT OF GEOLOGY
& MINERAL IND.

LIME PRODUCTS
OFFICE OF THE UNDERSIGNED
ROOM 201
230 N. STEPHENS ST.
ROSEBURG, OREGON

June 7, 1948

George Alexander
Superintendent State penitentiary
2605 State Street,
Salem, Oregon

Dear Sir:

In reference to our telephone conversation, I'm giving you a brief outline of the lime deposits. Engineers estimate 1,750,000 tons in sight. The quality of rock according to essay returns has a C A O content average 95.

I am sending you a copy of essay returns, one recent and the other some years ago. I and my associates have purchased the mineral right on about 700 acres in the Roberts Creek area, four and one half miles from the main line of the Southern Pacific.

Our investigation shows a raw material (namely limerock) to be a very high quality and suitable for agricultural purposes. I'll be glad to have your engineers to check the situation as soon as possible and if you find the material satisfactory, we will enter negotiation for the productions and price that will be satisfactory to you.

Yours truly,



In order to establish the average composition of the various parts of the limestone formation, I divided the accessible places of the mountain slope into six sections and took fair average samples at each of these by breaking off from 20 to 30 pieces of rock, which were finally crushed and ground. These sections are indicated on the map by the figures 2,3,4,5,6,1 while the red cross marks give the range of the places from where the single pieces were taken that constituted a sample.

The chemical composition of these samples follows herewith:

L I M E S T O N E S A M P L E S

	Silica	Alumina	Iron Oxide	Calcium Oxide	Magnesium Oxide	Carbonic Acid	CaCO ₃	neutral val.
Sample 1:	2.80%	0.56%	0.96%	55.60%	0.29%	39%	94.60	94.8
Sample 2:	1.60%	1.70%	1.50%	52.00%	0.10%	42.44%	94.44	94.59
Sample 3:	3.10	0.67	0.75	53.26	0.54	40.70	93.96	94.5
Sample 4:	2.75	0.55	0.56	53.02	0.46	41.52	94.54	95.0
Sample 5:	1.74	0.66	0.31	54.03	0.25	42.42	96.45	96.70
Sample 6:	3.27	0.48	0.57	53.32	0.19	41.16	94.48	94.6

These analyses show that the limestone consists, wherever it may be quarried, of about 95% of carbonate of lime and that it contains about 5% of silica, alumina and iron oxide in proportions suitable for the manufacture of Portland cement.

Copy

ASSOCIATED LABORATORIES
Chemists, Bacteriologists, Assayers

2419 S.E. Powell Blvd.
Portland 2, Oregon
Phone Vermont 6004

DATE
May 20, 1948

SAMPLE
Limestone

OUR REF. NO.
970-983 inclusive

YOUR MARK
As noted

RECEIVED
May 17, 1948

LABORATORY CERTIFICATE

Sample Description	Lab. No.	Percent lime as CaO in limestone rock
Landers Lease No. 1	970	52.56%
Landers Lease No. 2	971	53.42%
Landers Lease No. 3	972	53.07%
Landers Lease No. 4	973	53.04%
Landers Lease No. 5	974	51.27%
Landers Lease No. 6	975	52.13%
Landers Lease No. 7	976	51.76%
Landers Lease No. 8	977	50.38%
Landers Lease No. 9	978	47.53%
Landers Lease No. 10	979	49.72%
Landers Lease No. 10	980	52.35%
No Mark	981	52.80%
Harrington Deposit No 2	982	50.56%
Harrington Deposit No 3	983	52.92%

Aver 51.68
Aver CaCO₃
92.30

Harrington Deposit No. 3
Percent Magnesite as MgO
0.478%

Note: Sample of laboratory number was received with no accompanying tag or identification. It is presumed from the numeral designation of other samples that it may be Harrington Deposit No. 1.

Very truly yours,
ASSOCIATED LABORATORIES

by A. W. WILSON

Copy

STATE LIME PLANT
MANUFACTURERS OF AGRICULTURAL LIME

2605 STATE ST.
SALEM, OREGON

April 26

1948

Mr. F. W. Libbey, Director
State Dept of Geology
702 Woodlark Bldg.,
Portland 5, Oregon.

Dear Mr. Libbey,

Your letter of the 15th was duly received. Using the data given we have decided that it would be extremely doubtful if the quarry in question could be made to save us any money, and there is a probability that in the long run it may cost us more than we are now paying. So we will drop the matter.

Many thanks to you and Mr. Wolfe for your services.

Yours very truly

GEORGE ALEXANDER, SUP'T

By L. L. Laws, Manager

RECEIVED
APR 27 1948
DEPT OF GEOLOGY
MINERAL INDS.

April 15, 1948

Mr. L. L. Laws, Manager
State Lime Plant
2605 State Street
Salem, Oregon

Dear Mr. Laws:

Please refer to the matter of lime deposit owned by Messrs. Whitsett and Hays which is located near Gold Hill.

Our Mr. Wolfe has made a reconnaissance of the deposit and has forwarded to this office a confidential memorandum report. We should be glad to supply you with a copy of this report but since it is somewhat discouraging, I would assume that you would have very little interest in receiving a copy. Mr. Wolfe sums up his investigation as follows:

"The deposit does not appear suitable for use by the State Lime Plant. The amount of limestone apparent is not adequate to sustain this size of operation (anticipated use of 10,000 tons annually). From size of outcrops and inferred depths, an estimated 75,000 tons of limestone is present. The lenses are too small to be quarried without excessive contamination. Transportation to the shipping point at Gold Hill would involve costly construction of approximately one mile of road and a 30-foot to 50-foot bridge across Gall Creek to connect with the Gall Creek road."

If this Department can supply any further information, please feel free to call upon us.

Very truly yours,

Director

FWL: jr

March 30, 1948

Mr. L. L. Laws, Manager
State Lime Plant
2605 State Street
Salem, Oregon

Dear Mr. Laws:

As Mr. Libbey is out of town for a few days, your letter of March 29 has been referred to me for answering.

Mr. Wolfe, the Department's field geologist at Grants Pass, has been notified of your request and will try to contact Messrs. Whitsett and Hays with the object of looking at the quarry. Any information which you might furnish Mr. Wolfe would be appreciated. His address is P.O. Box 417, Grants Pass, Oregon.

Sincerely yours,

H. M. Dole
Geologist

HMD: jr
cc Harold Wolfe

STATE LIME PLANT
MANUFACTURERS OF AGRICULTURAL LIME

2605 STATE ST.
SALEM, OREGON

March 29, 1948

Mr. F. W. Libbey, Director
State Dep't of Geology & Mineral Industries
702 Woodlark Bldg
Portland 5, Oregon.

Dear Mr. Libbey,

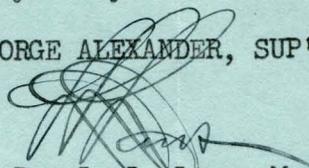
Many thanks for your letter of the 27th regarding
the old lime quarry near Gold Hill.

We would be very glad to have your geologist, stationed
at Grants Pass, go over and have a look at the quarry in
question. He may have to make arrangements by mail with the
owners as we don't know just where they live. They are:

Lawrence Whitsett, P.O.Box 606, Gold Hill
John Hays (address unknown, but presumably Gold
Hill)

Yours very truly

GEORGE ALEXANDER, SUP'T


By L. L. Laws, Manager

RECEIVED
MAR 30 1948

STATE DEPT OF GEOLOGY
& MINERAL INDS.

March 27, 1948

Mr. L. L. Laws, Manager
State Lime Plant
2605 State Street
Salem, Oregon

Dear Mr. Laws:

This acknowledges receipt of your letter dated March 25 inquiring concerning an old quarry near Gold Hill which was operated by the Beaver Portland Cement Company 25 to 30 years ago.

According to reports, the cement company quarried several lenticular bodies of limestone in the general area near Gold Hill 25 or 30 years ago. These sources of limestone proved to be both inadequate and expensive so quarry operations of the company were moved to Marble Mountain south of Wilderville. We do not have a record of the particular limestone body owned by Messrs. Whitsett and Hay 3 miles from Gold Hill. As stated above, these lenticular bodies have not proved very reliable in regard to reserves. They are likely to pinch out or contain "horses" or waste without very much warning. In other words, unless there has been adequate development work to prove reserves in these lenticular bodies, an operator cannot depend on a quarry face continuing consistently.

As for quality, we have analyses of a body of such limestone on ^KCane Creek 5 or 6 miles from Gold Hill which returned about 92.7 percent calcium carbonate. Although it is reported that samples from some of these bodies in Jackson and Josephine counties have given returns indicating high-grade stone, I would say that 92 or 93 percent would be a fair average.

If you wish us to do so, our geologist stationed at Grants Pass could go over and have a look at the quarry in question. To do this, it would be necessary for you to tell us where Whitsett and Hay may be found.

Very truly yours,

Director

FWL: jr

STATE LIME PLANT
MANUFACTURERS OF AGRICULTURAL LIME

2605 STATE ST.
SALEM, OREGON

March 25

1948

Mr. F. W. Libbey, Director
Dep't of Geology & Mineral Industries
702 Woodlark Bldg
Portland, Oregon.

Dear Mr. Libbey,

We are offered lime rock from the old quarry near Gold Hill that supplied this plant when it was located at Gold Hill 25 to 30 years ago. The present owners, however, are not able to operate it, so some plan of operation would have to be worked out.

