

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

BUREAU OF MINES
R. R. Sayers, Director

War Minerals Report 175

PROPERTY OF
STATE DEPT' OF GEOLOGY &
MINERAL INDUSTRIES.

HOBART BUTTE
LANE COUNTY, OREG.

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STATE OFFICE BLDG., PORTLAND, OREG.

Clay



WASHINGTON: 1943

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The War Minerals Reports of the Bureau of Mines are issued by the United States Department of the Interior to give official expression to the conclusions reached on various investigations relating to domestic minerals. These reports are based upon the field work of the Bureau of Mines and upon data made available to the Department from other sources. The primary purpose of these reports is to provide essential information to the war agencies of the United States Government and to assist owners and operators of mining properties in the production of minerals vital to the prosecution of the war.

WAR MINERALS REPORT

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W.M.R. 175 - Clay

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SUMMARY

Hobart Butte is about 15 miles south of Cottage Grove, Oreg. Most of it is on Government land, but the best part of the butte has been located as mineral claims since 1932. Numerous pits and a quarry expose the clay in many places on the summit and on the sides. Samples taken from these exposures analyze more than 30 percent available alumina and about 2 percent available iron. About 5,000,000 tons is indicated by the quarry and pits, and an additional 6,000,000 tons might be proved by further surface exploration. If the hydrothermally altered tuffaceous material should extend to a considerable depth, the reserves might be several times this amount.

Results of preliminary investigation of the butte justify an extensive core-drilling program to delineate the limits of the clay and determine its average grade. The Bureau of Mines plans to core drill 7,580 feet at a cost of \$40,200.

INTRODUCTION

Hobart Butte consists of volcanic tuff and breccia, which apparently has been hydrothermally altered (fig. 1). A capping

of large but unknown extent and depth has been so greatly altered that its composition is similar to that of kaolinite. Lower-grade materials of various types also are found, all of which are of suitable grade and amenable to the acid process for the recovery of alumina. The butte has been explored on the surface, sufficiently, at least, to warrant a project to determine the grade and tonnage of high-alumina clay available in this deposit.¹

Two township lines cross the deposit and intersect at about its center. The deposit, therefore, lies in four sections and four townships. Legal descriptions and ownership of the various properties are shown in the following table:

<u>Section</u>	<u>Section fraction</u>	<u>Township</u>	<u>Range</u> *	<u>Owner</u>
31	SW $\frac{1}{4}$	22 S.	3 W.	U. S. Government.
36	SE $\frac{1}{4}$	22 S.	4 W.	W. A. Woodard Lumber Co.
1	NE $\frac{1}{4}$	22 S.	4 W.	U. S. Government.
6	NW $\frac{1}{4}$	22 S.	3 W.	Weyerhaeuser Timber Co.

* Willamette meridian.

The northeast portion of the butte, which lies in the SW $\frac{1}{4}$ sec. 31, T.22 S., R.3 W., is owned by the United States Government. However, O. K. Edwards, of the Willamina Clay Products Co., and others located the mineral claims on this area in 1932. The Willamina Clay Products Co. subsequently opened a quarry and has excavated pits at various places on this area. The Columbia Metals Co. has recently obtained an option from Edwards on the mineral claims owned and controlled by him. This company has excavated other small pits, which further expose the ore body. From present indications, the northeast and southeast portions of the butte contain the better-grade clay. Although the land ownership has been given, it is not known at this time who owns the mineral rights of the northwest, southeast, and southwest areas of the butte.

¹ C. C. Popoff, mining engineer, and H. G. Iverson, district engineer.

HISTORY

Hobart Butte is about 15 miles south of Cottage Grove in Lane County, Oreg. It is reported that this deposit was discovered by a prospector, Robert Phillips. Professor Hewitt Wilson, of the University of Washington, called the attention of the Willamina Clay Products Co. to this deposit as a source of high-grade refractory clay, whereupon O. K. Edwards, of the company, and others located mineral claims in 1932 on the northeast portion of the butte. A road was constructed almost to the summit, and a quarry was opened on these claims. The Willamina Clay Products Co. has operated this quarry in a small way, 12,000 to 15,000 tons having been mined and shipped to their plant.

