Alberta
RESEARCH

Alberta Clays and Shales

Summary of Ceramic Properties

W. N. Hamilton and Pauline H. Babet

Alberta Clays and Shales

Summary of Ceramic Properties

ABSTRACT

Ceramic test data for more than 200 deposits of clays and shales in Alberta resulted largely from early investigations of the Federal Department of Mines (1912-15, 1932) supplemented by more recent work of Alberta Research (1951-present). These data indicate the bulk of the province's clays and shales to be of the low-grade, low alumina variety – suitable for low-value structural ware at best. Intermediate grades such as stoneware clay and fireclay are indicated in a few deposits. High-grade clays such as kaolin and ball clay are unknown.

The clays and shales are found in a variety of geologic types of deposits in the Cretaceous and Tertiary bedrock strata of the Plains and in the thick Mesozoic strata of the Rocky Mountains and Foothills, and as well, in the surficial deposits covering extensive portions of the province. Generally, the better grades and best quality of clays are found in the nonmarine bedrock deposits. Low-grade "brick" clays of fair to good quality are present in some surficial deposits. The marine shales mostly have little potential for ceramic use.

Alberta's ceramics (clay products) industry, since its beginning in 1893, has had more than 150 plants operating at various times in numerous localities across the province. Few of these survived; those that did evolved into modern and efficient plants, and the industry now is consolidated in two main areas of the province, Medicine Hat – Redcliff and Edmonton. Production in 1973 was valued at $4.6 millions.

by
W. N. Hamilton and Pauline H. Babet

ECONOMIC GEOLOGY REPORT 3
March, 1975
Price $2.00

Alberta Research
Edmonton, Alberta

CONTENTS

ILLUSTRATIONS

TABLES

ALBERTA CLAYS AND SHALES: SUMMARY OF CERAMIC PROPERTIES

INTRODUCTION

Since 1893, clays and shales in the region which is now the Province of Alberta have been utilized for the manufacture of ceramic products. In the early years following Alberta's inception as a province (in 1905) extensive programs of ceramic testing were undertaken by the Federal Department of Mines in settled parts of Western Canada to assess the potential of the clays and shales for ceramic use. The results are published in various reports, bulletins, memoirs, etc., of the Department of Mines, most of them now out of print. This report essentially is a compilation of these and subsequently published ceramic test data on Alberta clays and shales, supplemented by unpublished data from the files of Alberta Research.[1] In it are described those deposits which have been used in actual clayware production, as well as those which have not been used but on which ceramic tests have been made. The report does not include data on bentonites, or on clays and shales used for bloated lightweight products or cement.

The earliest major investigations of the clays and shales of Alberta are those of Ries and Keele (1912, 1913), Ries (1914a, 1915), and Keele (1915). Allan (1920, 1921) summarized additional information, though he made no detailed investigations of clay deposits. Worcester (1932) conducted a thorough survey of the clays and shales in the Turner Valley area, his work initiated out of concern over the wastage of natural gas in the Turner Valley oilfield; it was hoped to provide a market for the waste gas in the manufacture of clay products, if suitable clays could be found. Crockford (1951) investigated in detail the clays from the Elkwater Lake area of southeastern Alberta. Several other, less extensive reports have presented data on Alberta clays and shales.

Acknowledgments

This report was prepared intermittently over a period of several years with the participation of several staff members of the Geology Division, Alberta Research. The original compilation by P. H. Babet was revised and expanded by the senior author with assistance at times from M. E. Holter and I. J. McLaws. E. J. Seagel oversaw the final layout of tables and handled the onerous editing and proofreading chores. R. Green, D. W. Scafe and J. H. Wall critically read the manuscript.

Special thanks are due to Mrs. J. C. Checholik for her painstaking efforts in typing the lengthy tables.

CERAMIC CLAYS AND SHALES

Definitions

In ceramics, the physical properties of a clay or shale are much more relevant than the mineral or chemical composition. Accordingly, in this context the term "clay" is defined as an earthy material which becomes plastic when moistened with water, can be molded to any shape which is retained when dried, and upon firing is converted to a permanent rock-like mass. "Shale" is clay that has been consolidated and hardened by natural processes, although when ground and moistened it will in many cases become plastic. Early investigators tended to use the terms clay and shale interchangeably, their main concern being whether the material was suitable for clay products manufacture.

Properties

Clays, and their indurated rock equivalent, shales, are composed essentially of particulate hydrous alumino-silicate minerals called the clay minerals, of which there are several basic kinds each with unique physical properties.[2] For the clays used in ceramics, the significant properties are as follows:

(1) Plasticity and workability

(2) Texture

(3) Green and fired strengths

---

1 Formerly known as Research Council of Alberta.

2 Geologically, clays may be composed of many different minerals, all of comparatively fine grain size, but the clay minerals normally predominate and impart their properties to the clay rock.

(4) Drying and fired shrinkages

(5) Refractoriness and vitrification range

(6) Fired color.

Plasticity is perhaps the most important property, for without it a clay has comparatively little ceramic use. It is the property that promotes workability and enables a clay to be molded to any desired shape, which is retained when the molding force ceases. The degree of plasticity in a clay depends on several factors, including the type of clay minerals present and the fineness of grain. Clays are rendered to a plastic state (tempered) by adding the correct amount of water, most clays requiring from 20 to 40 percent of their dry weight in water to gain their ultimate plasticity.

Texture refers to the fineness and shape of particles comprising the clay. In shales or in hard clays, texture in the practical sense relates to the degree of grinding, with reference made to the size of ground fragments of clay rock rather than to the size of individual clay particles. The plasticity, strength, drying, and firing characteristics of a clay all are directly influenced by texture.

Green strengths, wet and dry, are properties of a clay that determine its resistance to the shocks and strains of handling, molding, stacking, and so on, prior to firing. The strength is due to cohesive force between the clay particles and appears to be interdependent with properties such as plasticity and texture; generally, the more plastic the clay the higher its green strength.

Fired strength is most important in clays used for structural products, as a measure of the load-bearing capacity of structural units. Generally, the harder a clay is fired the greater its strength.

Drying shrinkage results from the water film on clay particles being driven off, allowing the particles to come closer together, thus decreasing the volume. Further drying expels the water occupying pore spaces in the clay, but results in no further shrinkage. Drying shrinkage depends on the plasticity and amount of tempering water used; it commonly ranges from 1 to 12 percent, being low in the sandy clays and high in the very plastic ones. Excessive shrinkage during drying produces cracks in the ware and must be avoided; the addition of nonplastic material such as sand or "grog" (prefired clay) serves to reduce shrinkage in clay bodies.

Fired shrinkage results from particles in the clay gradually fusing and becoming welded together, causing a decrease in volume. The shrinkage may begin at a dull red heat, about the point where chemically combined water is expelled, and reaches a maximum when the clay vitrifies. The amount of shrinkage varies depending on the quantity of volatile substances present and the refractoriness of the clay.