Will you please give us what information you have available regarding this quarry -- its analysis, extent, etc. It is now owned by Lawrence Whitsett and John Hay and they claim to have taken possession about 10 years ago and changed the name of it to River View Lime Quarry. They said it had previously been known as the Merry Xmas quarry.

When the State operated this quarry an aerial tramway about a mile long was used. They state the quarry is about 3 miles from Gold Hill, so we presume they mean it is that far by road.

Any information you may be able to give us at this time will be greatly appreciated.

Yours very truly

GEORGE ALEXANDER, SUP'T

By L. L. Laws, Manager

Kame Creek 92.47% CaCO_3

RECEIVED
MAR 26 1948
STATE DEPT OF GEOLOGY
& MINERAL INDS.



STATE DEPARTMENT OF GEOLOGY
AND MINERAL INDUSTRIES

702 WOODLARK BUILDING
PORTLAND 5, OREGON
April 13, 1948

Mr. F. W. Libbey
702 Woodlark Bldg.
Portland, Ore.

Dear Mr. Libbey,

Enclosed you will find a report on the River View limestone deposit located on Galls Creek near Gold Hill. This is in accord with the State Lime Plant request.

In a letter from Mr. Laws of the State Lime Plant, it was mentioned that at present they are getting their limestone delivered at Wilderville for \$2.25/ton. It seems to me that to decrease this price any substantial amount would require the most favorable type of deposit and one well located in respect to a rail shipping point. The River View Claim has neither sufficient quantity of limestone nor favorable location and could not be considered. Mr. Laws mentioned the possibility of constructing an aerial tram but the cost of this would likely prove excessive. No information is available concerning the quality of the River View Limestone so am having two samples run (IG-78&79).

There was considerable delay in making this inspection as the ford has not been available for field work. It has stalled or failed to start on so many occasions that it was necessary to leave it at Watsons for a few days in an attempt to find the trouble.

Sincerely,

Harold D. Wolfe
Harold D. Wolfe

HDW/bw

✓
RECEIVED
APR 14 1948
STATE DEPT OF GEOLOGY
& MINERAL INDS.

March 11, 1948

Mr. L. L. Laws, Manager
State Lime Plant
2605 State Street
Salem, Oregon

Dear Mr. Laws:

This acknowledges receipt of your letter dated March 10.

I am sending you a copy of our G.M.I. Short Paper No. 15 which describes limestone deposits in the Willamette Valley. This is the only publication we have issued on the subject of occurrences. We have sponsored a Short Paper on flotation of limestone which describes experiments conducted by the U.S. Bureau of Mines on samples of lime rock obtained by this Department from the deposits at Dallas and Marquam. I assume that these metallurgical results would not be of particular interest to you.

In a matter of two or three months we shall issue a bulletin on the geology of the Dallas and Valsetz quadrangles which will have relatively brief statements concerned with limestone deposits in that area. These statements, however, will not add very much to commercial possibilities as given in our G.M.I. Short Paper No. 15.

Yours very truly,

Director

FWL: jr

STATE LIME PLANT
MANUFACTURERS OF AGRICULTURAL LIME

2605 STATE ST.
SALEM, OREGON

March 10

1948

Mr. F. W. Libbey, Director
Dep't of Geology & Mineral Industries
702 Woodlark Bldg.,
Portland Oregon

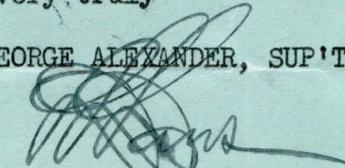
Dear Mr. Libbey,

Will you kindly send us a copy of GM No.1, Short Paper
No.15.

Would appreciate copies also of any material you may have
available on the various limerock deposits in the Willamette
Valley.

Yours very truly

GEORGE ALEXANDER, SUP'T



By L. L. Laws, Manager

RECEIVED
MAR 11 1948

STATE DEPT OF GEOLOGY
& MINERAL INDS.

Horsehead LIME CORPORATION



WALTER H. LEVERETTE - - - - President
 WK. E. COLEMAN - Vice Pres. & Sales Mgr.
 VINSON VAUGHAN - - - - Secty.-Treas.
 W. H. HOLLOWAY - - - - - Plant Mgr.

MAIN OFFICE: LEVERETTE BLDG.
 MEDFORD, OREGON
 PHONE 3166

SALES OFFICE: W. E. COLEMAN CO.
 207 S. E. CLAY ST.
 PORTLAND 14, OREGON

M E D F O R D , O R E G O N

Feb. 27, 1948.

RECEIVED
 FEB 28 1948

Mr. F. W. Libbey,
 State Dept. of Geology,
 Woodlark Bldg.,
 Portland, Oregon.

STATE DEPT OF GEOLOGY
 & MINERAL INDS.

Dear Sir :

The following information about Horsehead lime analysis is mostly from customers of lime made by our predecessors, the Washington Brick & Lime Co., and reports given by their chemists from carload lots.

General limits of analyses

Calcium Oxide	96% to	99%
Magnesium Oxide	0.4 -	1.0
Iron & Alumina	0.2 -	0.5
Silica	0.1 -	0.4
Phosphorus	0.016 -	0.024
Loss by Ignition	2.00 -	4.00

Customers Report of Cars

	No.1	No.2	No.3	No.4	No.5	No.6
Calcium Oxide	97.00	94.48	98.64	97.72	98.52	98.60
Mag "	0.41	0.58	0.54	0.74	0.48	0.40
Silica & Insoluble	0.06	0.16	0.02	0.30	0.63	0.36
Alumina & Iron	0.22	0.15	0.18	0.25	0.15	0.20
Phosphorus					0.018	0.019
Loss by ignition	2.33	4.05	1.83			

The first four numbers are reports from paper makers etc. and 5 and 6 are from a carbide maker who is quite interested in the phosphorus content.

If we can give you additional information please call us.

Yours very truly,

Horsehead Lime Corporation,

W.E. Coleman

To be investigated file.

Washington Co.

Limestone file

LIMESTONE WEST OF GALES CREEK

Fred Chain, Park Street, Forest Grove, working with Harding (Portland Assayer, now deceased) and Lazell (ditto) apparently for Oswego Portland Cement Co., prospected the area south of the Wilson River Highway and west of Gales Creek, and is said (by his father in law W.C. Looney, Park St., Forest Grove) to have discovered a very large deposit of limestone assaying from 70 to 85% CaCO_3 , $1\frac{1}{2}$ miles from one of the numerous logging railroad branches, near the head waters of the north fork of the Trask River. It is said to be several thousand feet long and over 100 feet thick, but had too great an overburden (50 to 80 feet) to interest the Oswego people. Chain is now in the Navy, (went in last April,) so it may be some time before he gets out. His wife visited the deposit with him, and might be able to guide one to it. She will look through his papers to see if she can find the exact description of the location, and will let us know.

The county judge, H.D. Kerkman, knows nothing of the location, nor does Looney. Floyd Werner of Rainier might know, but probably does not.

Report by JEA 11 October 1945.

Apparently one reaches the deposit by going up the ridge road west of Gales Creek ~~to~~ past the Zigzag guard Station and along the Skyline Truck Trail.....

COPY
OWENS-ILLINOIS GLASS COMPANY
601 36th Avenue
Oakland 1, California

June 9, 1945

761 limestone
247840 Bloch

cc: Mr. W. D. Miller
Our file: 11.22.750.3

Mr. Fred W. Draper
U. S. Dept. of Interior
Bonneville Power Administration
Portland 8, Oregon

Dear Mr. Draper:

We are pleased to send you the following analysis of the sample of limestone which you recently submitted from a deposit at Grants Pass, Oregon, owned by A. A. Muck of Portland.

SiO	0.08
Al ₂ O ₃	0.04
Fe ₂ O ₃	0.009
CaO	55.47
MgO	0.44
Ignition loss	<u>43.94</u>
	99.98

This chemical analysis indicates that the material is a very high grade limestone and if it can be crushed to our screen specifications, it should be entirely satisfactory for use at our proposed Longview, Washington plant.

Thank you for submitting this sample for our examination.

/a/ W. A. Mahaffy

W. W. MAHAFFY
Gen. Eng. Dept.

WAM:ha

NOTE: This is a weighted average of Muck's samples 3, 4, and 5.

COPY

OREGON

LIMESTONE

JOSEPHINE

MUCK'S LIMESTONE

Samples analyzed by Pacific Carbide Co.

<u>Sample No.</u>	<u>P</u>	<u>Ign.</u> <u>Loss</u>	<u>Insol.</u>	<u>Al₂O₃</u> <u>Fe₂O₃</u>	<u>CaO</u>	<u>MgO</u>
Upper Face - 1	.014	43.62	.57	.31	54.63	.49
" " 2	.009	43.60	.35	.15	54.92	.40
" " 3	.007	43.42	.60	.13	54.83	.44
" " 4	.008	43.27	.59	.23	54.50	.48
" " 5	.008	43.63	.38	.67	54.50	.35
Lower Face - 7	.010	43.47	.28	.58	54.60	.41
8	.008	43.42	.29	.43	54.96	.32

10-4-57

Push-Button Plant To Turn Out Lime

BAKER (Special) — Several thousand years ago the Egyptians and their unwilling slaves stuck the pyramids together with an adhesive made largely of lime. They did a good job and that's one reason why the pyramids have lasted so long.