PHYSICAL FEATURES

Hobart Butte is heavily covered with timber and rises steeply to about 1,600 feet above the valley floor, an elevation of about 2,530 feet above sea level. The Coast Fork of the Willamette River flows within half a mile of its base. It is accessible by a good county road, 12 miles of which is hard-surfaced, that joins U. S. Highway 99 near Cottage Grove, Oreg.; and there is a road that ascends the butte to the quarry and which is narrow, steep, and winding. Transportation up the butte itself during rainy weather and in winter would be difficult, but with normal seasonal weather the road to the quarry would require but little maintenance.

The climate throughout the year may be generally classified as wet and moderate in temperature. Only light snowfalls occur in winter at the lower altitudes, but snow cappings 3 to 4 feet deep are common on the summits of the buttes in the area.

At Cottage Grove, 16 miles north of Hobart Butte, average rainfall over a period of 25 years has ranged from 0.33 inch in July to 6.82 inches in January, and average snowfall for the same period has ranged from 0.2 inch in March and April to 1.5 inches

in January Average total annual precipitation has been 44.46 inches of rain and 4.3 inches of snow.

The nearest railroad station is at Cottage Grove on the Eugene-Medford branch of the Southern Pacific Railroad. A railroad from Hobart Butte could connect with the Southern Pacific Railroad 2 miles south of Cottage Grove, a distance of about 12 miles. The distances by railroad from Cottage Grove to the aluminum plants in the northwest area are as follows:

	<u>Miles</u>		<u>Miles</u>
Longview, Wash. . . .	210	Vancouver, Wash. . . .	162
Tacoma, Wash.	300	Troutdale, Ore. . . .	170
Spokane, Wash.	537		

LABOR AND HOUSING

James Bagan, district engineer of the United States Employment Service for Lane County, has reported that a very favorable supply of labor has been found recently in the central western Oregon area. It is believed that 300 to 500 workmen could be recruited from the immediate vicinity of Cottage Grove. The prevailing wage is 90 cents to \$1 an hour for common labor.

According to a survey of housing accommodations conducted in September 1942 under the supervision of N. J. Nelson, Jr., of Cottage Grove, and Postmaster E. F. Kelso of Yoncella, there were vacant houses, apartments, and cabins in Cottage Grove, Disston Rural Route, Black Butte Rural Route, and the communities of Yoncella and Drain. It is not likely that more than 100 housing units would be available without additional construction.

DESCRIPTION OF DEPOSIT²

Numerous pits and the quarry expose the rock or clay in places on the summit over nearly its entire 100 acres of area, and the road exposes the same material about 400 feet vertically below the

² Abstracted from unpublished report on Hobart Butte by R. L. Nichols, assistant geologist, Federal Geological Survey.

summit. Shallow pits suffice to expose the ore, as the overburden above 2,200 feet is only about 3 feet deep. The most conspicuous as well as the most common rock on the butte is white, light-gray, dark-gray, or yellow. This is the ore, and undoubtedly it has been altered. It is mainly kaolinite in mineral composition and varies considerably in texture. Some of it is almost entirely fine-grained; some of it is a breccia with angular fragments up to 1 inch in length, while some of it contains ovaloid clay pellets lighter in color than the matrix and as long as half an inch. Carbonized and petrified logs, some several feet in length, are found in the quarry where the ore is well exposed, and small pieces of charcoal also are found scattered through it. A ferruginous clay, which in places contains round, white clay fragments, is well-exposed on the road, and a stratified, unaltered, fine-grained, leaf-bearing rock was found on the southwest end of the butte. Breccia, tuff, and tuff-breccia, often red in color and sometimes less altered than the ore, are common. The unaltered material is considerably harder than the altered ore rock. Limonite veins, some of which are more than an inch in width, cut these rocks. Although little was learned with respect to the distribution of these veins, they are sometimes so abundant as to render this rock of doubtful value as clay. Most of these rocks are either pyroclastics or water-laid sediments. That the rocks are nearly horizontal is indicated by stratification, the attitude of flattened clay pellets, and by the distribution and attitude of carbonized and petrified logs. Slickensides are very common, and they may be due either to regional movements or volume changes resulting from alteration.

