THE GEOLOGICAL SURVEY OF WYOMING
Gary B. Glass, State Geologist

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CLAY RESOURCES OF WYOMING
(Excluding bentonite and fuller's earth)

by

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This report has not been reviewed for conformity with the editorial standards of the Geological Survey of Wyoming.

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Introduction

Clays are naturally-occurring, fine-grained materials composed primarily of a group of minerals known as the clay minerals. Clay minerals are hydrous aluminosilicate minerals having a sheet-like structure. Their chemical properties of hydration and cation exchange with water solutions make them valuable as absorbents and purifiers. Their physical properties of plasticity, cohesiveness, expansion upon hydration, hardness upon drying, and resistance to high temperatures make them valuable as sealants and binders, and as the major component in some construction materials such as brick and tile, dinnerware and pottery, and refractory materials. The relationship between the desired physical and chemical properties, and the clay mineralogy and chemical composition is not always direct.

The classification of clay is based on both use and mineralogy, so the categories often overlap. The U.S. Bureau of Mines divides clay into six categories: 1) bentonite, 2) fuller's earth, 3) kaolin, 4) fire clay, 5) ball clay, and 6) common clay. Since bentonite (clay that swells appreciably when wet) is a major industry in Wyoming, far exceeding the value of all other types of clays put together, bentonite will be the subject of a separate report. Fuller's earth has no compositional or mineralogical meaning, but much of the clay sold as fuller's earth is bentonite (Patterson and Murray, 1983). For this reason, occurrences of fuller's earth in Wyoming will be presented in the separate report on bentonite.

KAOLIN

Kaolin, also known as china clay, is a white clay-like material composed mostly of the mineral kaolinite. Besides kaolinite, the minerals dickite and halloysite are included in kaolin (Ampian, 1985). The term kaolin originated from Kauling, a hill near Jauchau, China, where clay for Chinese chinaware was mined centuries ago (Patterson and Murray, 1983). In the United States, kaolin is used primarily as a whitener of paper (43 percent), and also in dinnerware (seven percent), and in rubber products (four percent). The remainder (46 percent) is used in a variety of things such as paint, ceramics, and refractory materials (Ampian, 1986).

Kaolin is produced in the United States in Georgia, South Carolina, and North Carolina. Former mines, now inactive, are found in northern Idaho, California, New Mexico, Texas, Arkansas, Alabama, Vermont, and Virginia (Patterson and Murray, 1983). Recent production of kaolin in the United States is summarized in Table 1.

Table 1. Domestic production of kaolin, fire clay, ball clay, and common clay (1981-1985), (data in short tons) (Ampian, 1986).

Year	Kaolin	Fire Clay	Ball Clay	Common Clay
1985	7,880,000	1,120,000	910,000	30,000,000
1984	7,953,000	1,145,000	860,000	29,225,000
1983	7,203,000	1,043,000	747,000	27,066,000
1982	6,362,000	1,087,000	642,000	22,326,000
1981	7,660,000	1,927,000	845,000	27,543,000

FIRE CLAY AND REFRACTORY CLAY

Fire clay and refractory clay are detrital materials, either plastic or rock-like, containing low percentages of iron oxide, lime, magnesia, and alkalies, that are able to withstand temperatures of 1,500°C or higher without deforming or melting (Ampian, 1985). Fire clay and refractory clay are mostly kaolinite, so they are another variety of kaolin. The terms "fire clay" and "refractory clay" are used interchangeably without regard to fired color by the U.S. Bureau of Mines (Ampian, 1985). These are the reasons production categories overlap. Patterson and Murray (1983) define fire clays as all non-white firing refractory clays. Refractory and fire clay are used for fire-resistant bricks (35 percent), foundry sands (ten percent), and other uses (55 percent) such as refractory ceramics (Ampian, 1986).

The properties of refractory and fire clays are defined in terms of pyrometric cone equivalents (PCE). These standards were developed and are revised periodically by the American Society for Testing and Materials (ASTM) (ASTM, 1985). Clays are tested by comparing the deformation of a sample cone upon heating with standard cones developed by ASTM. The PCE of the sample is the number of the standard cone that deforms in the same way as the sample; that is until the tip of the standard cone bends over and touches the supporting plaque at the same temperature as does the tip of the sample cone. Refractory clays have a PCE greater than 19 (Table 2). Refractory and fire clay grades are subdivided on the basis of PCE into low (PCE 19-26), medium (PCE 26-31½), and high (PCE greater than 31½) duty (Patterson and Murray, 1983).

Table 2. Temperature end points of selected pyrometric cones (ASTM, 1985).

Number of cone	Temperature °F	°C
18	2,772	1,522
19	2,806	1,541
20	2,847	1,564
26	2,950	1,621
30	3,039	1,665
31½	3,090	1,699
36	3,279	1,804
38	3,335	1,835

Refractory and fire clays are produced in the United States in Pennsylvania, Ohio, Kentucky, Georgia, Alabama, Arkansas, Missouri, Colorado, Idaho, and California (Patterson and Murray, 1983). The production of fire clay is summarized in Table 1.