Refractoriness or fusibility is the degree to which a clay will withstand heat without deformation. It depends on the type of clay minerals present, the spread in particle size, and the amount of fluxes in the clay. The process of fusion in most clays is a gradual one rather than an abrupt melting at some specific temperature. This is a reflection of the heterogeneous composition of most clays. The process begins with melting of the least refractory mineral grains in the clay; interactions with other grains then follow, and as the temperature is raised one mineral after another fuses until all the mineral constituents are involved. When all the grains have softened sufficiently to close up pore spaces and render the mass impervious, the fired clay is said to have reached complete vitrification, and this condition represents the point of maximum shrinkage. Further increase in temperature will only induce further softening, swelling, and finally, failure of the mass through flowage.

The *vitrification range* or firing range is the range of temperature between the point where fusion begins and the point of complete vitrification. Generally, the wider the vitrification range the better, for if it is narrow, the firing conditions become very critical and the kiln must be very closely regulated to avoid overfiring. A spread in particle size tends to widen the vitrification range.

Color of fired clay products is related both to the chemical composition of the clay and to the burning atmosphere, depending above all else on the presence or absence of iron impurities. Generally, a clay is white-burning if it contains less than 1 percent Fe_2O_3, buff-burning with 1 to 5 percent Fe_2O_3, and red-burning with more than 5 percent Fe_2O_3. However, the presence of certain other impurities, such as lime (CaO), can have a bleaching effect on the iron, thereby neutralizing its coloring effect. Fired color is a very important factor in the marketability of ceramic ware.

Classification

The properties discussed in the foregoing section form the basis for a ceramic classification of clays, the principal ceramic types of which are as follows:

(1) Kaolins or china clays
(2) Ball clays
(3) Fireclays
(4) Stoneware clays
(5) Common "brick" clays
(6) Bentonite.

Kaolins consist almost entirely of the clay mineral kaolinite. Most are derived from the weathering of feldspathic rocks and invariably contain sand and mica, impurities which normally are removed by washing. The washed or refined kaolin, also referred to as ***china clay,*** is the highest grade of any commercial clay, and the chief ingredient in chinaware and porcelain bodies. It is white or nearly so in both unfired and fired states. The plasticity is low, usually too low for the clay to be used alone in ceramics, and the refractoriness is the highest of all clays (PCE values of cone 33 to 35) owing to the high kaolinite content. During firing, the clay characteristically undergoes very gradual vitrification and shrinkage over a wide temperature range. A distinction often is made between primary (residual) and secondary (transported) kaolins; the latter are usually more plastic, stronger, and have higher shrinkage as a result of being finer grained, but the color may not be as white.

Deposits of pure kaolin are unknown in Alberta, although kaolinitic sands are fairly common in certain Upper Cretaceous nonmarine formations, some containing as much as 25 percent kaolinite as interstitial matter. Recovery of the kaolinite is not commercially feasible at present.

Ball Clays are similar to kaolins, consisting primarily of kaolinite, and burning white or nearly so. They differ mainly in having a high degree of plasticity, due to being much finer grained than the kaolins. They are almost as refractory (PCE values of cone 30 to 34), and their principal use is in kaolin-based bodies to provide plasticity and green strength; they also increase the strength and degree of vitrification of the burnt ware, as they vitrify at temperatures much below those for kaolins. Excessive drying and firing shrinkages in ball clays render them generally unsuitable for use as a complete clay body, but the high green strength makes them excellent bonding material. The raw color may range from nearly white to nearly black, depending on the amount of organic material present.

No significant deposits of ball clay are known to exist in Alberta. Some are mined in Saskatchewan, from the upper part of the Whitemud Formation in the south-central part of the province, but equivalent beds in Alberta have yielded clays at best only of stoneware grade.

Fireclays are clays that will endure high temperatures without deformation. As strictly defined, they have a PCE value not less than cone 19. The most common fireclays are basically kaolinitic in composition, but lack the high purity of the kaolins and ball clays, and they usually burn to buff and yellow colors rather than white. Two main types are recognized – the plastic fireclays and the flint clays – with several grades and kinds of each type. Plastic fireclays are moderately refractory (PCE values up to cone 30), with plasticity ranging from that of ball clays to that just sufficient to permit shaping; in general, the more plastic the clay, the less refractory it is. Flint clays, so called for their hardness and conchoidal fracture in the raw state, are highly refractory, nonplastic, low-strength clays.

Fireclays are used mainly for making firebrick, and are graded as low (PCE values of cone 19 to 26), moderate (26 to 31), and high (31+) heat-duty according to their degree of refractoriness. Deposits are known at several localities in Alberta: in the Whitemud Formation of the Cypress Hills area, in coal measures mined in the upper part of the Edmonton Group at Lake Wabamun, and in places underlying the Athabasca Oil Sands along Athabasca River north of Fort McMurray. None of the deposits has been utilized.

Stoneware Clays, although less refractory than the fireclays, are fairly refractory and are sometimes referred to as low-grade plastic fireclays. They have the property of becoming dense (vitrifying) at a relatively low burning temperature, and are used in dense-fired ware such as sewer pipe, flue liners, face brick, pottery, and stoneware. Good stoneware clays have good plasticity and strength, and low shrinkages on drying and firing – ideally 12 to 16 percent (total) at vitrification. Most will vitrify around cone 4, and will not overfire or swell until cone 10 or higher. The normal fired colors are buff to "stoneware" grey, although some burn quite dark.

The Whitemud Formation of the Cypress Hills area contains abundant deposits of stoneware clay, from which considerable amounts are quarried for use in plants at Medicine Hat and Redcliff. Stoneware clays also are found underlying the Athabasca Oil Sands in northeastern Alberta, and in a few minor deposits scattered elsewhere about the province.

Common "brick" clays are the low-grade clays used in making low-value structural ware such as brick. These include any clays which are plastic enough to be molded easily, and which will burn hard and strong at a low temperature (below cone 1), usually to a red color, without excessive cracking or warping. The mineral constitution of common "brick" clays is variable, most of them having the clay mineral illite in heterogeneous mixtures with one or more additional clay minerals plus quartz, feldspar, and mica. Invariably, the clays contain iron oxide (which accounts for the red fired color) and substantial amounts of fluxing impurities (alkalis, calcium, etc.), and are much lower in alumina than are higher grade clays. Products made from common "brick" clays include common building brick, face brick, structural and hollow block, and drain tile. For face brick, which is harder burned ware for exterior use, a better than average grade of "brick" clay approaching that of a stoneware clay is needed.

Most of the clays of potential ceramic use found in Alberta are the common "brick" variety, and include surficial clays of lacustrine and floodplain deposits and the bedrock clays of nonmarine formations. The marine shales of Alberta almost invariably are unsuitable for ceramics owing to poor plasticity, poor drying and firing characteristics, or a tendency to bloat. In the past, brick plants were quite numerous throughout the province and "brick" clays were widely quarried; presently, with the brick-making industry concentrated in two main centers, quarrying of "brick" clays is more localized – from the Oldman Formation for the Medicine Hat-Redcliff plants, and from Pleistocene lake clays for the Edmonton plant.