The presence of realgar and cinnabar suggests that hydrothermal solutions have been active at this deposit, but recent petrographic study indicates that the clay was little affected by hydro-

thermal action. The flattened pellets of kaolinite, characteristic of the best-grade ore, are original sedimentary structures. They were soft at the time of deposition, for they are molded around grains of quartz and rock fragments, and they were laid down in a basin into which wood (now represented by charcoal and silicified wood) was washed. Similar pellets occur in the clays associated with lignite or coal at Castle Rock, Wash., and in the Mississippi Valley States, where there is not the slightest suggestion of hydrothermal action. /

MINE WORKINGS

A quarry is the only important working that has been developed on the deposit. This quarry is near the summit of the butte on mineral claims owned or controlled by O. K. Edwards. Approximately 12,000 to 15,000 tons of clay has been mined from it since 1933, and the mining face now measures approximately 140 feet in length and about 40 to 50 feet in height. There is no activity at the property at this time, however. Besides this development, small exploration pits have been excavated over the summit of the butte.

THE ORE

A number of samples of Hobart Butte have been taken by the Bureau of Mines and by others and analyzed for available alumina, iron oxide, silica, titanium oxide, and ignition loss. These results and description of samples are given in the following table:

Samples taken by Bureau of Mines

Sample	Al ₂ O ₃ , percent		Fe ₂ O ₃ , percent		SiO ₂ , percent	TiO ₂ , percent	Ignition loss, percent
	Total	Avail.	Total	Avail.			
Quarry material, fines after sorting; discarded as contain- ing too much iron. . .	34.5	-	2.5	-	46.7	2.3	13.3
Quarry; dumped as containing too much iron	33.1	-	4.6	-	45.6	2.1	13.2
Quarry; gray-white. . .	34.2	-	0.6	-	49.6	2.8	12.7
Quarry; blue-white. . .	33.5	-	0.6	-	49.9	2.8	12.5
Quarry.	40.5	33.0	1.6	-	45.2	-	12.9
Sample from old pits.	35.5	24.4	1.5	0.36	52.0	-	11.0
Quarry; open-pit, iron-stained	35.8	32.2	2.2	1.7	47.8	2.7	-
Quarry; white ore . . .	37.0	33.6	1.1	.2	47.6	2.8	-
Quarry; blue-gray ore	39.3	34.0	.9	.5	45.6	2.4	-
Quarry; light blue- gray ore	38.8	31.3	1.1	.9	44.9	2.1	-
Quarry; tan-gray ore.	36.2	34.5	.6	.4	48.3	2.7	-
Quarry.	42.5	37.0	1.3	1.3	41.3	2.3	-
Quarry; 500-lb. sam- ple.	36.8	31.4	1.2	.4	48.3	2.7	-
No. 1; tuff, tan.	21.3	-	1.18	-	Nil	-	-
No. 2; tuff, white.	28.2	-	.59	-	do.	-	-
No. 3; tuff, yellow- ish-white.	25.3	-	.52	-	do.	-	-
No. 4; breccia, yellow. . .	21.5	-	2.6	-	0.01	-	-
No. 5; breccia, yellow- ish gray	34.6	-	3.62	-	.01	-	-
No. 6; breccia, gray. . . .	35.4	-	.81	-	Nil	-	-
No. 7; lignitic tuff. . . .	38.2	-	1.33	-	do.	-	-
No. 8; heavy iron vein. . .	30.0	-	9.53	-	0.05	-	-
No. 9; brown tuff	31.2	-	1.55	-	.01	-	-