BALL CLAY

Ball clay is a white-firing, highly plastic clay used mainly for ceramics (Ampian, 1985). The term "ball clay" refers to the ancient mining practice of digging clay out of a deposit and rolling it into a ball for shipment. Kaolinite is the principal clay mineral in a ball clay, so ball clay is actually a variety of kaolin. The category ball clay is used because of marketing and its specialized use in ceramics. Ball clay is a special kaolin because it contains organic material, has a high bonding strength (high plasticity and dry strength), and a wide vitrification range (Patterson and Murray, 1983). It is used in dinnerware and pottery (27 percent), floor and wall tile (15 percent), and sanitary ware (bathtubs, sinks, etc.) (16 percent) (Ampian, 1986), where a vitreous luster is required.

Ball clay is produced in the United States in western Kentucky and Tennessee and in east-central Texas (Patterson and Murray, 1983). Table 1 gives the recent production of ball clay in the United States.

COMMON CLAY

Common clay is clay or clay-like material that is sufficiently plastic to permit ready molding (Ampian, 1985); lack of shrinkage upon drying and firing is sometimes a necessary property. Common clay contains the clay minerals illite, smectite, and kaolinite (Patterson and Murray, 1983). Clay and shale mined for lightweight aggregate are included in this category (Ampian, 1986) as is shale mined as a raw material for cement. Clay and shale that expand upon heating, without vitrifying, to form a non-absorbent material are used as lightweight aggregate in construction where a lightweight concrete is required. Most common clay (95 percent) is used in construction materials (Ampian, 1986) such as brick, tile, pipe, roofing, and aggregate. Clays used for brick, tile, pipe, and roofing are also known as heavy clay products; a term used in this report in the descriptions of pits, prospects, and occurrences.

Common clay is produced in most states, including Wyoming. Recent common clay production in the United States is summarized in Table 1.

CLAY MINING

Clays are bulk commodities whose value depends not only on the properties of the clay but also on transportation costs, distance to markets, and the cost of mining and processing. For certain clays like kaolin, selected clay properties such as purity, color, brightness, and refractory properties have a greater influence over mine site selection than transportation and processing costs. Mine site selection for common clay, however, is more dependent upon economic factors than clay properties.

Mining of clay is accomplished by open-pit methods (overburden removal, clay removal, and reclamation). Refractory and ball clays and kaolin are subject to fairly strict quality control during mining by continuous sampling methods. Common clay is usually mined and stockpiled. Material is taken from the stockpiles as needed.

The mining of clay mineral deposits is also sensitive to environmental concerns. Although clay mines are relatively small and unpolluting, their development is a balance between proximity to the point of use and local zoning regulations which may prohibit pit or quarry development near residential areas.

Exploration for clay deposits usually involves market studies since common clay and other types of clays are generally mined to serve a local or regional market, rather than a national market. Prospecting, sampling, and testing is usually done within the area deemed economically viable for the region.

HISTORY OF NON-BENTONITIC CLAY PRODUCTION IN WYOMINNG

Almost all of the clay produced in the past in Wyoming has been common clay used for heavy clay products. Limited production of fire clay has come from Uinta County. The Idealite quarry near Laramie is the lone recorded site of common clay production for making lightweight aggregate (Figure 2 and description, p. 12), (Wyoming State Inspector of Mines; Wyoming Department of Revenue and Taxation; Darton and others, 1910; Nicoll, 1963). Clay processing in Wyoming has been limited to the manufacture of heavy clay products. No non-bentonite clay processing plants are presently operating in the state.

In the late 1800s and early 1900s many Wyoming communities had brick plants (Figure 1) because transportation costs for bricks were high, and brick construction was popular for commercial building. As transportation costs decreased and alternate construction styles were developed, the plants closed. Most of the brick plants were closed prior to World War II. The surviving plants manufactured a variety of other heavy clay products in addition to bricks. These heavy clay product plants were all closed by 1976. They were probably driven out of business by cheaper plastic and cement tile products, and petroleum based shingles.

The brick plants that operated prior to World War II were numerous (Figure 1). Prior to the mid-1910s, plants were located in Almy, Casper, Cheyenne, Cody, Douglas, Gillette, Glencoe, Lander, Laramie, Rawlins, Sheridan, and

Wheatland (Veatch, 1907; Schultz, 1907; Knight, 1898; Anonymous, 1887, 1890, 1898, 1903a, 1907a, 1907b, 1907c, 1907d, 1907e, 1908, 1912a, 1912b, 1912c, 1912d, 1912e; Osterwald, 1947; Van Sant, 1961). Brick plants were also reported at Basin, Green River, Encampment, Thermopolis, and Worland prior to 1914 (Sanford and Stone, 1914), but no additional information about these plants has been found (after Van Sant, 1961; Anonymous, 1894, 1903b, 1907f, 1907g, 1907h, 1912f, 1912g, 1912h, 1912i, 1914). Of all these plants, only a refurbished Sheridan plant survived the 1930s. It is not certain if the Casper and Douglas plants survived the 1930s, but both closed prior to 1950 (Anonymous, 1907i, 1912j, 1920, 1925, 1931a, 1931b, 1944, 1948; Van Sant, 1961; Veatch, 1907). A plant was started in Sinclair (Parco) in 1927 (Dietz, 1927), but the longevity of the plant is not known. Another plant was operated briefly and sporadically in Laramie from 1941 to 1946 (Van Sant, 1961).