But the Egyptians and their aides lived too soon. Their job would have been much simpler and the whips fewer had they had access to the new push-button lime plant formally opened Thursday near Baker by Anthony Brandenthaler and Thomas R. Dant.

The new plant is really an electronic adaptation for the manufacture of the second oldest building material, lime, known to man, bricks being first. The citizens of Baker are very happy to participate in the venerable industry because the new \$2,000,000 development promises an annual payroll of \$300,000 to 40 persons and their families.

Lime Supply Large

With 60 years' supply of the basic material, limestone, standing grey and bold in the Blue mountains 12 miles northwest of Baker, most of the Baker citizens are figuring the cash income should last as long as they will.

The newly operating firm, Chemical Lime company, was welcomed and feted in Baker Thursday by a hosting group of Baker business concerns and the chamber of commerce and the Lions club. A number of out-of-town visitors, including Governor Robert D. Holmes, were guests at a Lions luncheon where Brandenthaler described the hopes of the project and Holmes welcomed the industry to the state.

In the afternoon a trip to the new plant was scheduled followed by a Baker-style barbecue to which all the city's 10,-

Thomas Dant, partner of the Dant and Russell lumber and shipping firm, late of Portland, came in with Brandenthaler and now the new firm is ready for business.

Their business will be the sale of chemical lime to some of the firms who utilize lime in more than 7000 processes. Practically all the Baker product to be sold under the name Blue Mountain Lime, will go to firms in Oregon, Washington and Idaho which manufacture paper, steel products, carbide, aluminum, glass and other products.

Pure Product Required

These are industries which will require a lime free of so-called impurities which are found in most limestone deposits. Most of the chemical lime has previously been brought to the Pacific Northwest from Louisiana, Mississippi, Missouri and Montana.

The Baker operation consists of blasting out the limestone rock, and feeding it through an electronically controlled crusher, which breaks the rocks into various sizes ranging from walnuts to peas. Then the material is hauled to the plant near Baker, where it is stockpiled. Next, the limestone is baked in kilns, where the bulk is reduced by half. Capacity is 72,000 tons a year. It is shipped in bulk and in bags.

Arrival of natural gas a year ago, via Cascade Natural Gas, made the project possible because an economic fuel was available for the first time. The new firm is appreciative of co-operation by Baker townspeople and by the U. S. forest service, which controls the quarry site.

Ore Moving Out

Hauling of crushed ore to the new plant is now under way via 32-ton trucks and trailers.

Officials of Chemical Lime

000 inhabitants were invited. Beef for the occasion was provided by William Wessinger of Blitz Weinhard, Portland.

Start 60 Years Ago

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Brandenthaler came out of Seattle and Portland to Baker to establish the successful Burnt River Lumber company, capacity 125,000 board feet a day. Seven years ago he became interested in the limestone deposits, which had been established about 1949 as being of unusually pure quality.

manager, who provided basic designs; Walt Taschek, superintendent of the entire operation; Ned Thomas, his office manager and superintendent, and Ray Fenn, his chemist. Detailed engineering was done by Stoyanov and Johnson, Portland.

Guests in Baker for the occasion—which precedes actual plant operation about a month—included Congressman Al Ullman, David Duncan, president of the Portland chamber of commerce; Edward L. Hix, Electro Metallurgical company, Portland; Harry Swanson, administrative assistant to Governor Holmes; Julius Jensen, manager planning and development department, state of Oregon; Ivan Bloch, consultant to the state development department; Floyd Maxwell, director Oregon centennial commission, of which Brandenthaler is chairman; Mr. and Mrs. William Wessinger; Mr. and Mrs. Thomas Dant, and C. W. Evers, Union Pacific traffic manager, Portland.

Quarry Haul Begun By Chemical Lime Co. This Week

New Industry Starts Initial Phase of Extensive Production

Chemical Lime Co. Monday began hauling lime rock from its Marble creek quarry to its plant site at Wing siding.

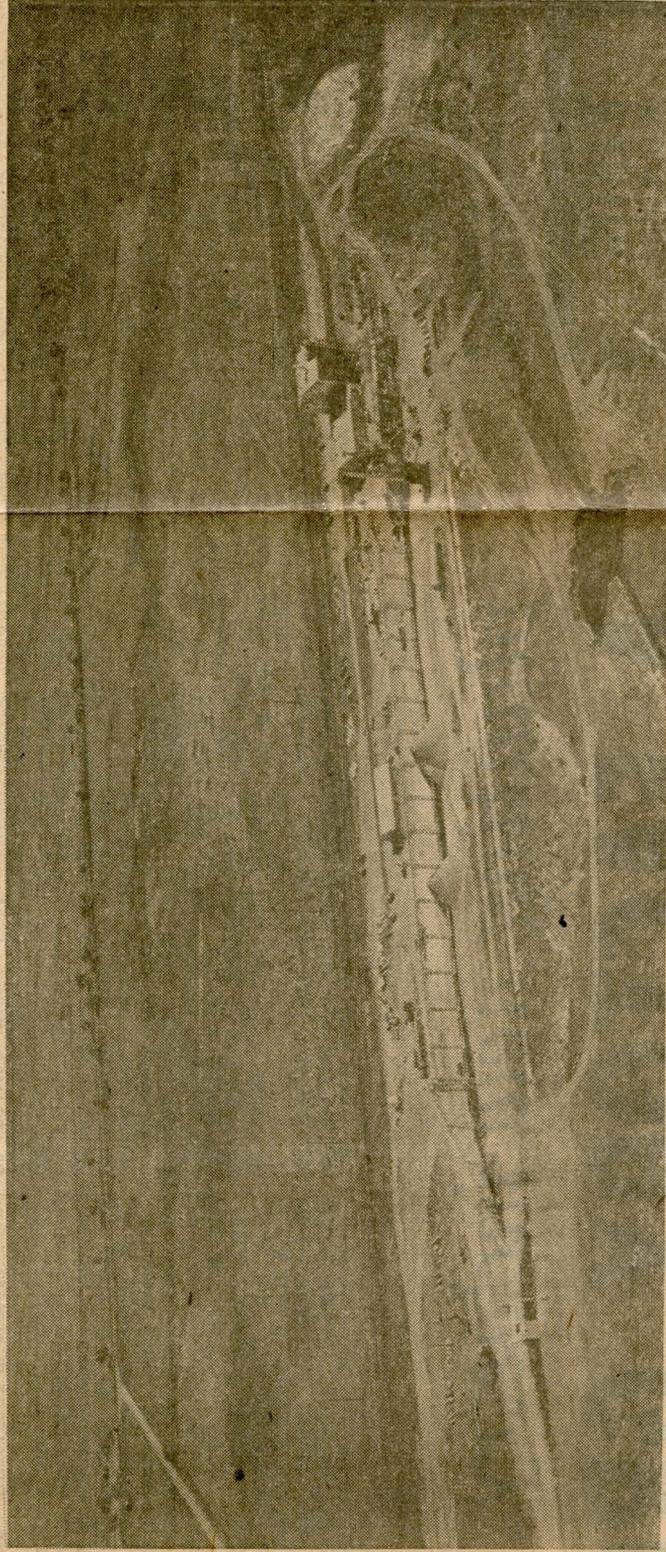
General Manager R. G. Vervaeke said today that the start of the plant itself will be some time later but that the quarry operation constitutes the initial phase of the new industry here.

Quarrying is under way at Marble creek together with operation of the primary crusher only. The initial haul consists of fill material for the huge plant stockpile facility. But next week the sized lime rock will be coming in, Vervaeke expects.

The secondary crushing facility will get into operation.

The haul from the quarry through the Wingville district to the railroad is being contracted to Dave Galle and Jack Brack who are using large truck and trailer units to shuttle on the run.

Mineral Industry Plant Dedication Set



CHEMICAL LIME PLANT Strategically situated on major transportation facilities in Powder Valley, this new industrial plant is being dedicated today. This aerial view looking eastward and a little south from the old Funk property on the Wingville road shows the new plant, shows the main line UP railroad and the new spur siding coming in from the center right. In the upper picture is shown the Old Oregon Trail highway, with the Wingville junction just showing at the upper left corner.

The aerial view by Holman Studio shows, at the left, the dumping dock where trucks bring in lime rock from Marble creek quarry 12 miles to the west. The central bridge-like structure shows rock piling up in the stockyard. The dark line at the base of the structure is the conveyor tunnel which will convey the sized rock to the kilns as required. The first of two rotating kilns is shown in the right center, with the new large warehouse and processing plant behind the kiln. —Holman Studio Photo

Processing Plant Flame to Be Lit

By **BYRON C. BRINTON**

At about 8 p.m. today Governor Robert D. Holmes will light the gas flame in kiln No. 1 at the new Chemical Lime Inc. plant at Wing siding and herald the opening of Oregon's newest industry and one of Eastern Oregon's first new mineral processing plants in recent years.

With extensive quarry operations already under way at Marble creek where years and years of reserves have been blocked out in chemical-grade limestone, the company launches the final phase of its development tonight, the inauguration of operational tests and shake-down phases at its new processing facility.

A score of Oregon industrial leaders were joining Partners Anthony Brandenthaler and Thomas Dant and Supt. Robert Vervaeké and a chamber of commerce committee at a huge public barbecue and ceremony at the plant tonight.