Bentonite is a special type of clay composed dominantly of montmorillonite, a clay mineral of extremely fine particle size which has the unique property of swelling when immersed in water. The swelling occurs to greater or lesser degrees as a function of the three-layer crystal structure of montmorillonite: where the exchangeable cation between the layers is sodium, the swelling is high (up to 15 times the volume) as water molecules can easily penetrate the interlayer spaces; where it is calcium, the swelling is low as the interlayer bond is greater. Bentonites of two basic kinds thus are distinguished – the "swelling" (high swelling) bentonites, and the "nonswelling" (low swelling) bentonites. "Fuller's earth" is a name sometimes given to nonswelling varieties that have extraordinary adsorptive properties.

The fine particle size and swelling aspects of montmorillonite are jointly responsible for a high degree of plasticity and stickiness in bentonites, properties which make them useful as plasticizers and bond clays. As a plasticizer in ceramics, the addition of 2 or 3 percent bentonite can be as effective as 10 percent ball clay in a ceramic body; however, its use in ceramics is limited by excessive drying shrinkage and low refractoriness.

Bentonite is widespread in Alberta, distributed throughout the sediments of Late Cretaceous age in the Plains region, and is particularly abundant in the Bearpaw Formation and the Edmonton Group, in which a number of seams of relatively pure bentonite are found. The bentonitic character of many of the Alberta clays and shales is in fact the reason for their unsuitability in ceramics, although pure bentonite has important industrial uses in its own right. Bentonite has been mined recently from seams in the Edmonton Group at two localities, mainly for use in foundries and in drilling muds.

General Requirements of Ceramic Bodies

The raw clay mixture used for making a ceramic product is termed the "body." Rarely can any clay be found in nature having the exact properties desired in a ceramic body, so that it has become common practice in the ceramic industry to blend two or more clays to obtain the desired properties. Each clay is selected for a certain property, and by varying the proportions of the clays a much wider range of properties, and thus of products, is possible for the raw materials at hand. Ceramic bodies fall into several main groups according to the products that are made from them, the main categories of products being as follows:

(1) Whiteware
(2) Structural products
(3) Refractory products
(4) Pottery, art ware, etc.
(5) Lightweight aggregate.

Whiteware clays are the kaolins and the ball clays, composed essentially of the clay mineral kaolinite, and of which the main requirement is a white or off-white fired color. Other essential properties include good plasticity and workability.

Structural clay products are made from a wide range of clays, mostly of the low grade type – the common "brick" clays – containing two or more kinds of clay minerals with a high proportion of fluxing impurities and quartz. The

properties desired of the raw material vary with the product and method of processing, but generally they are as follows:

(1) adequate plasticity and sufficient green strength for shaping and handling (for extruded products, the clay should flow smoothly through a die in a stiff column);

(2) low shrinkage during drying and firing to minimize cracking and warping (combined shrinkages should generally be less than 12 percent) — sand or "grog" is commonly added to control shrinkage;

(3) low temperature of vitrification and wide vitrification range for ease of firing and economical use of fuel — generally in the range of 980 to 1,200°C (1,800 to 2,200°F);

(4) suitable color after firing, and freedom from efflorescence or scum on the fired product.

Refractory clays have as their most important property the ability to withstand high temperatures without deformation. Most refractory clays have kaolinite as the dominant clay mineral, and refractoriness tends to increase with increasing content of kaolinite at the expense of impurities which tend to act as fluxes in the clay. The higher grades of refractory clay (PCE values of cone 19 or greater) are the fireclays. Stoneware clay, although widely used in pottery and in structural products (e.g., sewer pipe), is in fact a low grade refractory clay (PCE values of cone 15+) and is generally included in this category. Other properties of refractory clays vary in importance with the type of product and method of fabrication. Good plasticity, for example, is essential for extruded or hand molded products but is not so critical for dry-press firebrick. Properties such as green strength, drying characteristics, and so on, similarly are influenced by the method of fabrication.

In *pottery* clays, workability and fired color are the properties of primary importance, although the clay also must dry satisfactorily and mature at a relatively low firing temperature. Nowadays most pottery is made from blends of clays, for which the properties can be controlled within reasonable limits by proper selection and proportioning of different clays.

The clays used for *lightweight aggregate* are of the common low-fusion type, containing the clay minerals montmorillonite or illite in heterogeneous mixtures with various other components. The essential property of these clays is their ability to bloat upon rapid firing to temperatures near their fusion point, normally between 980 to 1,200°C (1,800 to 2,200°F). Expandable clays suitable for lightweight aggregate, although widespread in Alberta, are not dealt with specifically in this report beyond noting those that bloated in the course of routine ceramic (firing) tests.

Geologic Types of Deposits

All clays are essentially of secondary origin, formed as a result of weathering and breakdown of a parent rock. Deposits of the weathered product may be classified into two major types (Grimshaw, 1971): those which remained in situ, termed ***residual;*** and those which were transported and deposited away from their place of origin, termed ***sedimentary.***

Residual Deposits. Classic examples of the formation of residual clays are the weathering of granite and alteration of the feldspars to kaolin clay, and the weathering primarily by dissolution of a clayey carbonate rock to an insoluble residue of clay.[3]

No definite examples of residual clays are recognized in Alberta. Formerly, the clays in the Fort McMurray area that underlie the oil sands and rest on eroded Devonian limestones were thought to be residual clays (Carrigy, 1959, p. 36), but recent studies (Halferdahl, 1969) indicate these clays have been transported. Clays of the Whitemud Formation at one time were considered residual in part, formed in situ by weathering of a sedimentary deposit of feldspathic sand (McLearn, *in* Fraser, *et al.,* 1935). This origin recently has been disputed (Byers, 1969).

Sedimentary Deposits. Sedimentary clays, by far the most common form of clays, may be found in various types of deposits according to the mode of transportation and of deposition. The principal types are as follows (Grimshaw, 1971):

(1) Fluviatile

(2) Deltaic

(3) Lacustrine

(4) Marine

---

[3] Ideally, bentonite — formed by in situ alteration of volcanic ash — also belongs to this category, although in a ceramic context the bentonite clays are not generally regarded as relevant materials because of their unique (and for ceramics, undesirable) characteristics.

(5) Glacial

(6) Aeolian.

Fluviatile clays are deposited along the course of a river, or on the bordering plains of a river during high water; in the latter case, they may be termed ***floodplain*** clays. Most deposits are of variable composition, tend to be sandy, and are of small extent. The clays used for brickmaking in Edmonton in the early years were of this type, from Recent deposits on the banks of the North Saskatchewan River.

Deltaic sediments are deposited at the mouth of a river. Where several rivers flow collaterally into a basin, they may form a series of coalescing deltas, called a ***delta plain*** or ***an alluvial plain.*** The sediments are irregular in composition, usually quite sandy in the early stages of delta development, progressing to a characteristic lamination of fine sands and silts alternating with clays. Most of the potential ceramic clays in Alberta – clays of the nonmarine Cretaceous and Tertiary formations – are of this type. The nonmarine formations for the most part originated as alluvial plain deposits, forming vast coastal plains that bordered the western shores of ancient seas.