The most recent heavy clay products plants were located in Sheridan and Lovell. A remodeled Sheridan plant apparently operated until 1968 (U.S. Bureau of Mines Yearbooks). The plant in Lovell opened in the 1920s (Van Sant, 1961) and closed in 1976 (Parks, 1980).

In the last ten years, all of Wyoming's clay production has come from near Almy, Wyoming, in Uinta County. Operators made periodic shipments of clay to Utah for the manufacture of brick, tile, and fire brick (U.S. Bureau of Mines Yearbook, 1964; Wyoming Department of Revenue and Taxation 1959-1982). Small amounts of clay were apparently shipped from the Lovell area out of the State from 1976 to 1980 (Parks 1980; Wyoming Department of Revenue and Taxation 1959-1982). Reported clay production in Wyoming for the last ten years is shown in Table 3. Actual clay production in Wyoming is uncertain because these aforementioned producers are the only clay operations to appear on the State's tax records.

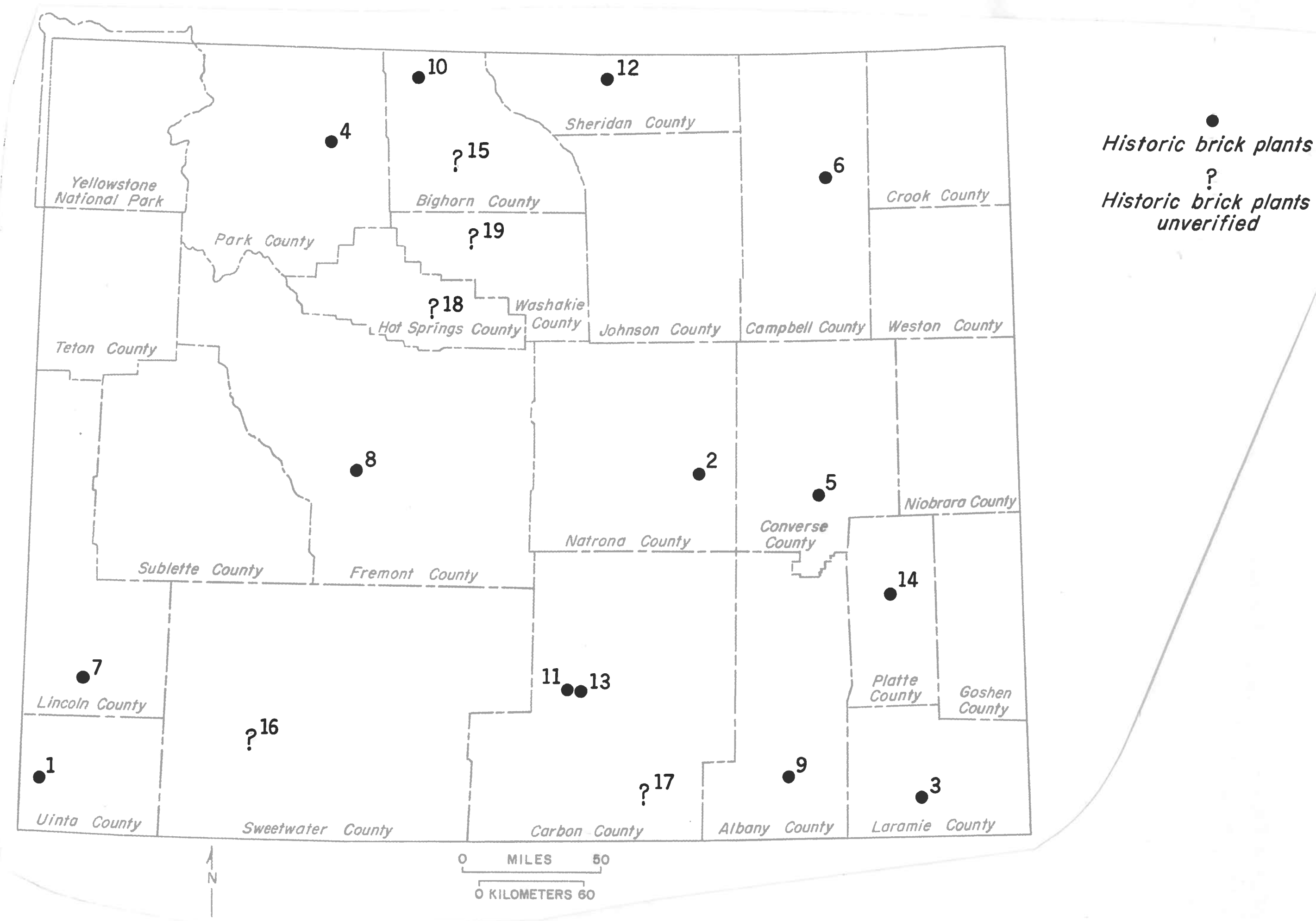

Figure 1. Locations of historic brick and tile plants in Wyoming.