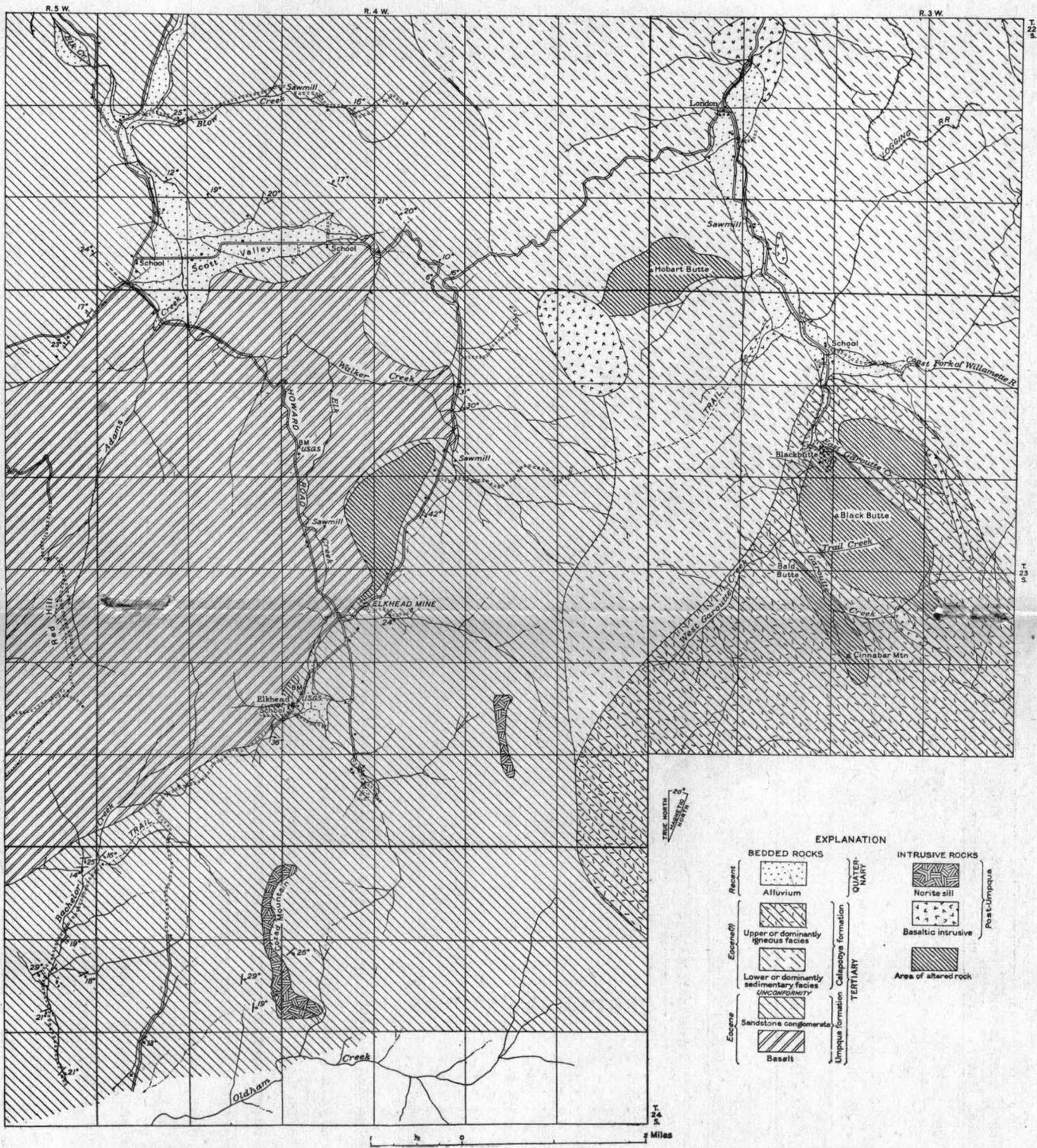


FIGURE 1. GEOLOGIC MAP OF HOBART BUTTE AREA. (FROM GEOL. SURVEY BULL. 850, PLATE 7.)

