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RESIDUAL KAOLIN DEPOSITS OF THE SPRUCE PINE DISTRICT, NORTH CAROLINA

BY

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The Brushy Creek deposits are not near a railroad but lie just a few hundred yards from a concrete road (U. S. Highway No. 19-E). The distance to the nearest shipping point on the railroad, Spruce Pine, is five miles. The different deposits of the group are easily accessible to the present plant of Kaolin, Incorporated, now being operated by Harris Clay Company, except for areas 21-29 inclusive; a road or aerial cableway would have to be constructed to reach them.

This deposit appears to be the largest and best in the district. A good deal of prospecting has been done in several parts of the area, though not all of the information obtained is now available or usable. The borings were in part haphazardly distributed and elsewhere not spaced closely enough. Some parts have not been bored at all and others not deep enough to make sure of the thickness. Enough work has been done, to justify belief that this deposit meets the requirements for aluminum ore. More definite information on the individual parts is desirable, especially those along upper Brushy Creek and along Laurel Creek. Completely reliable estimates of tonnage would require good logs of several hundred systematically distributed boreholes, spaced not over 50 feet apart, and each penetrating to unaltered granite.

GUSHER KNOB GROUP

A number of promising kaolin-bearing areas lie southeast of Gusher Knob, extending from three-quarters of a mile to two miles east of Ingalls (pl. 2). Though clay prospects in this vicinity have been known for thirty years, no kaolin has yet been produced. The western part of the deposit was prospected in 1936 by F. L. Hess[38] of the Bureau of Mines and C. E. Hunter of Tennessee Valley Authority. About 80 holes were bored and at least three shafts sunk.

The deposits underlie gently sloping, broad-topped ridges on the northwest side of Threemile Creek. These ridges are the dissected remains of a sediment-capped stream terrace lying about a hundred feet above the flat creek bottom. The overburden of gravel, sand, and clay is only two or three feet thick at its lower edge. Farther up on the ridges it increases to more than six feet in thickness. The sediment cap thins out at still higher altitudes and comes to an end at about 2,900 feet. Above this altitude four or five feet of residual soil covers the clay.

[38] Notes on three shafts and about a dozen boreholes, with unlocated sections of the drilled area, were supplied by Mr. Hess.

TABLE 2. KAOLIN RESERVES IN GUSHER KNOB DEPOSITS

Deposit	Area (sq. ft.)	Thickness (ft.)		Inclusions (percent)		Density (lbs. per cu. ft.)	Weight—Crude (short tons)		Recovery (percent)		Weight—Washed (short tons)	
		Probable	Possible	Probable	Possible		Probable	Possible	Probable	Possible	Probable	Possible
Gusher Knob No. 1	1,860,000	30	50	40	20	80	1,339,200	2,976,000	15	18	200,880	535,680
2	320,000	25	40	40	20	80	192,000	409,600	15	18	28,800	73,728
3	350,000	25	40	40	20	80	210,000	448,000	15	18	21,500	80,640
4	770,000	30	50	40	20	80	554,400	1,323,000	15	18	83,160	221,760
5	270,000	20	30	40	20	80	129,600	259,200	15	18	19,440	46,700
6	1,050,000	30	50	50	20	80	630,000	1,680,000	15	18	94,500	302,400
											458,280	1,260,908

The distribution of kaolinized granite was difficult to determine accurately because of the thickness and extent of the overburden. The limit lines drawn are consequently less certain than in most other localities. The western boundary may lie farther west than indicated and nearly all lines are subject to revision. The western half of the area seems to be underlain by a fair-sized granite body with some inclusions, whereas to the east dikes with intervening septa of gneiss and schist appear to prevail. Large supplies of kaolin are more certain in the western than the eastern parts. The amount of inclusions is problematical but apparently large. Information is most reliable on areas 1, 2, and 3 and least so on area 6.

The clay is of good average quality, in part stained from hornblende gneiss but not unduly so. Kaolinization has been thorough, so that recoveries of 15 to 18 or perhaps even 20 percent may be expected. The broad expanse of flat terrace favors a good depth of clay and 90 feet has been reported[39] in one place. Between 450,000 and 1,250,000 tons of refined kaolin are estimated to be available in the Gusher Knob deposits (Table 2).

The deposits lie adjacent to a good asphalt road (North Carolina Highway No. 194) and eight miles from the railroad at Spruce Pine.

The Gusher Knob deposits appear to be the second most favorable ones in the district. While they probably would yield less total kaolin than the Spruce Pine group, they have the advantage of compact distribution. The topographic situation is especially favorable to deep and thorough kaolinization. The principal uncertainty lies in the areal extent and distribution of granite and pegmatite; a large and systematic boring program is essential to determine these facts.

SPRUCE PINE GROUP

This dispersed group (pl. 4) includes deposits in four compact subgroups as well as several other possible small sources not carefully investigated. The total washed kaolin available (Table 3) in the group is estimated to be between 700,000 and 1,600,000 tons. Taken as a group, these deposits are large enough and close enough together to satisfy the aluminum ore requirements. Three kaolin plants are located in the area, the Harris Clay Company plants at Spruce Pine and at Minpro, and the Carolina China Clay Company plant half a mile east of Penland.

[39] Smith, F. E., Harris Clay Company, personal communication.