1	Almy	10	Lovell
2	Casper	11	Rawlins
3	Cheyenne	12	Sheridan
4	Cody	13	Sinclair
5	Douglas	14	Wheatland
6	Gillette	15	Basin
7	Glencoe	16	Green River
8	Lander	17	Encampment
9	Laramie	18	Thermopolis
		19	Worland

Table 3. Wyoming non-bentonitic clay production (1976-1985). Information from Wyoming Department of Revenue and Taxation, Ad Valorem Tax Division Annual Reports.

Year	Short tons
1976	47,017
1977	56,468
1978	37,417
1979	39,184
1980	41,996
1981	23,220
1982	15,702
1983	36,445
1984	59,639
1985	35,917

NON-BENTONITIC CLAYS IN WYOMING

Non-bentonitic clays in Wyoming that are suitable for manufacturing uses occur as alluvial and residual clays and in shales. Alluvial clays are those clays transported and deposited by water; residual clays develop in place by the weathering of shales. Many widespread Jurassic, Cretaceous, and Tertiary shales in Wyoming contain clay. Examples of geologic formations that contain exploitable clay-bearing shales are the Mesaverde, Cloverly, Frontier, Adaville, Evanston, Morrison, Niobrara, Cokeville, Fort Union, and Lakota Formations. Locations of pits, prospects and occurrences are shown in Figure 2. The brick plants usually obtained clay from pits near the plants that were in alluvial clay, residual soils on shales, and rarely from the shales themselves. Alluvial and residual clays are usually not thick or extensive enough to be of economic importance today, so pits supplying the Sheridan and Lovell heavy clay products plants and the present day pits in Uinta County are in shales.

At the writing of this report, only fire clay and common clay have been found in Wyoming in exploitable deposits. Kaolin is present in many shales and partings in coal (tonsteins) in Wyoming; but it is either diluted with abundant impurities or is in layers that are too thin to be mined. For examples, see Love and Blackmon (1962); Schultz and Mapel (1961); Glass (1975); Glass and Roberts (1984, 1986); and Bohor and others (1979). Ball clay has not been reported in Wyoming.

Most geologic examinations for clay in Wyoming were directed towards discovering sources of fire clay. However, only a few fire clay sources have been located. In contrast, many sources of common clay have been discovered and exploited. Testing for clays presently in higher demand, like those used in cement and lightweight bloated aggregate has been negligible. The lightweight aggregate locales listed in the following section under occurrences have not been thoroughly tested and many more might be discovered. Many localities contain more than one category of clay. The pits and occurrences listed in the following pages are almost entirely in shales. One notable exception is the apparently extensive residual clay on the Hilliard Shale in Mammoth Hollow in Lincoln and Sublette Counties.

Producing Pits

(numbers preceding each location refers to the Index Map, Figure 2).

Uinta County

1) Interpace Corporation Center S1/2S1/2SW1/4 sec. 18, T.16N., R.120W.

This clay pit is located on the Evanston and Murphy Ridge 71/2-minute Quadrangle maps. The general location is from the Wyoming State Inspector of Mines (1965). This pit is in shales in the Evanston Formation (Cretaceous-Tertiary) (Lamerson, 1982). The clay apparently is refractory grade (Wyoming

