

State Department of Geology and Mineral Industries

702 Woodlark Building
Portland 5, Oregon

Flint Fire Clay Occurrence

Unclassified Area
Morrow County

Foreword: This examination was made on the basis of a Portland office request. The request in turn was made on the basis of encouraging test results obtained on a sample submitted to the Department by the Raw Materials Survey, Portland. Attention was first directed to the occurrence through efforts of a Mr. Neal Knighten, Kamewick, Washington.

Location: T 6 S; R 26 E; Section 32 and 33. This location is in heavily forested country at an elevation close to 4000 feet. It is 6 miles by woods and lumber company's road from the Spray-Heppner highway (State Highway 207). The access road turns off from the highway at a sign reading Bull Prairie Guard Station. This access turn-off is 39 miles from Heppner and 16 miles from Spray, said points having the nearest rail terminals. The Spray terminal is that of a lumber company railroad.

Ownership: Land in the section mentioned is partly National forest land and partly owned by a Mrs. Jim Carsner, Spray, Oregon.

General: The clay sample referred to in the forward was an off-white clay with a hard fracture and very clean in appearance. Other clay to be seen in the area includes a predominately brick red clay and a mottled blue-red clay.

White Clay: The following letter gives the result of the original analysis of this material and is offered here because of its descriptive value.

State Department of Geology and Mineral Industries

COPY

702 Woodlark Building
Portland 5, Oregon
May 6, 1949

Mr. Neal F. Knighten
15th & South Washington Streets
Kennewick, Washington

Dear Mr. Knighten:

The analysis of the clay you submitted to me is as follows:

Dry color - off white and dull pink.
Wet color - pink.
Texture - hard rock-like, non-slaking.
Plasticity - fair when ground with water to a minus
20 mesh.
Dry Shrinkage - 3-1/2%.
Drying Behavior - Very good, slightly friable.
Shrinkage water - 7%.
Water of Plasticity - 29%.
Pore Water - 22%.

<u>Fired Properties</u>	<u>Color</u>	<u>Shrinkage</u>		<u>Absorption</u>
		<u>Fired</u>	<u>Total</u>	
C/04 1958°F.	Pink	5.2%	8.5%	22.0%
C/02 2030°F.	Pink	5.2	8.5	20.2
C/2 2138°F.	Pink	5.7	9.0	19.5
C/3 2174°F.	Pink	6.7	10.0	18.0
C/10 2300°F.	Yellow Gray	13.5	17.0	7.3

Firing behavior of this material is very good with the PCE of cone 31 plus.

This clay is a flint-type fire clay. It shows a good possibility as a refractory product. The shrinkage at C/10 is slightly excessive and at the same temperature the absorption is low. Both of these tendencies could be possibly corrected by an addition of calcined material to the mix.

This material is not suitable for aluminous cements.

I have given a copy of this report to Mr. A. G. Bartell, Managing Engineer of the Raw Materials Survey. Thank you for your interest, and I hope this report meets with your satisfaction.

Sincerely,

C. W. F. Jacobs,
Ceramist
3703 S. W. Corbett
Portland, Oregon

The strata from which the foregoing sample originated is exposed by a shallow excavation about three feet square and a foot deep. Detrital material is exposed for a distance of about 10 feet in a tire-rut sized wash gully adjacent to this pit. This constituted the only exposure of this clay variety seen on the occasion of this examination. Nowhere else in the area at large was similar material encountered, nor was there evidence in the immediate vicinity of the exposure just described to warrant any inference to the effect that an extensive deposit might exist. By this is meant a lack of a terrace or similar topographic expression which might reflect the presence of lateral extension otherwise obscured by soil and foreign overburden. A considerable amount of pitting and trenching will have to be done to reveal the nature of the occurrence, its thickness, lateral extension, etc. What is readily apparent is that a considerable thickness of red clay will probably cap, to a large extent, any strata of the white clay which might occur. That this is so hinges on the fact that the white clay exposure is situated on the lower extremity of a rather prominent knoll composed of the red clay. Uncapped white clay can exist only under the soil-covered flat below the hill and below the present exposure. Whether or not it does in fact occur here will require prospecting as already mentioned. Sample JB-137 represents a sample of the white clay taken on the occasion of this examination for the purpose of additional testing. For further discussion of this clay type reference is made to the appended analysts report under the above mentioned number.