Lacustrine deposits are formed in freshwater lakes. They tend to be fairly uniform in composition laterally, but may vary vertically from clay to sand – typically alternating in very distinct layers that reflect short-term seasonal or weather effects upon sedimentation in the lake. Lacustrine deposits very commonly are of glacial origin, laid down in lakes formed from the meltwaters of receding continental ice sheets. Lacustrine clays of this type are widespread in Alberta and, despite limitations in their quality, have been an important source of clays for common brick manufacture in the province because of their existence at the surface where they are easily excavated.

Marine clays are deposited similarly to lacustrine clays, but in a sea or ocean and thus on a much larger scale. Deposits may be hundreds of miles in extent, and hundreds or even thousands of feet thick, with little variation in composition. Commonly, the clays have been transformed into shales and the succession contains minor sandstone interbeds. Several of Alberta's Cretaceous formations – Clearwater, Colorado, Lea Park, Bearpaw, and equivalents – are of this type, formed offshore from the alluvial plain deposits discussed above. They comprise a major portion of the bedrock stratigraphic section, but have found little use to date as a source of ceramic clays.

Glacial deposits are formed directly by glaciers and consist of a heterogeneous mixture of materials picked up during advance and left as debris after retreat of the ice. The dominant material in these deposits is clay, normally very stony and sandy, forming a mixture called ***till.*** Till is widespread over Alberta, but has little potential as ceramic raw material.

Aeolian deposits generally comprise sand, although some deposits of finer, silty clay material – apparently windborne – are known, and are termed ***loess.*** No ceramic potential has been recognized for the loess in Alberta.

CLAY AND SHALE DEPOSITS OF ALBERTA

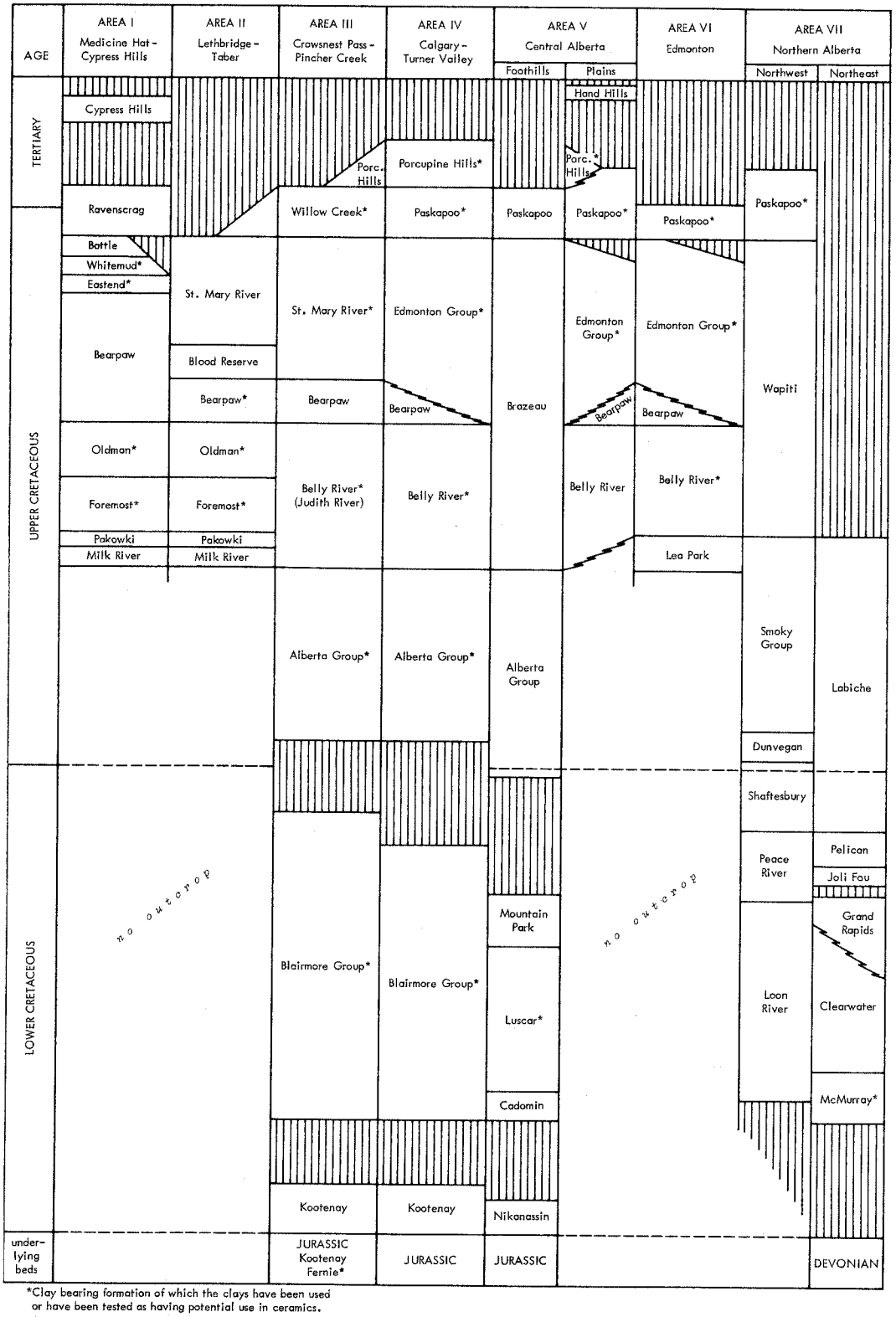
General Geology of Clay-bearing Formations

Geologically, clays fall into two basic categories, bedrock and surficial, within which they are found in a variety of geologic types of deposits as discussed in the preceding section. In figures 1 and 2, the clays of Alberta are shown in their geologic setting by respective categories, the bedrock deposits on a bedrock geology map of the province (Fig. 1) and the surficial deposits on a surficial geology base (Fig. 2).[4]

The regional geology of Alberta is discussed in many places elsewhere in current literature and need be dealt with only briefly here. Most of the province lies within the Interior Plains region and is underlain by sedimentary strata of Cretaceous and Tertiary ages, except in the lowlands marginal to the Canadian Shield in the northeast corner, where Devonian strata form the bedrock (Fig. 1). The Cretaceous and Tertiary strata comprise a succession of nonmarine sandstone and shale formations alternating with marine shale formations, the names and age relationships of which are indicated in figure 3. The beds are nearly flatlying but with a slight regional dip to the southwest, toward the mountains, that increases as the mountains are approached. It is in these strata, primarily in the nonmarine formations, that the bulk of the province's ceramic clay potential exists.

---

[4] For both of these maps, the geological base is compiled largely from published sources and is generalized to some degree in accordance with the map scale. Readers desiring greater mapping detail within selected areas are referred to Alberta Research Report 73-4, "Index to current geological, soils, and groundwater maps of Alberta" by J. D. Root (1973).



*Clay bearing formation of which the clays have been used or have been tested as having potential use in ceramics.

FIGURE 3. Nomenclature and correlation of Tertiary and Cretaceous bedrock formations in Alberta.