Tour Quarry

Headed by Governor Holmes the party was escorted by company personnel to Marble creek this afternoon where the 250-ton-per-hour primary crusher was seen in operation.



GOVERNOR HOLMES

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Headed by Governor Holmes the party was escorted by company personnel to Marble creek this afternoon where the 250-ton-per-hour primary crusher was seen in operation at the quarry, with limestone flowing through secondary treatment and into storage tanks preparatory to the haul by contract trucks to railhead at Wing.

But it is at the burning plant that tonight's ceremony will herald the production soon from the only producer of chemical-grade lime in Oregon whose metallurgical and chemical industries have been shipping in the material from as far away as Mississippi and Missouri.

2000 Expected

The nearly 2000 local residents anticipated at the plant open house tonight will see the major installations which will currently produce calcinated pebbled quick lime, principally for industry, calcinated pulverized quick lime, and hydrated lime, for both industry and the building trades.

They, in brief, will see not only a new industry, but the home plant of the "Blue Mountain" brand under which the product will be marketed.

The plant will ship its product in both bulk and bagged forms.

With children discouraged from attending tonight's function, because of safety, Supt. Vervaeke indicated that in due time closely supervised groups of students will be conducted through the plant as educational tours.

Scores of Leaders Here

The chamber and the company are prepared to handle open-house crowds tonight under shelter of the huge warehouse. The ceremony will follow and likewise is sufficiently sheltered at the kiln head to circumvent inclement weather.

The advent of local mineral production of a chemical-grade was being heralded by many leaders. Largest user of industrial lime, Electro-Metallurgical Co., of Portland, was represented by Mr. Hicks, its general manager.

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Dave Duncan, likewise an industrial authority and now president of Portland Chamber, was on hand. With Governor Holmes is his Aide Harry Swanson, his development department head Julius Jensen and Consultant Ivan Bloch, Congressman Al Ullman, State Sen. Dwight Hopkins, Rep. Clinton P. Haight.

Union Pacific is represented by Traffic Mgr. C. W. Evers, Gen. Supt. J. G. Kimmell, Traveling Freight and Passenger Agent L. E. Donahue, General Agent J. M. Landau, and E. L. Chantry, Asst. Supt.

Cascade Natural Gas was represented from Seattle by Harold B. Munton, its industrial sales manager, and from Walla Walla by Harold Floyd, district manager.

(Continued on Page Six)

Lime Plant Event Draws Near 3000

Community Salutes New Industrial Plant

An estimated 3000 persons jammed the 80-acre Chemical Lime Co. site at Wing siding Thursday night as the community helped the firm celebrate the lighting of its first burning kiln, a ceremony which drew Governor Robert D. Holmes, heading a list of notable dignitaries present.

The plant will actually require a month to shake the final bugs out of various procedures but the lighting heralded virtual completion of the big operation.

About 40 employees will be permanently employed on an annual payroll of about \$300,000.

The ceremony took place in spite of cool, dripping weather, following the serving of beef barbecue hurriedly moved indoors in the huge new warehouse which seated over 750 at a time.

Serving began at 5:30 and continued till about 9:30 slowed considerably by the disruption of outside plans due to the rains of last week, but dozens of volunteer chamber workers and business men dished out chili, salad and beef barbecue sandwiches until the last persons had gone home.

Manager Bob Vervaeke acknowledged a "well-done" to employees who had helped build the plant. With long years in the Western lime industry, this was the first plant he has had an opportunity to build from the ground up he said. Industrial Architect Tom Johnson was also on hand. Lee Gyllenberg spoke for the employees in "appreciation for the enterprise" of the Chemical Lime owners.

Governor Talks

Judge Lloyd Rea offered the full cooperation of Baker county to the new firm and expressed confidence in its future.

E. K. Hicks, head of Electro-Metalurgical Corp., Portland, told of his firm coming to the region 15 years ago and that it—one of the largest users of chemical lime—looks to the future with a great deal of courage and hope."

Union Pacific, Cascade Gas, Owner Anthony Brandenthaler, Chamber President Gilbert Ballantyne, Congressman Al Ullman and others appeared on the dedicatory program.

"The breadth and scope and majesty of a great state" is unfolding, Gov. Holmes said in reviewing a recent resource trip throughout the state and in acknowledging the local plant as a symbol of the rebirth of activity.

He declared timber resources, attention to the value of stored water, appreciation of the whole state for development of multipurpose dams, recognition of the great power potential in the region, irrigation, recreation and fisheries resources are all coming in for attention.

Expanding the tax question he promised to go into the 1959 legislative session with answers to the question: "How does a tax structure affect the orderly expansion of all industry?"



KILN LIT: Robt. Holmes, governor of Oregon, Thursday night inserted the torch which lit the natural gas fuel in Chemical Lime Co.'s new burning plant at Wing siding. Left is Bob Vervaeke, superintendent and to the right is Tom Dant, one of the owners of the new enterprise. At the rear in hard hat is W. R. McMillen, pipefitter for Chemical Lime. Ceremony was on high platform from which kiln is controlled. Huge crowd on the ground witnessed the ceremony.

Record-Courier News Photo



MANAGER: Robert R. Vervaeke, with long experience in the West in the lime quarry and processing industry, is in charge of Chemical Lime Co.'s operation here. Newsphoto shows Mr. Vervaeke as he appeared as host to huge dedication ceremony crowd October 3. He stands beside roaring furnace of first kiln which was dubbed "Roarin' Mary" by the workmen.

Baker Welcomes \$2,000,000 Pushbutton Lime Plant, \$300,000 Payroll

BY EDWARD MILLER
Assistant Managing Editor, The Oregonian

BAKER (Special)—Several thousand years ago the Egyptians and their unwilling slaves stuck the pyramids together with an adhesive made largely of lime. They did a good job and that's one reason why the pyramids have lasted so long. But the Egyptians and their aides lived too soon. Their job would have been much simpler and the whips fewer had they had access to the new pushbutton lime plant formally opened Thursday near Baker by Anthony Brandenthaler and Thomas R. Dant.

The new plant is really an electronic adaptation for the manufacture of the second oldest building material, lime, known to man, bricks being first. The citizens of Baker are very happy to participate in the venerable industry because the new \$2,000,000 development promises an annual payroll of \$300,000 to 40 persons and their families.

Lime Supply Large

With 60 years' supply of the basic material, limestone, standing grey and bold in the west of Baker, most of the Baker citizens are figuring the cash income should last as long as they will.

The newly operating firm, Chemical Lime company, was welcomed and feted in Baker Thursday by a hosting group of Baker business concerns and the chamber of commerce and the Lions club. A number of out-of-town visitors, including Governor Robert D. Holmes, were guests at a Lions luncheon where Brandenthaler described the hopes of the project and Holmes welcomed the industry to the state.

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Baker Welc

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Assistant Managing Editor, The Oregonian

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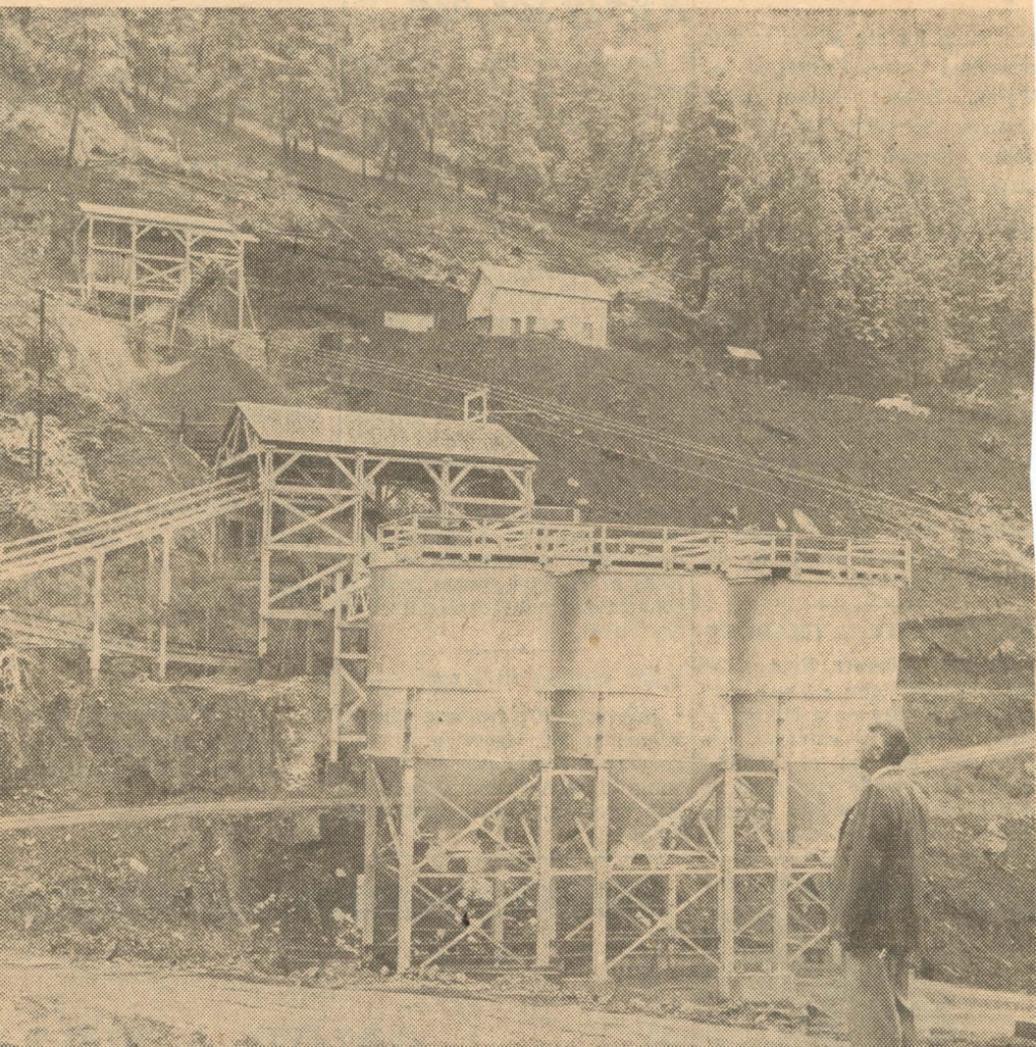
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Brandenthaler came out of