Sample	Al ₂ O ₃ , percent		Fe ₂ O ₃ , percent		SiO ₂ , percent	TiO ₂ , percent	Ignition loss, percent
	Total	Avail.	Total	Avail.			
No. 10; red tuff.	35.7	-	1.92	-	-	0.01	-
No. 11; red shale	24.1	-	1.4	-	-	Nil	-
No. 12; red shale or clay	30.4	-	2.44	-	-	0.05	-
No. 13; yellow-white clay	33.2	-	1.77	-	-	Nil	-

Samples taken by Columbia Metals

	<u>Available Al₂O₃</u>	<u>Available Fe₂O₃</u>
Pit 2.	23.1	0.20
Pit 3.	30.0	1.4
Pit 6.	29.8	.8
Pit 7.	37.2	.75
Pit 8A.	33.9	1.75
Pit 10.	30.0	.48
Pit 12.	31.1	1.87
Pit 13.	22.9	.80
Pit 19.	36.9	.56
Pit 33.	20.9	.84
Pit 33A.	31.6	.73
Pit 36A.	25.4	13.5
Pit 37A.	23.8	10.4
Average, all samples .	30.2	2.03

Available alumina and available iron are determined by a special method of analysis developed to determine the alumina and iron that will be taken into solution by acid processes. About 35 samples of various amounts and types of clay have been taken. The arithmetical average of available alumina and iron in these is 30.2 and 2.0 percent, respectively.

Samples 1 to 13 were taken from material first thought to be low-grade and otherwise undesirable as alumina ore. They averaged 32.4 and 2.26 percent available alumina and iron, respectively.

ORE RESERVES

Over 5,000,000 tons of ore is indicated by the outcrops, test pits, and quarry. It is also probable that at least 6,000,000

additional tons of ore may be developed. Should a large part of the butte be found to be ore, the tonnage would be very great indeed.

PLANT SITE

Probably the best available plant site for treating Hobart Butte clay would be on the west side of the Coast Fork of the Willamette River. This site would extend from London, Oreg., upstream for more than $2\frac{1}{2}$ miles; it has an area of approximately 200 acres, is relatively flat, and lies in an elevation of 15 to 20 feet above the river bank.

The plant site is 2 to 3 miles distant from the ore body. The distance to the railroad at Cottage Grove is about 14 miles, and the distance to the Coast Fork of the Willamette River is one-fourth to one-half mile. The terrain rises rather steeply from the edge of the flat area selected for the plant site. If the plant were built on this area, the pumping head from the river to the plant would be less than 50 feet in all instances.

The following table shows the river flow near London, Oreg.:

Water flow, Coast Fork, Willamette River, feet

	<u>1940</u>	<u>1941</u>
January	149	237
February	513	139
March	329	84
April	164	130
May	64	139
June	34	97
July	19	37
August	12	23
September	24	41
October	33	-
November	155	-
December	278	-

The least flow occurred in August for 1940 and 1941. The minimum for these two years was 12 feet.

Another area similar to that for the plant site is available on the opposite side of the river and might be used for tailing disposal. This area also comprises several hundred acres.

RAW MATERIALS

Fuel

Coal beds believed to be of considerable extent are found in Coos County, Oreg., but up to the present have been developed only slightly. Only two or three small mines are now operated; a great deal of exploration and development would be necessary before a large tonnage could be mined from these deposits. At the present time, most of the coal for this area is obtained either from Wilkeson, Wash., or from Utah. Washington coal has a thermal value of 12,000 to 12,500 B.t.u.'s per pound and costs \$6.85 per ton. Utah coal has a thermal value of 13,500 B.t.u.'s per pound and costs \$10.50 per ton. A small part of the fuel required probably could be obtained locally as cord or waste wood, but it would be necessary to depend on coal or oil for most of it.