Faulted and folded strata that form the Rocky Mountains and Foothills range in age from Precambrian to Tertiary; the Foothills strata – dominantly sandstone and shale formations of Jurassic and Cretaceous ages – also possess some ceramic clay potential.

Over the Plains, much of the bedrock surface is covered by a mantle of surficial sediments, which may range up to several tens or even hundreds of feet in thickness. Figure 1a is an overlay contour map of drift thickness in those parts of the province where it has been mapped, showing also the main areas of bedrock outcrop in the province. Outcrops are most common along major river valleys, where erosion of the drift has exposed the underlying bedrock.

The surficial sediments for the most part are of glacial origin, deposited with the advance and retreat of the continental ice sheets during the Pleistocene epoch and varying widely in composition from fine lake clays to coarse outwash gravels (Fig. 2). Some of the clays of these deposits, particularly the glacial lake clays, have potential for use as ceramic materials.

Descriptions and Ceramic Properties

The deposits of ceramically tested clays and shales in Alberta are indicated by location in figures 1 and 2. Descriptions of the deposits and results of the ceramic tests are given in table 1 (Appendix A).

For convenience of presentation of these data, the province has been divided into seven geographical areas as outlined in figures 1 and 2, with the clay deposits of each area grouped accordingly in table 1. The division boundaries are somewhat arbitrary, based largely upon historical aspects of the clay-working industry, but to some extent also reflecting geological and geographical influences. Within each area the deposits are further grouped in table 1 into those that have been utilized by the clay-working industry and those that are undeveloped.

Many of the ceramic tests reported in table 1 were made in the early days of Alberta's history as a province, and the results must be viewed in this perspective. In some cases, the suggestions cited under "Potential Ceramic Use" may no longer be relevant to modern-day ceramic technology. Some claywares are obsolete. For clays in general, new methods of treating, handling, and processing have resulted in greater flexibility in their use and in the development of new uses. Also, in some of the deposits utilized in the past the reserves may have long since been exhausted, although the tests and descriptions still are useful in giving an indication of what may be expected for other deposits of the same formation.

Other changing factors include accessibility of deposits, economic limits in size of deposits, and thicknesses of overburden that can be handled. In the early days when transportation facilities were poorly developed, accessibility was the major factor in appraising a deposit; it is still an important consideration although not quite to the same degree. A small-sized clay deposit, which might have been adequate for the type of local operation of the early days, may be too small for economic development for the modern, large-scale operation. However, good deposits of limited extent can still be useful for working on a small scale, such as for pottery making. Finally, the ratio of strippable overburden to clay can now be much greater, with the development of modern earth-moving equipment.

Chemical Analyses

Ceramically tested clays and shales for which chemical analyses have been made are indicated in table 1 in the "Remarks" column. The results of the analyses are given in table 2 (Appendix A).

Summary

Clays and shales are widespread in Alberta, found as the dominant rock type in the Cretaceous and Tertiary bedrock strata underlying most of the Plains region and in the thick succession of Mesozoic strata of the Rocky Mountains and Foothills. Clay is present also as a major lithology of the surficial deposits covering extensive portions of the province. The deposits included in table 1, that is, all the ceramically tested deposits of the province, provide a fairly broad sampling of these clay and shale resources, and the test results thus give a fair indication of the ceramic types represented.

The bulk of the clays and shales are of the low-grade, low alumina variety – suitable for low-value structural ware at best (although even this use is limited because of drying difficulties common with the clays). Intermediate grades such as stoneware clay and fireclay are indicated in a few deposits, but high-grade clays of the type, for example, required for whiteware (kaolin, ball clay) are not in evidence.

The better grades of clays, and also the best quality of lower grade (common "brick") clays, are found mainly in the nonmarine bedrock deposits. Low-grade clays of fair to good quality are present in some surficial deposits, some of which have served admirably as a source of brick clays despite limitations in the quality. The marine shales in most deposits have deficiencies in their ceramic properties that make them generally unsuitable for use, except perhaps as "grog."

A major limitation in the quality of Alberta clays and shales is poor drying behavior, which renders much of the material unsuitable or only marginally suitable for ceramic use. This drying difficulty is due primarily to the bentonitic nature of the clays and shales, particularly in the Plains deposits, the high water absorption properties of bentonite causing excessive shrinking, cracking, and warping as the water is expelled.

Most deposits of the better grade clays tested in Alberta are located in the southeast, on the flanks of the Cypress Hills, where the Upper Cretaceous Whitemud Formation is typically represented. The Whitemud Formation, undoubtedly the most important source of clays in Western Canada, contains numerous deposits of stoneware clays in this area, and its eastward development in Saskatchewan has, in addition, fireclay and even some ball clay deposits. Other stoneware clays are indicated in a few widely scattered deposits, the most promising exposed along the Athabasca River in northeastern Alberta, directly underlying the Athabasca Oil Sands. Deposits of good quality fireclay are present in Upper Cretaceous coal seams being mined at Lake Wabamun in west-central Alberta, the deposits forming thin but extensive partings between coal seams.

THE CLAY-WORKING INDUSTRY IN ALBERTA

Historical Summary

In the early days of the ceramic industry in Alberta, clay products plants were established at numerous scattered localities throughout the province. In those days transportation facilities were poorly developed and the cost of transporting low-value claywares such as brick and tile was prohibitive, so that it was common practice for each population center to make its own, using whatever local raw materials were available. The manufacturers depended almost entirely upon demands of the local building trade for their markets, and operations tended to be haphazard and intermittent: plants frequently changed management, ownership, names, and technical procedures, and all but a very few of the operations eventually failed. In many cases, the plants were constructed before the raw material had been properly tested, and the clay subsequently proved to be unsuitable. Often the product was unsatisfactory because the clays were not burned hard enough to develop the required properties. Fire safety precautions were lax, and several plants burned down. For some plants, a raw material source would be depleted or the overburden would become too thick to be removed economically. Conditions within the industry itself — loss of markets resulting from the fluctuating demand for clay products, labor shortages (particularly during the two World Wars), lack of money during the depression — caused shutdowns or cutbacks in production from time to time. Some products — particularly the higher value ware — faced stiff competition (despite import duty protection) from goods marketed by well-established United States firms.

The consequence of all this has been that the clay-working industry in Alberta is now concentrated in two main centers, Medicine Hat — Redcliff and Edmonton. The major concentration is in the Medicine Hat — Redcliff area, where the availability of cheap natural gas and good quality raw materials (largely from the nearby Cypress Hills) has helped the industry to survive through many difficult periods since the turn of the century.

In table 3 (Appendix B), clay products plants of the past and present in Alberta are listed more or less in historical sequence for each of the seven geographical areas previously outlined. In the past, complete records of the clay plants were not kept, and for many of the plants the details regarding products, raw materials, and so on, are scanty; nevertheless, table 3 does at least provide a broad outline of the history of the clay-working industry in Alberta.