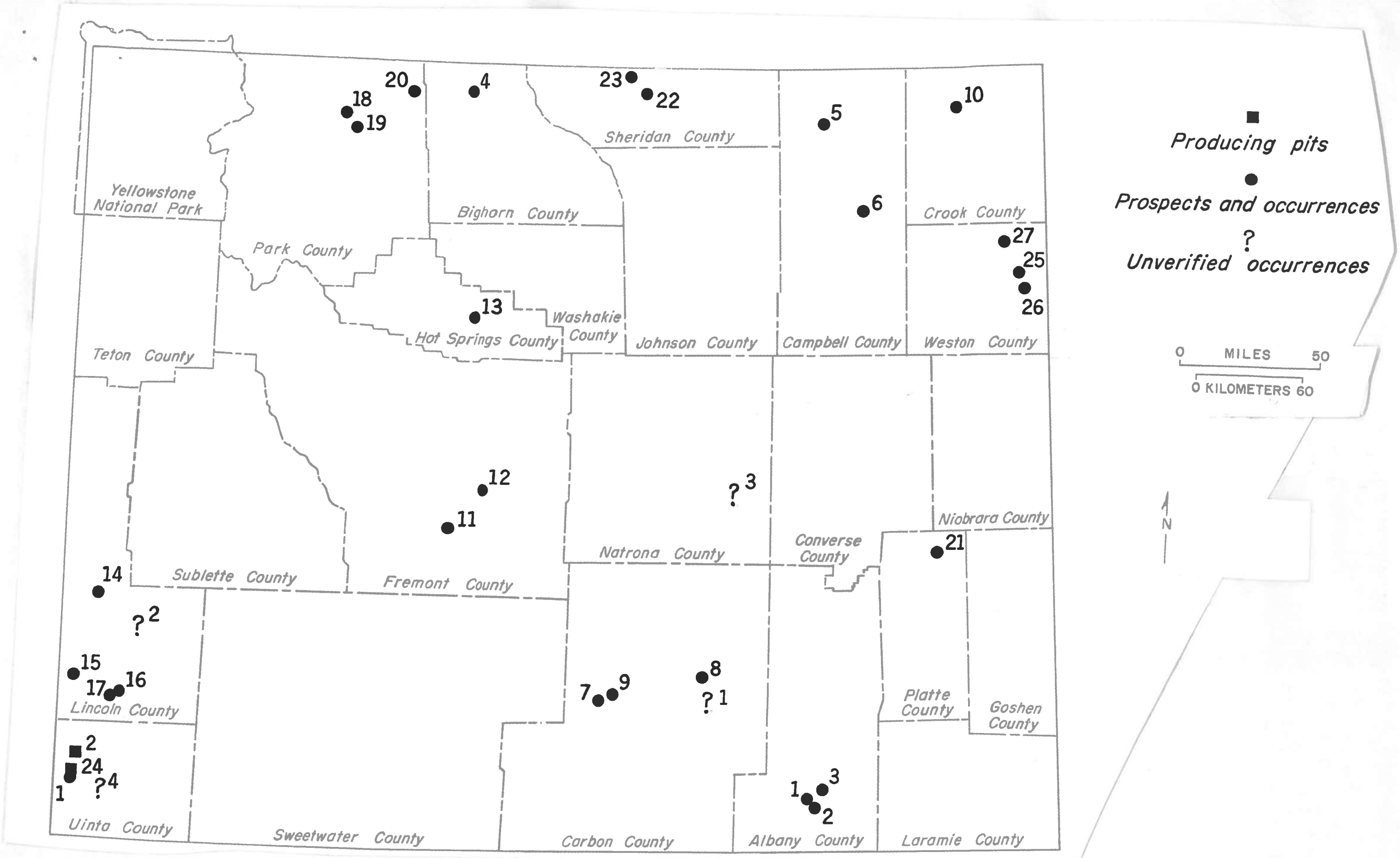

Figure 2. Locations of non-bentonitic clay pits, prospects, and occurrences in Wyoming.

Pits

1	Interpace Corporation	2	Interstate Brick Company

Prospects and Occurrences

1	Idealite	15	Sage
2	Hutton Lake	16	Diamondville
3	Laramie	17	Elkol area
4	Lovell Clay Products Company	18	Rhodes pit
5	Spotted Horse area	19	Cottonwood Creek area
6	Wyodak Coal Company	20	Garland area
7	Rawlins area	21	Morris Canyon
8	Hanna area	22	Sheridan Press Brick and Tile Co.
9	Sinclair	23	Big Horn Coal Co.
10	Elkhorn Creek area	24	Almy area
11	Beaver Creek area	25	Cambria
12	Rodgers Mountain anticline	26	Newcastle
13	Thermopolis area	27	Bertha Canyon
14	Howland Creek area		

Unverified Occurrences

1	Soda Lakes	3	Natrona County
2	Mammoth Hollow	4	Richardson Coal Mine

State Inspector of Mines, 1980) and has been mined since at least 1962. Production has been reported in only two of the last ten years, with the last production occurring in 1984 (Wyoming Department of Revenue and Taxation). The pit at this locality is fenced, but there were no signs indicating ownership (in 1986).

2) Interstate Brick Company Center sec. 26, T.17N., R.120W.

This clay pit is located on the Three Forks 7½-minute Quadrangle Map. The general location is from the Wyoming State Inspector of Mines. This pit is in shales in the Evanston Formation (Cretaceous-Tertiary) (Lamerson, 1982). This clay is apparently not refractory grade, but it is used to make brick and tile (Wyoming State Inspector of Mines) and has been mined since 1959 (Wyoming Department of Revenue and Taxation).

Prospects and occurrences

(numbers preceding each location refer to the index map, Figure 2.)

Albany County

1) Idealite Center S½ sec. 4, T.14N., R.74W.

This pit is in shales in the Cretaceous Frontier Formation (Nicoll, 1963) and was the source of the clay that was calcined to produce lightweight aggregate from 1957 to 1964 by the Ideal Cement Company (Wyoming Department of Revenue and Taxation; Osterwald and others, 1966).