Red Clay Sample JB-138 represents a composite sample of red clay types as the subordinate variations thereof occurred in the

small a scale and were repeated too frequently to warrant individual sampling. While this red clay sample was secured from the knoll above the white clay, similar red clay was seen to occur at various places over a wide area in the general vicinity. Nowhere were any of these occurrences exposed by prospect workings, nor was there any conspicuous material evidence to indicate the likely presence of a large yardage in any single occurrence seen. In fact, evidence in the form of abundant exposures of fresh bedrock existed to indicate that individual clay occurrences were of small in size. The area was, however, not studied systematically or thoroughly on the occasion of this examination so that should tests of this sample reveal the clay to possess unusually good and distinctive properties, and should an analysis of the transportation-market factor reveal an operation to be practical, a more comprehensive examination of the area would be in order. For further discussion of this clay, reference is made to the appended analyst's report under the sample number mentioned at the outset of this paragraph.

Blue Clay: Sample JB-139 represents a sample of a third type called here blue clay because it is characterized by a blue background color. Actually the clay is mottled with off-red spots. This sample was secured from the roadbed several hundred yards distant from the knoll from which samples JB-137 and JB-138 were obtained. Like the red clay, it is to be seen in several widely separated places. Also like the red clay, none of the natural outcrops are of such nature as to indicate the existence of truly large, thick occurrences. Mr. Knighten, however, did point out to the writer the site of a pit dug by him some ten to fifteen

years ago on one of the occurrences. This pit is now caved and sloughed full, but the dump indicates the blue mottled clay to have been encountered. The thickness of clay penetrated according to Knighten's recollection was about 16 feet. Several bedrock exposures exist within close proximity to this pit so that unless a narrow belt of clay traverses the country here in a manner so as to escape obvious attention, the occurrence is of limited size. The comments made regarding potential distribution in the area at large for the red clay apply also to this blue clay. For further discussion of this clay-type reference is made to the appended analyst's report under the sample number mentioned at the outset of this paragraph.

Conclusions: Three varieties of clay occur in this area - a white clay which previous tests have shown is possessed of attractive properties, a red clay and blue clay - both heretofore untested. The white clay was seen in only one place. The material exposure was very limited in size. The occurrence was otherwise not delimited by prospect workings, nor did surface conditions indicate the trend of any belt or the presence of a probable occurrence of appreciable size. Surface conditions did show that an appreciable thickness of red clay probably capped at least part of any white clay body which might exist. The red clay was otherwise often observed elsewhere in the vicinity as was also the blue clay. No prospect work has been done on any of these clays and no single occurrence of any variety was seen which could be judged as representing a large, mineable occurrence on the basis of natural exposure. While a careful search of the area at large might reveal the existence of mineable-sized and situated occurrences, or while prospect work might possibly show some of the occurrences seen to be of greater

size than natural exposures indicate, prospect development work would be justified only provided (1) test show the clays to be possessed of exceptionally good commercial properties, and provided (2) that a careful study of the transportation-market factor shows mining would be economically possible. In this latter respect the situation seems negative to the point of precluding further consideration because of (1) the great distances to the nearest rail terminals (2) the great distance by rail to the possible consuming market areas (3) the extensive amount of improvement which would have to be made on access roads, and (4) because seasonal conditions would probably enforce seasonal operation. Samples JB - 137, 138 and 139 represent preliminary, near surface samples of each of the clay types as previously mentioned. While the test results for these samples are not yet completed, they are to be appended to this report when available, and reference is here made to them at this time as the final observation to be offered.

Report by:	N. S. Wagner
Date of Exam:	June 22, 1949
Informants:	Neal Knighten, Mr. Palmer, letter from F.W. Libbey, May 20, 1949.

STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
702 Woodlark Building, Portland 5, Oregon

CLAY FIRING REPORT

Date September 15, 1949

Reference number P-8743
C-237

Dear Wag:

The analysis of the clay you submitted to this office for testing is as follows:

Dry color: **Off white**

Texture: **Massive, fine grain, flinty**

Wet color: **Light grey cream**

Plasticity: **Fair to good**

Drying shrinkage: **6%**

Drying behavior: **Very good**

Firing properties:

Cone	F.	Color	Shrinkage	Total shrinkage	Absorption
04	1958°	White	5 %	11 %	22 %
2 02	2075° 2000°	White	5.25	11.25	19.3
4 1	2129° 2100°	White	9.25	15.25	11.2
8 3	2237° 2100°	Light buff	13.50	19.50	5.5

Firing behavior: **Very good**

Pyrometric cone equivalent **C/32 - 33**

Remarks: This material has the general character of a semi flint clay. It is composed of kaolinite, anauxite and illite. If the material is in quantity and accessible it could be used very successfully as a raw material for grade #1 fire brick.

Porosity is C/04 - 49%
C/2 - 35%
C/4 - 27%
C/8 - 11%

The chemical analysis shows the clay is very low in iron and other fluxing and coloring material.