Spruce Pine deposit.—Much of this deposit on the southea edge of the village of Spruce Pine (pl. 4) has been mined o between 1916 and about 1936 by Harris Clay Company. Mu clay remains, however, in two areas to the south of the old pi The site was abandoned because the clay contained enough iron spoil it for high-grade ceramic use. The amount of iron, ho ever, is less than the tolerance for aluminum ore. The ove burden is principally terrace sediment, up to about 12 feet thi in places. Iron stain has been carried downward by grou water from this cap, as well as developed from garnets and hor blende gneiss inclusions. The depth of kaolinization is report by Hunter and Mattocks[40] to extend below river level (85 fee in places. Bayley[41] reports, however, that the material was t hard to mine below 85 feet. A thickness of 58 feet of clay belo the overburden was measured at the northwest side of the we pit and of 69 feet at the southwest corner of the long east p The total thickness may be somewhat greater as the pits are no in part filled with waste. The recovery of washed kaolin is lo about 10 or 12 percent. In the two sections of this depos between 150,000 and 300,000 tons of washed kaolin remain. Th deposit is readily accessible, as it lies within 300 yards of th railroad. Part of the old plant has been removed but the mi recovery portion is still in operation.

Grassy Creek deposits.—The Grassy Creek deposits (pl. 4) l about two miles south of Spruce Pine. Three good-sized pi have been mined by Harris Clay Company but have been aba doned since 1936. A large area in this vicinity is underlain l granite, not only on the east side of Grassy Creek around the o pits but also up Silver Run and Graveyard Creek to the wes Superficially the prospects look good in this area but kaoliniz tion has been neither deep nor thorough. The old pits expo fairly hard granite within 20 feet of the surface. In many plac the clay is too hard to penetrate with a soil auger for more tha four or five feet. Much partly decomposed feldspar is found the soil. A large area on the north side of Graveyard Creek h big boulders of granite lying on the ground and several outcro occur. The whole area doubtless contains a good deal of cla probably 300,000 to 500,000 tons in the five sections outline but the yield would be low and the operation proportionate expensive. A large part of the clay is badly stained by decor posed garnets. The overburden is mostly residual soil four to fi

[40] Hunter, C. E., and Mattocks, P. W., op. cit., p. 19.
[41] Bayley, W. S., op. cit. (Bull. 29), p. 95.

SUMMARY AND CONCLUSIONS

The investigation shows that the residual kaolin deposits of the Spruce Pine district constitute a potential source of aluminum ore provided that a suitable process for extracting alumina from kaolin on a commercial basis is developed. These deposits lie nearly midway between the aluminum reduction plants at Badin, North Carolina, and at Alcoa, Tennessee, about 175 miles by railroad from each. Though by no means as large as many sedimentary clay deposits, nor as high in alumina content as some, washed kaolin from the Spruce Pine deposits meets the established specifications and averages 37 percent or more in Al_2O_3 and under one percent Fe_2O_3. The depth of minable kaolinized granite is rarely as little as 15 feet and is frequently as much as 50 feet. The overburden is comparatively shallow, averaging between 5 and 10 feet, and is almost never as thick as the clay. Two groups of deposits will yield over a million tons of washed kaolin and two others may do so.

The Brushy Creek deposits are much the largest and most favorable. Between 1½ and 3 million tons could be produced from a comparatively small area. A large and efficient washing plant is already operating. The distance to the railroad is five miles by a paved road.

The Spruce Pine group is second in regard to tonnage available, containing between 700,000 and 1,600,000 tons. The individual parts of this group, however, are separated from each other by from one to three miles, necessitating considerable hauling if worked from a central plant. All but one of the parts is less than a mile from the railroad.

The Gusher Knob deposits, though smaller than the Spruce Pine group, have the advantage of being a compact group. They may possibly yield over a million tons but they are eight miles from the railroad.

The Newdale-Lunday group is the lest favorable source. It may possibly yield a million tons but it is not likely to do so. The individual parts are so scattered that much hauling, in part over poor crooked roads, would be involved. The largest deposits are three miles from the railroad, though some smaller ones are nearer.

The total refined kaolin available in the district is estimated to be between 3 and 7 million short tons.

APPENDIX A

ESTIMATES OF KAOLIN RESOURCES OF SPRUCE PINE DISTRICT, NORTH CAROLINA, MADE BY C. E. HUNTER AND P. W. MATTOCKS, REGIONAL PRODUCTS RESEARCH DIVISION, COMMERCE DEPARTMENT, TENNESSEE VALLEY AUTHORITY

		Crude (short tons)	*Refined (short tons)*
AVERY COUNTY			
GUSHER KNOB			
Area	?		
Depth	?		
Deductions	?		
Yield	15%	3,304,800	567,816
BRUSHY CREEK			
Area	3,000 by 2,000 feet		
Depth	60 feet		
Deductions	10% stained 25% hard		
Yield	12%	10,200,000	1,224,000
MITCHELL COUNTY			
GRASSY CREEK			
Area	?		
Depth	?		
Deductions	?		
Yield	10%	4,600,000	460,000
GRAVEYARD CREEK			
Area	1,000 by 600 feet		
Depth	70 feet		
Deductions	25% (inclusions) 10% (hard and stained)		
Yield	10%	1,205,875	120,587
ENGLISH CREEK			
Area	?		
Depth	?		
Deductions	?		
Yield	11%	1,987,654	218,641
SPRUCE PINE			
Area	?		
Depth	?		
Deductions	?		
Yield	12%	850,616	102,074
SULLIVANS (PROBABLY SULLINS) BRANCH			
Area	?		
Depth	?		
Deductions	?		
Yield	11%	108,561	11,941