2) Hutton Lake N½ sec. 34 and center W½ sec. 27, T.14N., R.74W.

Van Sant (1961) obtained and tested four shale samples at these sites. The samples came from the Jurassic Morrison (section 34) and Cretaceous Cloverly (section 27) Formations. The Cloverly Formation contains clays suitable for low-duty fire brick (PCE 20), heavy clay products, and lightweight aggregate. The Morrison Formation contains clays suitable for low to moderate duty fire brick (PCE 28). Both formations are more widespread than the listed sites but vary in lithology both laterally and vertically (Van Sant, 1961).

3) Laramie SE1/4NW1/4 sec. 36, T.16N., R.74W.

This pit was in the upper part of the Cretaceous Frontier Formation. The lateral extent of the clay shale is uncertain because outcrops are limited. The pit was 40 feet deep, and neither the top nor the bottom of the clay shale was exposed in the pit. Preliminary testing by the Geological Survey of Wyoming indicated that if the shale was ground, it was suitable for making common brick. The clay was heated at 2,400°F without bloating. Darton and others (1910) report this pit was the source of clay for the Laramie brick plant prior to 1910.

In 1985, clay was mined from this pit and used to construct an impermeable barrier around an unused creosote plant in Laramie. Toxic wastes are present in the soil and substrata beneath the old plant. Embankments were constructed using this clay to isolate the toxic-waste site from the Laramie River. Following the clay extraction in 1985, this pit was reclaimed and revegetated so the clay is not presently exposed. The site is mistakenly designated a gravel pit on the Laramie SW 7 1/2-minute Quadrangle Map.

Big Horn County

4) Lovell Clay Products Company Center E1/2E1/2 sec. 17 and NW1/4NE1/4NE1/4 sec. 20, T.56N., R.95W.

These sites are clay pit locations depicted on the Lovell Lakes 7 1/2-minute Quadrangle Map, and the locations agree with the general description of Van Sant

(1961). These pits are in clay shales in the Cretaceous Cloverly Formation and were the source of clay for brick and tile and other heavy clay products manufactured at the Lovell Clay Products Company plant in Lovell. The clay is not refractory, having a PCE of 17 to 18. The clay shales in the Cloverly Formation in this area are at least twenty feet thick and extend hundreds of feet laterally (Van Sant. 1961).

Campbell County

5) Spotted Horse area Approximately N1/2 sec. 33-34 line, T.55N., R.74W.

Van Sant (1961) reported that clay shales from this site are suitable for use in heavy clay products. These clay shales are associated with coal beds in the Eocene Wasatch Formation. The sampled unit is eight feet thick and is traceable for several hundred feet. Fulton (1967) concluded these clay shales made good stoneware.

6) Wyodak Coal Company open pit mine Sec. 27, T.50N., R.71W.

A five-foot thick clay shale bed just above the mineable coal bed in Tertiary sediments could be used to make lightweight aggregate (Van Sant, 1961).

Carbon County

7) Rawlins area Sec. 25, T.21N., R.88W.

A carbonaceous clay shale in the Mesaverde Formation (Cretaceous) from this site is suitable for low-duty fire clay. It has been tested as PCE 18 to 19. The carbon does not remain after high temperature firing (2,100°F). This clay-shale bed is five feet thick and is exposed for several hundred feet laterally. Many clay shales suitable for low-duty fire brick probably occur in the Mesaverde Formation at other sites near Rawlins (Van Sant, 1961).

8) Hanna area NE1/4 sec. 10, T.22N., R.81W.
NE1/4 sec. 16, T.22N., R.81W.
Center N1/2 sec. 3, T.22N., R.81W.

These are the locations of the Nugget Coal and Timber Company strip mines northeast of Hanna. All are in the early Tertiary Hanna Formation (Glass, 1972). Underclays and clay shales in overburden at one of these pits were tested by the Wyoming Natural Resources Research Institute. None were refractory, but all had definite bloating characteristics and might be suitable for lightweight aggregate (Van Sant, 1961).

9) Sinclair Approximately N1/2 sec. 21, T.21N., R.86W.

The exact location of the clay pit is not known. The pit was reportedly on the site of the brick plant in Sinclair (formerly Parco). The plant produced common brick in 1927 (Dietz, 1927), but little else is known. The pit was probably in the Upper Cretaceous Niobrara Formation or Steele Shale.

Crook County

10) Elkhorn Creek area Approximately sec. 1, T.55N., R.66W.

This poorly described sample site is in clay shales in the Cretaceous Inyan Kara Group (Robinson and others, 1964). The clay shale is suitable for making some kinds of brick and tile, but it is not refractory. The bed is five feet thick although the lateral extent is uncertain (Van Sant, 1961).

Fremont County

11) Beaver Creek area Sec. 34, T.31N., R.96W.

An extensively exposed carbonaceous shale in the Upper Cretaceous Frontier Formation at this site is suitable as a low-duty refractory clay (PCE 23) and for heavy clay products. However, the shale is thin (three feet thick) and covered by too much overburden to be a good prospect (Van Sant, 1961).