Sulfur and Sulfuric Acid

Sulfur is used in large quantities in paper-pulp mills. This is furnished by the Texas Gulf Sulfur Co. and the Freeport Sulfur Co. The present public rate on sulfur, f.o.b. Gulf of Mexico, is \$16 per long ton. Freight from the Gulf to Puget Sound area by boat has varied from \$5.50 to \$8 per ton during the past several years. The railroad rate for carload lots is \$12.99 per long ton; but it is reported that since shipping by water has been discontinued, an emergency rate of \$10.50 per ton is in effect.

Sulfuric acid is produced at Tacoma, Wash., and Garfield, Utah, by the American Smelting & Refining Co.; at Anaconda, Mont., by the Anaconda Copper Mining Co.; and at Kellogg, Idaho, by the Bunker Hill & Sullivan Mining Co. At present, however, complete output of all of these acid plants has already been contracted, so that it probably would be necessary to construct an acid plant to supply make-up acid.

Electric Power

A power line runs through the area about $1\frac{1}{2}$ miles from Hobart Butte. It is owned by the California-Oregon Power Co., and power is furnished by their prospect plants in the northern part of Jackson County. These plants are now loaded to capacity, but it probably will be possible for Bonneville power to tie into their line at Springfield, about 7 miles from Eugene. It is reported that this power line could handle an additional load of 40,000 kilowatts.

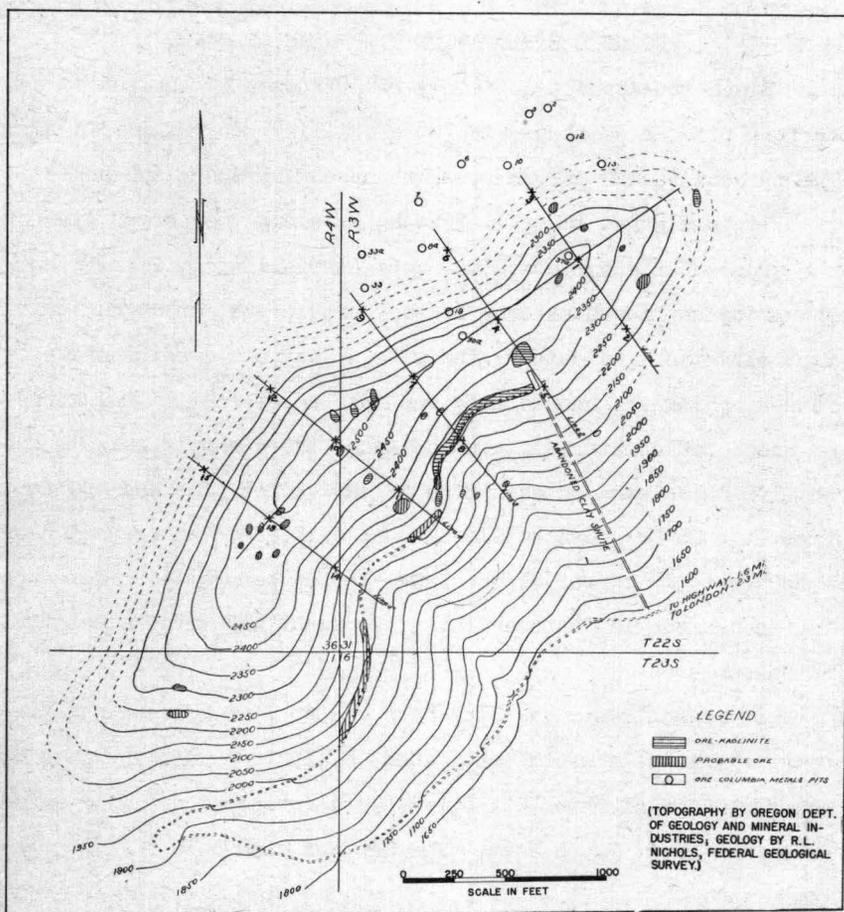


FIGURE 2. PROPOSED DIAMOND DRILLING, HOBART BUTTE.