Lime Quarry Operating Near Baker



BAKER, Or. (Special)—Thirty-two-ton trucks are now hauling limestone rock from the quarry, above, to the new Chemical Lime company plant near Baker. The Baker reduction plant was dedicated Thursday in ceremonies attended by Governor Robert Holmes. In the mountain on which the quarry development rests are limestone deposits sufficient to supply the Baker plant for 60 years. Quarry rock crusher is electronically controlled, can be operated by two men. In foreground is Tony Brandenthaler, co-owner, with Thomas R. Dant of Chemical Lime company. New enterprise will bring \$300,000 payroll to Baker.

Manager Named At Lime Plant

Hans Leuenberger, formerly of Niagara Falls, N. Y., has been named by Tony Brandenthaler and Thomas Dant Sr., owners of the Chemical Lime Co., five miles north of Baker, as general manager of the company.

Mr. Leuenberger is a native of Switzerland and came to the United States in 1950 to accept the position of assistant administrative manager of technology with the Electro-Metallurgical Co. of Niagara Falls. He has remained in the United States since that time and became a citizen in 1956.

During 1939 and 1940 Mr. Leuenberger, employed by the Shell Oil Company, was in the United States on business for that company. He was employed by Shell for nine years and traveled throughout the world.

Mr. Leuenberger takes over the position recently vacated by Robert Vervaeke, Baker, who had been with the company since 1956 when the construction of the plant started.

Mr. Leuenberger received his Masters Degree and Doctor of Sciences at the Swiss Federal Institute of Technology in Zurich.

The new general manager said that at the present time both kilns at the lime plant are in operation and lime rock is still being transported from the quarry. He said that the plant will continue to operate all winter from the stockpile accumulated during the spring, summer and fall.

Leuenberger, his wife Marie and two boys, Jack, 15 and Martin, 9, are living at 2730 Indiana Ave.

October 31, 1957

Lime Plant Begins Production Tuesday

Kiln No. 1 Fired; Tests Are Being Run

Chemical Lime company Tuesday fired up its No. 1 kiln at its Wingville plant and production of the first lime was being run, Superintendent Bob Vervaeke said this noon.

Although quarry production at Marble creek and stockpiling of the crushed limestone at Wingville has been underway for several months, Tuesday's run was the first burning undertaken at the big plant. The kiln was fired up at 3 a.m., Mr. Vervaeke said.

First shipments will be both bulk and bag commodities.

The first several days are being devoted to the usual test runs to shake down the machinery, calibrate instruments and test the product through the treatment processes.

The superintendent indicated the results and production volume have shown to be up to expectations. Instrument technicians were on hand today to check out their installations.

December 5, 1957

Mr. R. G. Vervaeke, General Manager
Chemical Lime Company
P.O. Box 670
Baker, Oregon

Dear Bob:

Thank you for the Ore.-Bin article on your chemical lime plant. We really tore into it after it arrived and under separate cover we are sending you one hundred copies which you may wish to use. We are deeply appreciative of the great amount of effort you went to in the preparation of the flowsheet and the article, particularly so when you were just getting the plant underway.

Wishing you every success, and with the best of the season's greetings,

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk
cc Norman S. Wagner

Home Office:
102 Jackson Tower
PORTLAND 5, OREGON
Phone Capitol 2-1925

Kilns and Quarry:
P. O. Box 670
BAKER, OREGON
Phone JA 3-4404

CHEMICAL LIME COMPANY

November 26, 1957

Mr. Ralph S. Mason
Mining Engineer
Oregon Dept. of Geology and Mineral Industries
1069 State Office Building
Portland, 1, Oregon

Dear Mr. Mason:

Attached is the article for the Ore-Bin. You may change this
in any form you see fit.

Yours very truly,

CHEMICAL LIME COMPANY

R. G. Vervaeke
R. G. Vervaeke
General Manager *YJ*

RCV/jt
Attachment

RJ

The Chemical Lime Company Operation at Baker Oregon by R.G. Vervaeke *

A new industry for Eastern Oregon began producing in October of 1957. This industry is the ~~new~~ lime plant of the Chemical Lime Company at Baker, Oregon.

Lime is the second oldest material known to man, preceded only by burnt clay or brick. Evidence of lime's lasting quality as a building material is ~~that it is~~ ^{found in the pyramids, Egypt} in use ^{it was} as the cementing material ^d in the pyramids. ^{for the limestone blocks. Today,} There are some 7,000 uses for lime and it is ^a the primary base ^{for} used in the chemical industry. Lime from the Baker plant will be used in the manufacture of acetylene gas, in the steel industry, nickel smelting, paper industries, water treatment, adhesives, insecticides and building material.

The ^{new} plant ^{which is} of 75,000 ton capacity is located at Wing Siding on the Union Pacific Railroad, five miles North of Baker. ^{yearly} Stone is obtained from a quarry located ten miles ^{Lime} East of the plant at an elevation of 5400' on Marble Creek in the Blue Mountains.

The ^{plant's} first 7 1/2 X 150' Vulcan Rotary kiln is now in operation and the installation of a second similar kiln alongside the first will be completed sometime in January of 1958. The output from the plant includes chemical grade lime, pulverized quicklime, regular and superfine hydrate and various other lessor products. ^{Oregon} The ~~new~~ operation is owned by Mr. Anthony Brandenthaler and Mr. Thomas W. Dant, ^{who are prominent} lumbermen. Mr. Robert G. Vervaeke, General Manager, is responsible for the basic design and development of the flow sheet at the quarry and the plant. Engineering details were handled by Stoyanov & Johnson of Portland, Oregon. General Superintendent is Mr. Walter Tschek and the chemist is Mr. Raymond Fenn. Exclusive sales agent for the finished product is the Great Western Chemical Company of Seattle and Portland.

The ~~natural~~ outcroppings and extensive exploratory diamond drilling ^{of the limestone deposit} has indicated a proven reserve of 3 million tons of excellent quality high-calcium stone with an additional 3 million tons indicated in the same area. A second limestone deposit of equal quality is located 1 1/2 miles ^{being mined} East of the ~~first~~ deposit. Total height of the

* General Manager, Chemical Lime Company.

THE CHEMICAL LIME COMPANY OPERATION AT BAKER, OREGON
by
R. G. Vervaeke*

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1/10/57
S. J. K. E. K.

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* General Manager, Chemical Lime Company.

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quarry face

November 22, 1957

Mr. R. G. Vervaeke, General Manager
Chemical Lime Company
P.O. Box 670
Baker, Oregon

Dear Bob:

Received your flow sheet this morning and have had our draftsman work up a rough idea of how we will present it in The Ore.-Bin. Would you please look this over quickly and send it back to us in the enclosed envelope after you have examined it and made any necessary comments or corrections. Our finished product will be much neater than this but we are just trying to get the essential features down first.

The print of the hydrated lime circuit was a little blurred and one line starting "Water 21% - 6-tube Kritz . . ." has some missing letters or words. Apparently it is a hydrator but am not absolutely sure. We plan to break the flow sheet up about as shown on the individual sheets and spacing them throughout your text. We would like to start work on the final drafting of this flow sheet not later than Tuesday morning if possible.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk
Encl.

LIMESTONE IN OREGON

<u>Producer</u>	<u>Quarry Location</u>	<u>Plant Location</u>	<u>Remarks</u>
(1) Oregon Portland Cement Company	Lime, Baker County Durkee, Baker County Dallas, Polk County	Lime, Baker County Oswego, Clackamas County	Production from Lime and Dallas quarries is for cement. Durkee quarry is for chemical, metallurgical, etc. (Non-captive.)
(2) Ideal Cement Co.	Marble Mountain, Josephine County	Gold Hill, Jackson County	Used largely for cement, some paper and agstone.
(3) Pacific Carbide & Alloys Co.	Enterprise, Wallowa County	Portland, Multnomah County	Used for calcium carbide. Fines once sold for agstone.
(4) Chemical Lime Co.	West of Baker, Baker County	Wingville, Baker County	Used for burned lime.
(5) Dewitt's Polk County Lime	West of Dallas, Polk County	Crusher and screens at quarry	Used for agstone, small production of low-grade stone.
(6) Pacific Northwest Lime Co.	Williams, Josephine County	At quarry ?	New operation, not in production. Plan to sell agstone, paper rock, etc.