Quarries

Quarrying operations in Alberta were not closely regulated in the early days, and records were not carefully kept; thus, no complete list of the clay and shale quarries, including old abandoned workings, can be compiled. However, since 1950, under the Quarries Regulation Act the Alberta Department of Mines and Minerals has formally administered all mineral quarrying in the province, thus enabling the government to maintain records of quarrying operations, as

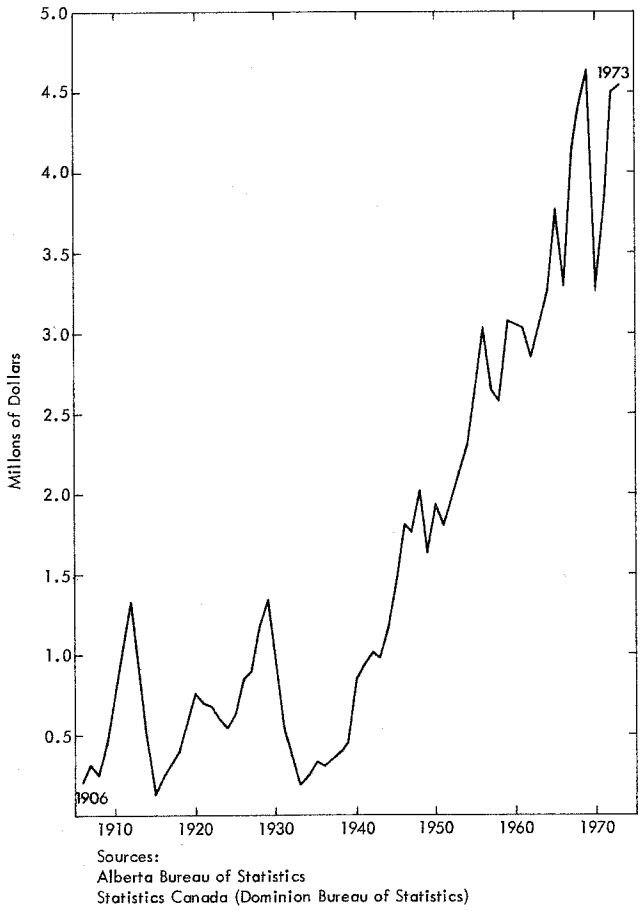


FIGURE 4. Value of clay products manufactured in Alberta for the period 1906-1973.

well as exercise control over safety aspects, and so on. Table 4 (Appendix B) lists the clay and shale quarries that have been worked in the province since 1950.[5]

Production Statistics

Production figures for clay products in Alberta are given graphically in figure 4 for the period from 1906 to 1973. A comparative analysis of the figures is difficult to make due to changing methods of reporting the statistics. Those reported for the early days represent a summation of the production of brick, hollow block, structural tile, sewer pipe, firebrick, and pottery, but for the years following 1953 the figures are impossible to separate for specific products and may include additional commodities not dealt with in this report, such as bentonite and lightweight aggregate.

Nevertheless, the graph of figure 4 does indicate the general growth trend in the clay products industry. A substantial decrease in production is noted for the years during World War 1 (1914-18), caused by the lack of markets and a shortage of labor. Another notable decrease for the several years following 1929 was partly a result of the Great Depression, but also partly a result of the gradual substitution of steel and reinforced concrete for structural clay products in the construction industry.

In 1973, the production of clay products in Alberta was valued at $4.6 millions.

SELECTED BIBLIOGRAPHY

ALBERTA BUREAU OF STATISTICS (1947, 1959, 1963, 1967, 1970, 1972): Alberta Trade Indexes.

_____ (1950, 1954): Facts and Figures, Alberta.

_____ (1964-1972): Annual Reviews of Business Conditions, Alberta.

ALBERTA DEPARTMENT OF LANDS AND MINES, MINES BRANCH (1934-1948): Annual Reports.

ALBERTA DEPARTMENT OF MINES AND MINERALS, MINES DIVISION (1949-1971): Annual Reports.

ALLAN, J. A. (1920): First annual report on the mineral resources of Alberta; Sci. and Ind. Res. Coun. Alberta, Rept. 1, p. 28-45.

_____ (1921): Second annual report on the mineral resources of Alberta; Sci. and Ind. Res. Coun. Alberta, Rept. 2, p. 25-35.

_____ (1935): Mineral production in Alberta 1887-1934; Thirteenth annual report, Res. Coun. Alberta, Rept. 28, p. 20-22.

ALLAN, J. A. and J. L. CARR (1946): Geology and coal occurrences of Wapiti-Cutbank area, Alberta; Res. Coun. Alberta, Rept. 48, p. 41-3.

5 The list may not be complete, because in 1961 the Clay and Marl Act was passed in the Alberta Legislature, declaring clay and marl to be the property of the surface land owner. Quarrying of these materials on private lands thus ceased to be regulated by the government, and subsequent new clay pits (if any) are not necessarily recorded. This act does not apply to ***shale.***

BRADY, J. G. (1962): The effect of the mineralogical composition of Whitemud Formation clays on their utilization; Canada Dept. of Mines, Mines Branch, Res. Rept. R99, 53 pages.

---------- (1961): The nature and properties of some western Canada clays; Canada Dept. Mines, Mines Branch, Tech. Bull. TB21, 33 pages.

BYERS, P. N. (1969): Mineralogy and origin of the upper Eastend and Whitemud Formations of south-central and southwestern Saskatchewan and southeastern Alberta; Can. Jour. Earth Sciences, Vol. 6, p. 317-34.

CANADA DEPARTMENT OF MINES, MINES BRANCH (1906-1920): Annual Reports on the Mineral Production of Canada; Ottawa.

---------- (1925a): Investigations in ceramics and road materials, 1923; Rept. 619, p. 5.

---------- (1925b): Investigations in ceramics and road materials, 1924; Rept. 645, p. 4, 5.

CANADA DEPARTMENT OF MINES AND TECHNICAL SURVEYS, MINERAL RESOURCES DIVISION (1950): Manufacturers of clay products in Canada; Operators List 6-3.

---------- (1958-1967): Ceramic plants in Canada; Operators List 6.

CARRIGY, M. A. (1959): Geology of the McMurray Formation, Pt. 3 — General geology of the McMurray area; Res. Coun. Alberta Mem. 1, 130 pages.

CROCKFORD, M. B. B. (1947): Preliminary report on ceramic importance of clay and shale deposits in Alberta; Res. Coun. Alberta, Mimeo. Circ. 3, 20 pages.

---------- (1951): Clay deposits of Elkwater Lake area, Alberta; Res. Coun. Alberta, Rept. 61, 102 pages.

DOMINION BUREAU OF STATISTICS (1920, 1933, 1961, 1963-1964): Canada Year Books.

---------- (1960): The clay products industry; Lists 44-206, 44-215, 44-216.

ELLS, S. C. (1915): Notes on clay deposits near McMurray, Alberta; Canada Dept. Mines, Mines Branch, No. 336, Bull. 10, 15 pages.

---------- (1926): Bituminous sands of northern Alberta; Canada Dept. Mines, Mines Branch, Rept. 632, p. 9-11.

FRASER, F. J., F. H. McLEARN, L. S. RUSSELL, P. S. WARREN, and R. T. D. WICKENDEN (1935): Geology of southern Saskatchewan, Chapt. 7 — Origin of the Whitemud sediments, by F. H. McLearn; Geol. Surv. Canada Mem. 176, p. 104-11.