PLANS FOR COMPANY OPERATIONS

The only mining or quarrying of clay on the property has been done by the Willamina Clay Products Co., and this was a small-scale operation on the Edwards' claim. The mined material was used in the manufacture of fire brick and face brick. It is reported to be about the best refractory clay found in the northwest; it has a standard cone fusion of 32 to 33. As far as known, the company does not plan to expand the output from this quarry for the manufacture of refractories or for any other purpose.

PROPOSED EXPLORATION BY BUREAU OF MINES

Since the deposit is fairly well exposed by the quarry and surface pits, a comprehensive core-drilling program is planned. The project should determine the tonnage and grade of the deposit.

It is planned to drill five holes along the center line of the crest of the butte at 500-foot intervals (fig. 2). These should be continued as long as they are in ore, or to the 1,800-foot elevation indicated on the maps. They could be stopped before reaching it, should they run into a substantial thickness of undesirable material. In addition, there should be two lines of five holes each on each side of the center line and 400 feet from it. These holes should also be drilled to an elevation of 1,800 feet, if in ore, or should be stopped before this elevation is reached should a substantial thickness of undesirable material be encountered.

It is estimated that the five center-line holes along the crest of the butte would total about 3,330 feet, and the 10 side holes would total about 4,250 feet. Total proposed drilling would amount to about 7,580 feet. The depth of each hole is listed below:

Five "center-line" holes

<u>Hole</u>	<u>Estimated depth,</u> <u>feet</u>
1	630
4	630
7	660
10	720
13	690

Ten. side holes

2	300
3	450
5	500
6	200
8	450
9	350
11	550
12	500
14	500
15	450
	<u>7,580</u>

Water is not available on the Butte. The nearest source is the Coast Fork of the Willamette River, about 4 miles distant from the end of the road near the summit. This point lies at an elevation of about 1,300 feet above the river. Water for drilling would have to be hauled from the river and stored in a suitably located tank. The tank would have to be moved at least once during progress of the drilling to cut down the length of pipe line necessary. About 1,000 feet of $1\frac{1}{2}$ - or 1-inch pipe and fittings will be required, together with a pump, to operate against a head of 200 feet. The cost of this project is estimated as follows:

Core drilling 7,580 feet at \$5.25 ³	\$39,795
Supplies	<u>405</u>
	40,200

It is estimated that by using two drills the project may be completed in 5 months.

Several nearby areas appear to be similar to the Hobart Butte deposit, but the exposures on these are few and limited in extent. These exposures were noted on Putman's property, 4 miles from Cottage Grove; on Adam's property, 2 miles from Cottage Grove, above

³ Includes engineering, supervision, and sampling, but excludes analyses.

the Brewster mill in the Elkhead area; and on Woodard's logging road on the hill east of Hobart Butte. Reconnaissance should be made of these areas, to be followed by some surface exploration by pits and trenches on those that are favorable, if it is found that Hobart Butte will not yield enough alumina.

CONCLUSIONS

1. A preliminary examination of the Hobart Butte high-alumina clay deposit and sampling of numerous pits and the quarry indicate that at least 5,000,000 tons of clay is amenable to acid processes for extracting alumina. An additional 6,000,000 tons might be proved by further surface exploration, and several times this amount might be indicated by core drilling.

2. The Bureau of Mines plans to core drill 7,580 feet at a cost of \$40,200.

3. A suitable plant site is available within 2 or 3 miles of the Butte on the Willamette River.

4. The chief disadvantage of the deposit is its relative inaccessibility. The nearest railroad connection is 12 miles from the proposed plant site.

5. Additional investigation will be required to find an adequate and suitable supply of fuel for processing the clay.

6. Other factors, such as water supply, electric-power supply, and availability of labor, are favorable.

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