References:

- Libbey, F.W., "Limestone Resources of the Pacific Northwest", Resource Rept. No. 9, Raw Materials Survey, Inc., 1957.
- Peterson, N.V., "Limestone Occurrences in Western Oregon", The Ore.-Bin, April 1958.
- Wagner, N.S., "Limestone Occurrences in Eastern Oregon", The Ore.-Bin, May 1958.

(Location of plants and quarries shown on accompanying index map.)

SPECIFICATIONS FOR LIMESTONE AND DOLOMITE AND LIME FOR THE PRINCIPAL CONSUMING INDUSTRIES*

Use	Chemical Requirements	Physical Requirements
Limestone for portland cement	Magnesium oxide (MgO) not more than 3%, preferably not more than 2%. Total alkalies not more than 0.5%. Minimum calcium carbonate (CaCO ₃) content varies from plant to plant depending upon availability of other raw materials.	Some manufacturers prefer limestone that does not decrepitate during calcining, i.e., that will hold its lump form throughout calcination.
Limestone for lime (high calcium)	Calcium carbonate (CaCO ₃) content not less than 97%, preferably 98% or more.	Some manufacturers prefer rock that does not decrepitate during calcining.
Magnesian limestone for lime (magnesian)	Magnesium oxide (MgO) content should fall between the limits of 10 and 15%, preferable 11-12%.	Some manufacturers specify rock that will not decrepitate when heated.
Limestone and magnesian limestone for steel flux (blast furnaces)	Silica (SiO ₂) less than 5%, alumina (Al ₂ O ₃) less than 2%, magnesia (MgO) less than 4% to less than 15% at various plants. Phosphorus pentoxide (P ₂ O ₅) not more than a trace, i.e., .005 to .006.	Some manufacturers specify rock that holds its lump form until consumed in the melt.
Limestone for steel flux (open hearth)	Calcium carbonate content preferably more than 98%, lower grades occasionally accepted. Phosphorus must not exceed trace amounts.	Some manufacturers specify rock that holds its lump form until consumed in the melt.
Dolomite for refractories	Magnesium oxide (MgO) not less than 18%. Silica (SiO ₂), ferric oxide (Fe ₂ O ₃) and alumina (Al ₂ O ₃) not to exceed 1% each, but lower grades sometimes accepted.	Some manufacturers require rock that will not leave a scum when dissolved in acid.
Limestone for general chemical use	Calcium carbonate content should exceed 98%. Preferred rock runs more than 99% CaCO ₃ . Limestone as low as 97% CaCO ₃ is sometimes accepted.	

* This table indicates such chemical and physical requirements as have been standardized by the various consuming industries.

Use	Chemical Requirements	Physical Requirements
Limestone for beet-sugar manufacturers	Silica (SiO ₂) not more than 1%. Magnesia not more than 4%. At some plants ferric oxide (Fe ₂ O ₃) must not exceed 0.5%.	To be acceptable at most California plants limestone must retain its lump form during calcination (burning).
Agricultural limestone	In general the higher the lime (CaO) content the better the price. Rock containing less than 85% CaCO ₃ is seldom accepted.	Other factors being equal, a soft, friable rock is more acceptable because it is cheaper to process.
Agricultural dolomite	The price received is dependent mainly on the calcium-magnesium carbonate content, rocks being seldom accepted if they contain less than 85% of carbonate minerals.	Same as agricultural limestone.
Limestone and dolomite for glass	Ferric oxide (Fe ₂ O ₃) not more than 0.05%, preferably not more than 0.02%. Calcium carbonate (CaCO ₃) content should exceed 98% in case of limestone, or 98% calcium-magnesium carbonate, in case of dolomite.	
Limestone for calcium carbide and calcium cyanamide	Calcium carbonate (CaCO ₃) content must exceed 97% and should exceed 98%. Magnesium oxide (MgO) should be less than 0.5%; alumina and ferric oxides (together) less than 0.5%; silica (SiO ₂) less than 1.2%; and phosphorus, less than 1.2%. Sulfur must not be present in greater than trace amounts.	Rock must retain its lump form during calcination.
Limestone for paint and filler	In general the calcium carbonate content should exceed 96% but magnesian limestones containing as much as 8% magnesium oxide are (rarely) tolerated - the MgCO ₃ content generally is 1%. Other maxima are: Fe ₂ O ₃ - 0.25%, SiO ₂ - 2.0% and SO ₃ - 0.1%.	Rock which breaks down into rhombic particles is preferred in some plants. The main controlling characteristic is the degree of whiteness shown by the processed material.

Use

Chemical Requirements

Physical Requirements

Limestone and dolomite for concrete aggregate, ballast, road metal, road base.

Concrete aggregate should be low in alkalis and free of surface organic matter. Presence of opaline silica is highly undesirable in concrete aggregate. Other aggregate suitability is based chiefly on durability, particularly toughness.

Must be clean, strong, durable and of low porosity.

Quicklime for pulp and paper manufacturers

Calcium oxide (CaO) contents must be more than 96% for most manufacturers.

Lime for soft rubber goods

Magnesian lime is generally used. Must be free from carbonates and should contain less than 3% of total impurities other than carbon dioxide or magnesium oxide. In vulcanization such lime must also be free of manganese, copper and calcium oxides.

Must be thoroughly hydrated, fine-grained and free of grit.

Lime for lubricants (greases)

Calcium oxide not less than 72.6%, magnesium oxide not more than 1%, maximum silica plus iron oxide plus alumina, 1.5%, maximum carbon dioxide (at point of manufacture), 1%.

Must be completely hydrated and free of grit.

Lime for textile dyeing

Calcium oxide (CaO) not less than 94%, alumina-iron not more than 2%, silica not more than 2.5% and magnesia not more than 3%.

Varnish

Must be very low in iron and magnesium oxide.

Must be very fine-grained and very white.

Wm Stone

December 6, 1957

Mr. M. E. Crow
Lestine
Oregon

Dear Mr. Crow:

Since your visit to the office several days ago I have made some rough calculations concerning your proposed limestone operation near Lestine. There are two methods which could be used to operate the quarry. The first would be to purchase all of the equipment and amortize it against the expected life of the operation. This would involve a capital outlay in excess of \$100,000. The second plan would be to contract all of the quarrying, crushing, and screening out to some contractor who had proper equipment for open pit operations and a portable crushing and screening plant. This would entail a minimum of capital outlay and would have the further advantage of a more efficient operation due to the fact that you would be able to operate about nine months a year.

The problem of hauling from a quarry to rail siding could be handled in the same way and here again lower costs could probably be achieved by giving the job to a contract hauler.

To be competitive your operation would have to be at least as large as that at Durkee and it should be borne in mind that they have no long haul to a rail siding and can operate the year around. The matter of loading and siding facilities is an important one. National Industrial Products Company ships approximately 15 cars a day. This requires a long siding and daily train service.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk

Yambstone

December 5, 1957

Mr. M. E. Crow
Lostine
Oregon

Dear Mr. Crow:

Following your visit to the office a few days ago I worked up some rough cost estimates on a medium sized limestone operation such as you outlined. These figures are based on the assumption that a million tons of ore are available and that a $7\frac{1}{2}$ mile haul from the quarry to a rail siding will be required. A production of 725 tons per day would give a $5\frac{1}{2}$ year life for the property. It should be understood that these are only estimates and any or all of the items may vary somewhat from the actual, but it is felt that they are representative of the overall picture.

I hope you will find this information of value to you in your planning.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk

LIMESTONE IN DOUGLAS COUNTY

From "Limestone of the Pacific Northwest", January 1938, by E.T. Hodge.

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Harrington deposit

Location: $W\frac{1}{2}$ sec. 21, T. 28 S., R. 5 W. No body of limestone found in place. Said to carry limestone of 97.6 percent $CaCO_3$ and 2.4 percent insolubles.

Oakland District

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Several small masses of impure limestone near Oakland.

- (1) Along a road nearly 1 mile northeast of Oakland, sec. 3, T. 25 S., R. 5 W., probably used for road metal.
- (2) At head of Green Valley 10 miles northwest of Oakland, secs. 21, 22, T. 4 S., R. 6 W. Tunnel caved. No estimate available as to thickness, etc.
- (3) Starr's ranch about 4 miles west of Stephens. The deposits are each less than 1 acre in extent (outcrop HGS). $NW\frac{1}{4}$ sec. 22, T. 25 S., R. 6 W. Beds thin and small. Limestone is hard, brittle, calcareous shale with much $CaCO_3$ due to great number of fossils.

Roseburg District

Widely spaced chain of lenticular limestone bodies extends about 10 miles northeast from Roberts Mountain to valley of Deer Creek about 8 miles south and east of Roseburg. They occur in Myrtle formation of Cretaceous (?) age.

- (1) SE corner, sec. 20, T. 28 S., R. 5 W. Three separate exposures. Portland Cement Company. Daily production - 250 tons per day. Analysis: 52 percent \pm CaO , 1.2 percent to 1.6 percent Fe. Caved by company after they decided no more ore could be profitably mined in view of cheaper limestone elsewhere.
- (2) Sec. 33, T. 27 S., R. 4 W. Once worked for structural marble. Other deposits in this area not properly explored. Oden-Hatfield deposit: color - pale fawn. Massive, can be quarried for dimension stone or monuments. Outcrop 25 by 225 feet. South contact is fine-grained sandstone, north contact is ferruginous chert. Appears to pinch out toward east.