FRECHETTE, H. and J. G. PHILLIPS (1929): Investigations in ceramics and road materials, 1927; Canada Dept. Mines, Mines Branch, Rept. 697, p. 4-16.

GRIMSHAW, R. W. (1971): The chemistry and physics of clays; John Wiley and Sons Inc., New York, 4th ed., 1024 pages.

HALFERDAHL, L. B. (1969): Composition and ceramic properties of some clays from northeastern Alberta; Res. Coun. Alberta, Rept. 69-3, 24 pages.

HUME, G. S. (1924): Clay deposits on Athabaska River, Alberta; Geol. Surv. Canada Summ. Rept. 1923, Pt. B, p. 16B-20B.

KEELE, J. (1911): Geol. Surv. Canada Summ. Rept., Sessional Paper 26, p. 233-239.

---------- (1915): Clay and shale deposits of the western provinces; Geol. Surv. Canada Mem. 66, 74 pages.

LEACH, W. W. (1914): Blairmore, Alberta; Geol. Surv. Canada Summ. Rept. 1912, p. 234 and Map 107A.

LINDOE, L. O. (1965): Ceramic clays of the Cypress Hills; ***in*** 15th Ann. Field Conf. Guidebook, Alberta Soc. Petroleum Geol. Part 1, p. 210-225.

MacKENZIE, J. D. (1914): South Fork coal area, Oldman River, Alberta; Geol. Surv. Canada Summ. Rept. 1912, p. 245.

PHILLIPS, J. G. (1931): Investigations in ceramics and road materials; Canada Dept. of Mines, Mines Branch, Rept. 722, p. 46-52.

---------- (1938): Improving the properties of clays and shales; Canada Dept. of Mines, Mines Branch, Rept. 793, 39 pages.

RIES, H. (1914a): Clay and shale deposits of the western provinces; Geol. Surv. Canada, Mem. 47, Part III, 73 pages.

---------- (1914b): Clay investigations in western Canada; Geol. Surv. Canada Summ. Rept. 1912, p. 230-231.

---------- (1915): Clay and shale deposits of the western provinces; Geol. Surv. Canada, Mem. 65, Part IV, 83 pages.

RIES, H. and J. KEELE (1912): Preliminary report on the clay and shale deposits of the western provinces; Geol. Surv. Canada, Mem. 24-E, 231 pages.

---------- (1913): Report on the clay and shale deposits of the western provinces; Geol. Surv. Canada, Mem. 25, Part II, 105 pages.

RUSSELL, L. S. and R. W. LANDES (1940): Geology of the southern Alberta plains; Geol. Surv. Canada, Mem. 221 , 223 pages.

STEWART, J. S. (1919): Geology of the disturbed belt of southwestern Alberta; Geol. Surv. Canada, Mem. 112.

WAIT, F. G. (1909): Report of analyses; Canada Dept. Mines, Mines Branch, Rept. 59, p. 112-113.

WORCESTER, W. G. (1947): Preliminary tests on clay sample no. 417, Camrose Collieries; Res. Coun. Alberta, unpublished report.

---------- (1932): The clay and shale resources of Turner Valley and nearby districts; Canada Dept. Mines, Mines Branch, Rept. 729, 126 pages.

APPENDIX A

PROPERTIES OF ALBERTA CLAYS AND SHALES

EXPLANATORY NOTES TO ACCOMPANY TABLE 1

Location of Deposit

The legal location is given as completely as possible from the information available. A brief descriptive location also is included.

Group or Formation

The geologic rock unit from which the materials tested were sampled. In cases where the stratigraphic terminology has been changed since the date of an early reference, the rock unit name in current usage is given.

Description

Brief lithologic description of the clay or shale material in its natural setting.

Unfired Characteristics

The results of ceramic tests are summarized from the original reference, in which all tests for different clays within a single deposit are detailed separately. For this compilation clays of the same deposit that display closely similar ceramic properties are combined as a unit, and the ***range*** of properties of the clay unit is given.

Tempering Water

Percent by weight of water added to the dry clay to develop its best working properties. Also called water of plasticity.

Working Properties

Ease with which a tempered clay body may be shaped, molded, extruded, etc.

Drying Behavior

Extent to which the clay cracks on drying. "Slow" drying refers to drying in standing air at normal room temperature, "rapid" drying to drying in circulated air heated to approximately 80°C (176°F).

Drying Shrinkage

Percent decrease in length of a molded clay specimen on drying.

Pyrometric Cone Equivalent (PCE)

Neither a fired nor an unfired property, but a measure of the clay's refractoriness. The PCE is the cone number at which a heated specimen of the clay deforms in the prescribed manner under a standard set of test conditions.

Fired Characteristics

These are the fired properties observed for the given cone number or ***range*** of cone numbers. Generally, where a range of cone numbers is given, that range approximates the ***vitrification range*** of the clay, and was selected for this presentation from a sequence of test firings reported in the original reference; that sequence in many cases will have also included test firings at cones well above or below the vitrification range, but these irrelevant data have been excluded. In most cases, the gradation in properties within the

given range is fairly linear. In a few cases where only a single cone number is given this is usually the highest cone of the sequence, which nevertheless fell short of vitrification. Complete details on the results of firing tests can be obtained in the reference listed.

Cone Number

A number relating to the temperature and heating rate at which a clay specimen is fired (see Appendix C). It is the number of a cone in a series of standard pyrometric cones supplied commercially for measuring and recording kiln temperatures and heat-work done.

Fired Shrinkage

Percent decrease in length of the dried clay specimen on firing.

Absorption:

A practical measure of the porosity, or volume percentage of "open" pore space in a fired clay product. It is determined by soaking the specimen in water and weighing the quantity of water absorbed — expressed as a percentage of the dry, bulk weight.

Hardness

Stated relative to the hardness of steel and measured by scratching a fired test specimen with a steel point. It is recorded as "steel hard" if the specimen remained unscratched, "very hard" if it could just barely be scratched, or "hard," "fairly hard," "fairly soft," or "soft" depending on how easily it could be scratched.

Potential Ceramic Use

Ceramic products for which the clay might be suitable, as suggested in the original reference.

Remarks

Where a deposit was utilized; chemical analyses available; overburden thickness if known; and other miscellaneous information pertaining to past, present, or possible future development of the deposit.

Reference(s)

Short form of reference as listed in the selected bibliography. RCA files refers to unpublished information in the economic mineral files of Alberta Research.