Charles W. Jacobs

STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
702 Woodlark Building, Portland 5, Oregon

CLAY FIRING REPORT

Date September 14, 1949

Reference number P-8744
C-238

Dear Wag:

The analysis of the clay you submitted to this office for testing is as follows:

Dry color: **Brick red**

Texture: **Massive, fine grain, flinty**

Wet color: **Red brown**

Plasticity: **Fair - good**

Drying shrinkage: **6.5%**

Drying behavior: **Good**

Firing properties:

Cone	F.	Color	Shrinkage	Total shrinkage	Absorption
04	1958°	Red	5 %	11.5%	23.0%
2 02	2075° 2000°	Red	9.5	16.0	12.3
4 2	2129° 2100°	Red	10.5	17.0	8.8
8 6	2237° 2100°	Red	13.0	19.0	7.5

Firing behavior: **Good**

Pyrometric cone equivalent **C/ - 23**

Remarks:

This material is too high temperature for the average face brick product and is the wrong color and too low a P.C.E. for a fire brick product. This material is composed of approximately the same minerals as C-237 plus iron oxide which produces the color and lowers the P.C.E.

Porosity is - C/04 - 38%
 C/2 - 28%
 C/4 - 20%
 C/8 - 20%

Charles W. Jacobs

STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
702 Woodlark Building, Portland 5, Oregon

CLAY FIRING REPORT

Date September 15, 1949

Reference number P-8745
C-239

Dear Wag:

The analysis of the clay you submitted to this office for testing is as follows:

Dry color: Pale lavender, blue with limonite

Texture: Specks. Massive, fine grain

Wet color: Light brown

Plasticity: Good

Drying shrinkage: 6.3%

Drying behavior: Good

Firing properties:

Cone	F.	Color	Shrinkage	Total shrinkage	Absorption
04	1958°	Lt. chocolate brn.	6.0%	12.0%	24. %
2 <i>pk</i>	2075° <i>pk/bk</i>	"	10.5	16.5	14.
4 <i>k</i>	2129° <i>kA/bk</i>	"	12.0	18.0	9.6
8 <i>b</i>	2237° <i>kA/hA</i>	Dk. chocolate brn.	14.0	20.0	8.5

Firing behavior: Good

Pyrometric cone equivalent C/ - 23

Remarks:

This material like P-8744 - C-238 is high in iron. This causes the low P.C.E. and produces the red color. Both of these (color and low P.C.E.) make the material useless as a fire brick raw material. Halloysite is the main clay mineral.

Porosity is - C/04 - 40%
C/2 - 26%
C/4 - 21%
C/8 - 18%

Charles W. Jacobs

State Department of Geology and Mineral Industries

702 Woodlark Building
Portland, Oregon

Unclassified Area

Flint Fire Clay Occurrence

Morrow County

Supplemental Report No. 1

Foreword: This occurrence is situated in T 6 S, R 26 E, sections 32 and 39. It is described in a Departmental report entitled as above, by N. S. Wagner, June 1949. In view of the quality of the white clay (analytical results included with original report) further field investigation was made by this Department. This investigation consisted of test pitting (Mason and Wagner, October 19, 1949) on the clay type mentioned, and the objective was to determine whether or not a more extended drilling project would be warranted. A description of the test pitting and the conclusions attendant thereto are contained in the following report.

A hole sunk on the white clay occurrence showed this clay bottomed within a matter of 12 inches from the bottom of the original exposure. It was underlain by the red clay which is abundantly exposed in the area and which tests have shown to be valueless. The test hole was sunk to a depth of a foot in the underlying red clay by way of establishing that said clay occurred in quantity and not just as a thin seam or parting.

The thickness of the white clay strata proved to be only 15 to 18 inches in the thickest section exposed by the hole. Lateral extension of this

hole further showed the white clay to occur as a lens which pinched to a thickness of but a few inches in a lateral distance of three feet from the center of the main pit. A trench dug some seven feet distant from the occurrence in the opposite direction from the pinch revealed that the white clay body was overlain by red clay and that it likewise failed to possess lateral extension in that direction. The situation is portrayed graphically in the attached photographs.

The extremely small size of the white clay lens, when considered in conjunction with the lack of natural exposures of like material elsewhere in the immediate vicinity, rules out the feasibility of any more extended exploratory project at this time on this particular occurrence. The grade of the white clay is such, however, that other occurrences of comparable material situated elsewhere in the area would bear consideration by those interested in the development of mineral resources

Report by: N. S. Wagner
Date of report: November 12, 1949
Test Pitting by: Mason & Wagner, October 19, 1949.