- (3) SW $\frac{1}{4}$ sec. 30, T. 28 S., R. 5 W. Fisher property. Appears to be similar to #1 above owned by Portland Cement Company. Outcrop 40 feet wide and 175 feet long. Chip sample analysis:

SiO ₂	0.78 %
Al ₂ O ₃	0.75
Fe ₂ O ₃ and FeO	0.78
CaO	56.46
MgO	0.33
Ignition loss	<u>41.18</u>
	100.28 %

Wall rock on north is red chert and south contact is 4 to 5 foot seam of hematite.

- (4) Dodson deposit. NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T. 28 S., R. 5 W. Outcrop - width 60 feet, length 300 feet. Color - gray but some white. Quite pure but ferruginous inclusions occur occasionally. Possibility of development.
- (5) Hatfield deposit. SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, T. 27 S., R. 4 W. Largely hidden by overburden. Few large blocks quarried. Tan color. Also outcrop of limestone near Roy Hatfield house in fork of South Deer Creek. Probably small outcrop.

REPORT ON LIME AND LIMESTONE

FOR THE PORTLAND AREA

January 13, 1943

*Submitted
By W. H. Derry*

There is a serious shortage of both lime and limestone in the Portland area for industrial and agricultural purposes.

Lime is being allocated by the War Production Board to the various industries and any new industry would have to arrange with them for supplies.

Mr. Robert Herron, Chief, Alkali and Lime unit of Chemical Section, War Production Board, recently made a survey of the lime situation of the Pacific Northwest and finds that the area is short 150 tons of lime per day, or approximately 4000 tons per month as of April 1, 1943. He recommends that the Amalgamated Sugar Company of Nyssa, which has a capacity of 65 tons per day burn lime from April 1, to August 15, and that the Pacific Lime Company of British Columbia increase their capacity 2,500 to 3,000 tons per month.

The United States Gypsum Company with offices in Portland (Mr. R. S. Painter) have a lime plant at Evans, Washington. Under normal times this lime sells for ~~\$10.00~~ per ton. f. o. b., Evans, Washington. The freight from Evans to Portland was \$3.60. They have little lime to sell and are quoting \$24 per ton (Texas lime for building purposes). In normal times this lime sold to industrial users (Carbide) at \$11.85 per ton. The freight rate from Evans has been increased and is now \$3.80 per ton. The price for carbide purposes is now \$14.80 per ton in bulk, less 25%. They have given up their building lime business to Desplico Lime Company, Deamond Springs, California. This lime contains 14% magnesium. They could make carbide lime from Eldorado Limestone Company near Sonora, California.

The Roche Harbor Lime Company is selling lime in Portland on an equal basis to U. S. Gypsum.

The Washington Brick and Lime Company with offices in Spokane formerly had a plant at Republic, Washington (Republic Lime Company) which has been abandoned. They recently built a plant at Grants Pass, Oregon where they manufacture 10 to 12 tons per day. This plant has a capacity of 15 tons per day but the efficiency has been reduced 20% on account of labor and lack of wood. They have recently voted to increase their capacity to 40 tons per day and are now making plans to expand. *Millions*

Other sources of lime are the Pacific Lime Company of British Columbia (Blubber Bay), the Amalgamated Sugar Company, Nyssa, Oregon (April to October), the Oregon Portland Cement Company, Lime, Oregon (3 kilns, none operating), the Black Marble Lime Company, Enterprise, Oregon, (three kilns, none operating), the Spokane Portland Cement Company, Spokane, Washington, (not operating on lime at present but rumored to be installing a plant to produce 75 tons per day.), U and I Sugar Mill at Toppenish, Washington, (Has a kiln now used for sugar, would be available from April to October.), the Superior Portland Cement Company of Seattle were buying limestone from Alaska and are now getting it from Concrete, Washington.

Sources of limestone for the Portland area:

Grants Pass, Oregon-

Rogue River Lime Company

Washington Brick and Lime Company

Beaver Cement Company

New Quarry opening up at Gold Hill

Lime, Oregon-

Oregon Portland Cement Company

Enterprise, Oregon-

Black Marble Lime Company

Joseph, Oregon-

Large deposits not opened up as yet.

Lime Point, Idaho-

American Power & Light Company have large holdings located on the Snake River.

Alaska-

Large deposits available to coastal boats.

Astoria, Oregon-

F. C. Green. Small operation for agricultural lime.

Evans, Washington-

The U. S. Gypsum Company

Roche Harbor, Washington-

Pacific Lime Company, Blubber Bay, B. C.

Wylie Hempill-Seattle-

Jaques Spur, Idaho

N. P. Union Pacific R. R.

Limestone Quarry

Shipping to Wallace Idaho Bunker Hill Smelting Co.

Smelting Co.

Camas	1600 tons per month
West Lynn	800 tons per month
St. Helens	500 tons per month
Vancouver	500 tons per month
Hawley	?
Total	3,400 tons per month
Oregon Portland Cement Co., Oswego --	105,000 tons - 1941
Lime, Oregon --	117,000 tons - 1941
Amalgamated Sugar Co., Nyssa, Ore. --	62,000 tons - 1943

Best estimate of lime sales in the Portland area is excess of 25,000 tons of lime per year or 50,000 tons of limestone.

Oregon City and Salem, Oregon, buy their lime from California.

Agricultural Lime

The Willamette Valley should require in excess of 300,000 tons of limestone per year, only a fraction of this is being used on account of the high delivery price and difficulty of obtaining it.

Oregon Portland Cement Company sold 7500 tons of agricultural limestone in 1941.

Other markets for lime and limestone are:

Poultry grits and feeds	\$18 to \$20 per ton
Livestock mineral	\$20 to \$22 per ton

A very satisfactory hog mineral can be mixed from 1/3 ground limestone, 1/3 bone meal and 1/3 salt. It sells for approximately \$50 per ton

Sugar Refining	--Make their own lime
----------------	-----------------------

Hydrated lime for dusting dairy barns.

Hydrated lime is used to manufacture chloride of lime for sanitary purposes.

Hydrated lime is used in manufacturing glues.

Lime is used in sprays for fruit and vegetables.

The following is a resume of the analyses of the most extensive limestone deposits adjacent to the Portland industrial area.

See Part C Co

		CaO%	SiO ₂ %	R ₂ O ₃ %	MgO%	Ignition	Loss %	P%	S%
Beaver P. C. Co.	(1)	54.69	1.42	1.10	0.43	41.87			(Undetermined)
Oregon P. C. Co., Lime, Oregon	(2)	54.58	1.41	0.57	0.75	42.89		0.01	-----
Pikes Peak Deposit	(3)	54.78	1.60	0.66	trace	43.02			(Undetermined)
Jones Property	(4)	55.55	0.13	0.38	none	43.63			(Undetermined)

<u>Ideal Analysis</u>	CaCO ₃ %	SiO ₂ %	R ₂ O ₃ %	MgO	P%	S%
	97 plus	1.s(max)	0.5(max)	0.5(max)	0.004	trace

- (1) Average of 6 samples - U. S. engineers (Quarry at Marble Mt. Josephine Co.)
- (2) Average of 53 samples (CaCO₃ 94.5%; (CaMg) (CO₃)₂, dolomite 3.5%) Baker Co.)
- (3) Surface samples - SiO₂ should decrease in deeper zones.
- (4) R. C. Wells - U. S. Geol. Survey, Bulletin 419.

The following analysis of marble from Jones Quarry in the Williams Creek area was made by R. C. Wells of the U. S. Geological Survey, as given in U. S. Geological Survey Bulletin 419, page 209, 1910:

SiO ₂	0.13
Al ₂ O ₃ +Fe ₂ O ₃	0.38
MgO	None
CaO	55.55
H ₂ O	0.26
CO ₂	<u>43.63</u>
	99.95
Phosphorous	0.036
Sulphur	0.605

From quarry of Black Marble Lime Company, Enterprise, Oregon,
November 23, 1939:

Sample Mark	Insol.	<u>Limerock Analysis</u>					CaCO ₃ Calculated
		Iron and Al. Oxide	(CaO) Lime	Magnesium (MgO)	Loss on Ignition	Total	
Enterprise, Ore. (McClain)	.52	.20	54.08	.49	44.69	99.98	96.57

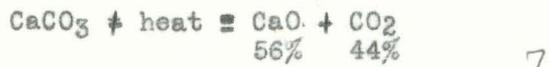
Lime Point, Idaho

In 1912 Hoyt S. Gale examined this locality and collected 121 samples from the walls of this tunnel, a composite sample of which was analyzed in the laboratories of the Bureau of Standards, by A. B. Lort, with the following results:

CaO	55.52
	0.17
MgO	0.17
Fe ₂ O ₃	Trace
Al ₂ O ₃	0.48
SiO ₂	0.48
CO ₂	43.07
Water	Trace
Alkalies and undetermined	0.28

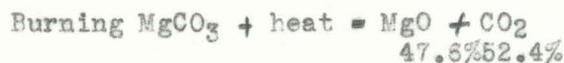
A comparison of the foregoing analyses shows conclusively that there is a body of limestone of exceptionally high quality, with a thickness of 144 feet, penetrated by the tunnel.

LIME



Dissociation begins at 750°C (1350°F), but it is usually not complete until 900°C (1620°F).