12) Rodgers Mountain anticline NW1/4 sec. 17, T.33N., R.94W.

A clay shale from the Upper Cretaceous Frontier Formation near the crest of this anticline is suitable as a low-duty refractory clay (PCE 23). The approximately 15-foot thick clay shale is exposed over an area of at least 200 feet by one-half mile and apparently has a consistent thickness (Van Sant, 1961). A small amount of this clay shale has been recently used for a one-man stoneware operation in the Midwest.

Hot Springs County

13) Thermopolis area NW1/4 sec. 19, T.43N., R.94W.

At this locality (a roadcut). a clay shale in the Cretaceous Cloverly Formation was sampled by Van Sant (1961). The clay shale is suitable for making heavy clay products and weather-resistant brick. The five-foot thick clay shale is only traceable for a short distance away from the roadcut (Van Sant, 1961). This is a good stoneware clay (Fulton. 1967).

Lincoln County

14) Howland Creek area SW1/4 sec. 16, NW1/4 sec. 21, T.26N., R.118W.

At this site. a clay shale that is in the Cretaceous Cokeville Formation (after Rubey and others, 1980; Van Sant, 1961) is suitable for making lightweight aggregate (Van Sant, 1961). However, the sampled unit is only one-half foot thick, in a roadcut, and natural exposures are rare due to colluvial and vegetation cover (Van Sant, 1961).

15) Sage Center SE1/2 sec. 7, T.21N., R.119W.

The general location is a few hundred feet north of U.S. Highway 30, next to abandoned underground coal mines (Van Sant, 1961); the exact location is from Rubey and others (1975). One of two samples of clay shale in the Cretaceous Cokeville Formation (Rubey and others, 1975) proved to be suitable for brick and tile. The suitable clay shale is seven feet thick and overlies the coal beds that were mined. The clay shales near Sage are not traceable for more than a few tens of feet laterally (Van Sant, 1961).

16) Diamondville Sec. 25 or 36, T.21N., R.116W.

Southeast of Diamondville, a five-foot thick clay shale from the Cretaceous Frontier Formation was found to be suitable for making heavy clay products (Van Sant, 1961). Although Van Sant (1961) states the sample site is in Section 25, his description suggests that the sample came from Section 36.

17) Elkol area SE1/4SE1/4 sec. 31, T.21N., R.116W.
SW1/4SW1/4 sec. 29, T.21N., R.116W.
Center N1/2 sec. 10, T.20N., R.117W.

These sample sites were all from Kemmerer Coal Company's open pit mines, and prospect pits and trenches in the Cretaceous Adaville Formation. At all three locations, the sampled clay shales vary from worthless to suitable for brick. The sampled clay shales are also suitable for heavy clay products (section 10). and possibly suitable for lightweight aggregate (section 29) and low-duty fire clay (PCE 17) (section 31). The clay shales are from 15 to six feet thick and could only be found by trenching (Van Sant, 1961). These clay shales were probably destroyed by coal mining after they were examined by Van Sant (1961). (See spoil pile locations on the U.S. Geological Survey Kemmerer and Elkol 71/2-minute Quadrangle Maps.)

Park County

18) Rhodes pit Sec. 7, T.54N., R.102W.

This site was the source of clay used for pottery classes at the Heart Mountain Relocation Center during World War II (letter from Daniel Rhodes to H.D. Thomas dated September 5, 1943). The clay shale at the site is about ten feet thick and is in the Cretaceous Mesaverde Formation. The clay shale, when fired to produce hard brick, has an unpleasing greenish-gray color and is not refractory (Van Sant, 1961). In contrast, Fulton (1967) says the clay is suitable for stoneware.

19) Cottonwood Creek area Center W1/2 sec. 11, T.53N., R.102W.

Van Sant (1961) sampled a clay shale in the Cretaceous Cloverly Formation at this site. He found the clay to be suitable for heavy clay products. The clay shale is only exposed in a bulldozer cut and is but one foot thick (Van Sant, 1961). Finding a thick (economic) clay shale would require extensive prospecting.

20) Garland area Secs. 17 and 20, T.56N., R.98W.

The clay shale sampled at this site is from the Lance Formation (Cretaceous) or Fort Union Formation (Tertiary). It is suitable for heavy clay products. The clay shale bed is ten feet thick, but the lateral extent is not certain (Van Sant, 1961).

Platte County

21) Morris Canyon — Sec. 16, T.29N., R.67W.

This sample from a sandy clay shale in the Jurassic Morrison Formation definitely bloated above 2,200°F. The sampled unit might be used for making lightweight aggregate, but it is only three feet thick (Van Sant, 1961).

Sheridan County

22) Sheridan Press Brick and Tile Company — Sec. 26, T.56N., R.84W.

This is the company's older pit 1,000 feet northeast of the plant. The pit is in the Eocene Wasatch Formation (Van Sant. 1961).