Expulsion of CO₂ is hindered by the pressure of the gas. It can be removed by means of a pump or by a jet of steam or water. The addition of steam reduces the pressure under that of the gas alone. The latter is quite common practice.



Dissociation of a magnesian limestone appears to be effected at a lower temperature, probably 600°C to 700°C (1080°F-1260°F).

Heat Required in Burning Limestone

- (a) Evaporation of any water contained in limestone.
- (b) Heating to dissociation temperature.
- (c) Driving off CO₂.

The water aids in the dissociation.

Heat of dissociation of $\text{CaCO}_3 = 772 \text{ B.T.U./lb.}$

Heat of dissociation of $\text{MgCO}_3 = 465 \text{ B.T.U./lb.}$

Heat and Fuel Theoretically Required in Burning One Ton of Limestone

	100% CaCO_3
Heat for raising temperature to dissociation point	721,600 B.T.U.
Heat for actual dissociation	<u>1,544,000 B.T.U.</u>
Total	2,265,600 B. T.U.

Coal at 14,000 B.T.U.

Intermittent Kilns 162#

Continuous Kilns 110#

In actual practice, coal required per ton of burned lime = 300-500 lbs.

Total Cost of Lime Manufacturing Per Ton

Interest on cost of plant and quarry	\$0.05	to	\$0.20
Taxes, minor supplies, etc.	0.10	to	0.25
Cost of quarrying 2 tons limestone	0.50	to	0.90
Cost of fuel for burning	0.30	to	0.75
Cost of labor exclusive of quarry men	<u>0.25</u>	to	<u>0.80</u>
Total per ton of bulk lime	\$1.20	to	\$2.90

Average cost throughout the country is probably 6 to 8 cents per bushel (70#) \$1.71 to \$2.28 per ton.

Note: Above costs based on Tennessee prices in 1936

Analysis of High Calcium Limes

35 kilns over United States

SiO_2 --trace to 3.42%

Al_2O_3 and Fe_2O_3 --trace to 2.03%

Lime CaO --91.93 to 99.29%

MgO --trace to 3.06%

CO_2 and H_2O --.12 to 3.04%

BURNING HIGH CALCIUM LIMES

Average Analysis of Burned Lime

CaO	98.00%
CO ₂ and H ₂ O	.30
MgO	.60
Impurities, SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , etc.	<u>1.10</u>
	100.00%

Computed Analysis of Limestone from Above

in 100 lbs. Lime

98# CaO	= $\frac{98}{.56}$	=	175#	CaCO ₃
.6# MgO	= $\frac{.6}{.476}$	=	1.39#	MgCO ₃
Impurities	= 1.10 x 1.7639	=	<u>1.94#</u>	
Total CaCO ₃ to produce 100 lbs. lime			<u>178</u>	
lbs. CaCO ₃ to be burned per ton lime		=	175 x 20 = 3500 lbs.	
lbs. MgCO ₃ to be burned per ton		=	1.39 x 20 = 27.8 lbs.	
Impurities		=	1.94 x 20 = 38.8 lbs.	
Total weight of limestone per ton lime			<u>3566.6 lbs.</u>	

Sp. Heat of limestone 0.22

Heat to raise temperature of limestone to 1650°F

$$3567 \times .22 (1650-60) = 1,250,000 \text{ B.T.U.}$$

Heat of dissociation CaCO₃ in Limestone

$$3500 \times \frac{772}{722} = 2,700,000 \text{ B.T.U.}$$

Heat of dissociation MgCO₃

$$27.8 \times 465 = 13,000 \text{ B.T.U.}$$

$$3,963,000 \text{ B.T.U.}$$

+ 15% losses
Total

$$\frac{595,000 \text{ B.T.U.}}{4,558,000 \text{ B.T.U.}}$$

Recoverable heat in CO ₂ lbs. CO ₂ 1554#	
1554 x .24 x (1650-200)	542,000
- additional recovery from	
hot lime (est.)	<u>500,000</u>
Total est. heat recovery	1,042,000 <u>1,042,000</u>
Net heat to be generated with elec.	<u>3,516,000 B.W.U.</u>
KWH reg'd per ton of product	<u>3,516,000</u> 1,030 KWH
	3,415
KW reg'd per ton per day	<u>43 KW</u>
Cost of power per ton of lime at 3 mills	\$3.09

Eckel; Cements, Limes and Plasters; p. 112 estimates the cost of lime as follows;

Interest	\$0.45
Salaries	0.24
Wages	2.09
Taxes	0.50
Limestone (2 tons)	1.70
Fuel	1.04
Supplies	0.06
Miscellaneous	<u>0.12</u>
	\$6.20

Value of Product
(Cost of limestone quarried at plant)

Mr. R. L. Howard, state manager for the Utah Idaho Sugar Company gives his cost of burning lime as follows;

Interest)	
Salaries)	
Wages	)	\$1.07 per ton
Taxes)	
Supplies)	
Misc. Expenses)	
Limestone (2 tons limestone to 1 ton lime)		\$8.50 f.o.b. plant
Fuel		<u>\$2.08</u> per ton
		\$11.65

I estimate proposed cost of burning lime in Portland area to be as follows:

Interest	\$.25
Salaries	.15
Wages	.50
Taxes	.10
Limestone (2 tons)	2.00
Freight (2 tons)	3.04
Fuel	2.00
Supplies	.05
Miscellaneous	.10
	<u>8.19</u>
Packaging	<u>1.00</u>
Total Cost per Ton	\$9.19

There is a distinct shortage of dry ice in the Columbia River basin area and the CO₂ could be compressed into dry ice at an additional profit.

Prepared By- H. W. Derry, Manager
New Industries Department
Pacific Power & Light Company
411 Public Service Building
Portland, Oregon

Specifications

Crown Zellerbach paper rock:

Min. CaCO_3	96%	
Min. loss ign.	42.4%	
Min. CaO	54%	Further data
in-		can be furnished
Max. solubles (Si)	3%	if necessary.
Max. Fe, Al oxides	7%	19-2-46
Max. MgCO_3	3.15%	

Only buy in "man-size" lots, pieces of 50-100 lbs. or over, washed, no fines or spalls.

No specifications on S or P.

December 3, 1943

MEMO ON SPECIFICATIONS FOR LIMESTONE FOR CARBIDE

Follows conversations with Mr. J. J. Connolly, plant superintendent, Pacific Carbide and Alloys Company, Portland.

Tolerances for carbide rock for use in carbide manufacture are substantially as follows:

	<u>Under</u>	<u>Would like</u>
Silica	1%	.5%
MgO	.50	.25
P	.005	.003
Sulphur	1% or less	.5
Iron	Not critical	
CaCO ₃	Should be 97% plus	

Mr. Connolly thinks that the texture of the rock is not critical because by "hard burning", that is, raising the calcine temperature to 1100° C., a hard textured calcine can be produced. Connolly believes that travertine would be okay. He is not particularly concerned with a small percentage of iron because it serves to take up silica in the raw material.

Percentages of impurities in raw materials are practically doubled when the line is burnt. Carbide and Alloys now are buying burned lime. Most of it comes from Canada, some from Utah, occasionally a carload from the Washington Lime and Brick Co. near Grants Pass. Their principal bugaboo is phosphorus. As an excess produces phosgene gas in the finished carbide and makes the carbide poisonous in use and it fails to meet Government specifications.

Oh, No!

About forty tons per day, 365 days per year, would be consumed in the Portland plant in normal times and they are now planning on normal time operation. They would like to buy or mine and burn limestone at the Portland plant, also for their Tacoma plant which in itself would require the lime from about eighty tons of limestone per day.

Pacific Carbide would like burned lime delivered at Portland at \$10 per short ton. They claimed that the national average cost of production, including mining and burning of the lime is around \$6 at the lime plant.

We agreed to go into the question of phosphorus analyses and obtain samples for such determinations at the more prominent of our Oregon deposits.

5505

800-1000 t per mo

3500-4000 t glass sand per year
10-12000 t/yz brick work

SPECIFICATIONS - LIMESTONE

Mesh Size: (U. S. Standard Series Screens)

No particles coarser than	16 mesh
Not over 2% coarser than	20 mesh
Not over 35% coarser than	40 mesh
Not over 20% through	100 mesh

Chemical Content:

Calcium oxide (CaO plus MgO) not less than	55.0%
Iron Oxide (Fe ₂ O ₃) not over	0.035%
Acid insolubles, not over	0.5%

about 98% CaCO₃

Bonnevillle: Specifications for glass:

	Class I	II	III	Minima
CaO + MgO	46%	91%	83%	
SiO ₂	4%	9%	17%	
Fe ₂ O ₃	0.035-0.27%	0.4%	0.8%	
Al ₂ O ₃ + P ₂ O ₅	0.2%	0.5%	1.0%	

From Thompson - U.P.
Limestone for glass works.

Mr. Nixon,

A comparison of direct milling costs for plants of 30, 350, and 700 tons daily capacity give the following ratios

<u>30 tons</u>	<u>350 tons</u>	<u>700 tons</u>
1	.366	.278

If small plant production costs \$1.50 per ton delivered to the cars, the 700 plant would be able to lay it in the can for \$0.42 or for \$1.08 less than the 30ton plant.

Transportation from a large central plant would probably eat into this differential considerably. Apparently some other source for price reduction must be found, and distribution seems to offer the biggest possibilities, since it is the largest single cost factor.

Adams

December 1940.

Simulation
file