23) Big Horn Coal Company — Sec. 36, T.58N., R.85W.,
Sec. 1, center E1/2E1/2 sec. 2, T.57N., R.85W.

The Sheridan Press Brick and Tile Company also obtained clay from a coal mine in the Paleocene Fort Union Formation near Ranchester. The location listed is the site of a coal mine on the Monarch 71/2-minute Quadrangle Map. This mine was probably the source of the clay. The clay that was used was directly above the mined coal bed and was four to six feet thick. This clay is not suitable for making brick or tile when used alone (Van Sant, 1961), but must be mixed with better quality clays.

Uinta County

24) Almy area — Sec. 19, T.16N., R.102W.

This site is just south of the Interpace Corporation clay pit. In section 19, clay shale samples from the Evanston Formation (Tertiary-Cretaceous) were suitable for refractory products (PCE 23-26 and 31). The sampled clay shales were from three to 15 feet thick, but the sampled sites were not amenable to clay mining (Van Sant, 1961).

Weston County

25) Cambria NW1/4NE1/4 sec. 29, T.46N., R.61W.

One clay shale sampled at this site is probably from the Lakota Formation (Cretaceous) and is suitable for low-duty refractory clay (PCE 26). The clay shale is about 20 feet thick and is traceable along a canyon wall for several hundred feet (Van Sant, 1961; Mapel and Pillmore 1963a).

Clay shale from the Morrison Formation (Jurassic), was sampled in the same area. This Morrison clay shale is suitable for making heavy clay products. This clay shale is seven feet thick and is exposed for several hundred feet on either side of the sample locality (Van Sant. 1961).

26) Newcastle N1/2NW1/4 sec. 28, T.45N., R.61W.

This sample site is in a roadcut on old U.S. Highway 85 near Newcastle. The sampled unit is a clay shale in the Cretaceous Skull Creek Formation (after Van Sant, 1961; Mapel and Pillmore, 1963a). The clay shale is suitable for making moderate-duty refractory products (PCE 26-27), but it is only two feet thick and is not traceable beyond the roadcut (Van Sant, 1961).

27) Bertha Canyon Center N1/2 sec. 2, T.47N., R.63W.

A clay shale in the Cretaceous Lakota Formation was sampled at this site (after Van Sant, 1961, and Mapel and Pillmore, 1963b) and proved to be suitable for making brick. The clay shale is six feet thick, but it could not be traced beyond an exposure in a roadcut (Van Sant, 1961).

Unverified occurrences

(numbers preceding each locality refer to the index map, Figure 2.)

Carbon County

1) Soda Lakes — Sec. 23, T.21N., R.81W.

Kaolin was reported in Carbon County near Soda Lakes in great purity and quantity in 1891 (Day, 1893). The report was never confirmed. This site is on the Lewis Shale (Dobbin and others, 1929). Besides Soda Lakes, there is also Soda Lake in Carbon County near Separation Rim (common corner, secs. 22, 23, 26, and 27, T.25N., R.89W.) which could also be the location of Day (1893).

Lincoln - Sublette County

2) Mammoth Hollow — T.25, 26, and 27N., R.115W.; T.23 and 24N., R.116W.

Schultz (1907) notes Quaternary clay deposits, mostly derived from weathering of underlying shales, in this area. He also notes they were used to make brick at Glencoe, but neither the quality of the brick nor the location of the clay pit is known. The underlying shales in Mammoth Hollow are in the Hilliard Shale (Cretaceous). The suitability of Hilliard shales for fired clay products is not certain because Van Sant (1961) did not examine this unit.

3) Natrona County

Shales in Natrona County have not been tested for suitability in making refractory products, brick, heavy clay products, pottery, stoneware, or lightweight aggregate. The work of Dobbin and Swedenborg (1931), although not specifically on clay products, indicates clay shales in Natrona County might be suitable for making multi-colored brick, pottery, and stoneware, and in making lightweight aggregate. Van Sant (1961) discounts the existence of refractory clays from the work of Dobbin and Swedenborg (1931).

Uinta County

4) Richardson coal mine NE1/4NW1/4 sec. 12, T.15N., R.118W.

Veatch (1907) reports that clay from the Standard Reserve Oil Company coal mine at Spring Valley, Wyoming, was tested in Salt Lake City and found to be suitable for fire brick in furnaces. No mine bears the Standard Reserve Oil Company coal mine name anywhere else in Veatch's (1907) report or plates.

The location given is that of the Richardson coal mine which is in the Spring Valley coal beds of the Frontier Formation (Cretaceous). This location is given because the Standard Reserve Oil Company drilled an oil well in section 12, when Charles O. Richardson was president of the company. The two small coal mines present in section 12 were used to supply fuel for nearby drilling oil wells (after Veatch, 1907). This mine was probably obliterated during the construction of Interstate Highway 80 (after Veatch, 1907; U.S. Geological Survey Ragan 71/2-minute Quadrangle Map).

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