Table 1. Summary Results of Ceramic Tests of Clays and Shales in Alberta

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA I (MEDICINE HAT-CYPRESS HILLS)							
	Utilized Deposits							
1.	SE 35 11 5 W4 (south of Dunmore)	Oldman	clay, light grey to buff; about 70 ft thick, upper 10 ft sandy	-	-	-	-	-
2.	- 3 12 5 W4 (1½ miles south of Dunmore)	Oldman ?	(1) clay, black, carbonaceous; 6 ft bed	21	very plastic, sticky	"does not dry well"	8.5	15
			(2) clay, light yellowish grey, massive	22	very plastic, sticky, poor workability	cracks in slow drying	7	4
			(3) clay, brown, buff, grey, sandy; beds highly lenticular, up to 10 ft thick	20-24	plastic, sticky, gritty	cracks in drying	5.0-8.0	3-5
3.	- 31? 12 5 W4	Pleistocene	clay (gumbo), mixed with silty clay and sand lenses	-	stiff, poor workability	cracks in drying	"high"?	1+
4.	- 8 13 6 W4 (clay pit at Redcliff Brick Co., ½ mile southwest of CPR mainline station)	Oldman?	shale, green	19	good plasticity	cracks in rapid drying	7.2	5
5.	- 8 13 6 W4 (clay pit at Redcliff in narrow coulee)	Oldman ?	(1) shale, yellow; 10 ft - 12 ft bed	30	very plastic, sticky	cracks badly in drying	11	5
			(2) shale, dark grey; 6 ft bed	43	very sticky and plastic, difficult to work	cracks badly in drying	11.6	5
			(3) shale, light buff, sandy; 4 ft bed	28	plastic, rather short, springy	will not stand fast drying	4.4	3
	Undeveloped Deposits							
6.	8 5 7 1 W4 (2½ miles south of Fox P.O.)	Whitemud	clay, greenish grey to buff, calcareous; beds up to 5 ft thick of a 24 ft succession	22.5-26.5	fairly to very plastic, generally works well	cracks in rapid drying	7.3-9.6	9-13
7.	9 5 7 1 W4 (about 2½ miles south of Fox P.O.)	Whitemud	(1) clay, greyish green, silty, calcareous; 1 ft bed	25.2	very plastic, works well	cracks in rapid drying	8.8	12
			(2) clay, greenish brown, silty; 4½ ft bed	34.4	very plastic, works fairly well, tough	cracks very badly	12.1	26
			(3) clay, greenish grey; 1½ ft bed	30.5	highly plastic, works well	cracks in rapid drying	8.6	13
8.	6 18 7 2 W4 (on Thelma Creek, about 2 miles south of Thelma P.O.)	Whitemud	(1) shale, dark brown; two 1½ ft beds	35.0-36.2	very plastic, works well, tough	cracks badly in rapid drying	12.0-12.8	28-30
			(2) clay, grey, bentonitic; 1 ft bed	30.0	very plastic, sticky, works well	cracks badly in rapid drying	11.0	15
9.	12 18 7 2 W4 (on Thelma Creek, about 2 miles south of Thelma P.O.)	Whitemud	(1) clay, grey; 1 ft and 4 ft beds	26.2-31.8	good to high plasticity, works well	cracks badly in rapid drying	9.7-11.0	16-18
			(2) clay, cream, bentonitic; 2½ ft and 4 ft beds	26.2-26.6	good to high plasticity, works well	cracks badly in rapid drying	9.0-9.3	14½-15
			(3) shale, dark brown; 2½ ft bed	31.0	very plastic, works well	cracks very badly in rapid drying	11.2	27
			(4) clay, grey, silty, bentonitic; 3 ft bed	26.5	very plastic, slightly sticky, works fairly well	cracks very badly in rapid drying	9.3	13

[1] Cone numbers given in this column refer either to the European standard Seger series or the U.S. standard Orton series of pyrometric cones, which differ slightly in fusion temperatures as shown in Appendix C. Generally, for the older references -- those of 1926 or earlier -- the cone numbers given are Seger cones, whereas for the newer references they are Orton cones.

[2] In this column the abbreviation s.s. means "slightly swelled." "Shrinkage" refers to linear shrinkage.

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.[1]	Fired Shrinkage (%)[2]	Absorption (%)	Color	Hardness	Other			
-	-	-	-	-	-	pottery	Used in pottery works in Medicine Hat before 1940	Russell and Landes (1940), p. 71.
03-5	s.s.-3.6	6.6-2.3	pale red - grey	steel hard	vitrified below cone 9	brick	Used for brick-making by Alberta Clay Products Company in 1910-11	Ries and Keele (1912), p. 69-73; ——— (1913), p. 30-32, 86, 89, 93, 98.
010-1	0.0-3.3	10.1-2.3	light red	hard - steel hard	vitrified below cone 3	dry-press brick	Chemical analysis No. 1; used for brick-making by Alberta Clay Products Company in 1910-11	
03-3	0.0-4.6	13.2-1.5	red	steel hard	-	brick, sewer pipe (did not warp in roofing tile test)	Used for brick-making by Alberta Clay Products Company in 1910-11	
010	-	-	red	steel hard	-	brick	Used for brick-making by Medicine Hat Brick Company in 1913	Keele (1915), p. 31, 32.
03-1	0.4-3.0	8.9-3.4	red	steel hard	vitrified @ cone 3	possibly drain tile and fire proofing	"Run-of-bank" material, used for wire-cut brick about 1910 by Redcliff Brick Co.	Ries and Keele (1912 p. 65, 66.
010-1	s.s.-5.0	10.8-1.3	dark red	hard - steel hard	-	common brick, possibly sewer pipe if treated	Used for dry-press brick about 1910 by Redcliff Brick Co.	Ries and Keele (1912 p. 64-68.
010-1	0.6-0.0	10.8-3.4	light red - brown	steel hard	-	doubtful value	Not included with other clays for brick-making	
03-1	s.s.-1.3	22.3-14.0	pale red	-	vitrified @ cone 1	doubtful value, possibly common brick	Not included with other clays for brick-making; underlies 5 ft coal seam	
06-1	0.3-7.3	11.3-0.1	buff, red (scummed badly)	hard - steel hard	-	common brick, tile, possibly dry-press brick, stoneware		Crockford (1951), p. 46, 87, 88.
03-1	3.0-1.0	6.8-1.9	salmon	fairly soft - steel hard	-	brick and tile, possibly stoneware		Crockford (1951), p. 47, 89.
06-10	1.7-6.7	11.1-1.0	buff - dark grey	hard - steel hard	-	semi-fireclay		
06-1	1.0-6.7	12.9-0.0	light - dark buff	fairly hard - steel hard	warped on firing	structural products		
06-10	3.0-7.7	13.2-2.8	buff, salmon	hard - steel hard	-	semi-fireclay		Crockford (1951), p. 45, 46, 86.
03-1	5.3-7.3	4.2-1.4	buff	very hard - steel hard	-	early maturing-type stoneware clay, requiring blending		
1-6	1.4-5.3	11.0-5.1	buff	very hard	vitrified near cone 10	tender drying stoneware	Stripping ratio 1:1	Crockford (1951), p. 45, 84.
06-1	0.7-5.7	13.8-2.5	buff	fairly hard - steel hard	little further vitrification between cones 1 and 6	structural products - face brick, tile, possibly sewer pipe		
03-6	4.3-6.7	9.5-6.0	buff	hard - very hard	-	semi-fireclay		
03-1	4.0-6.0	4.8-0.6	salmon	very hard - steel hard	vitrified @ cone 6	structural products, possibly sewer pipe		

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA I (continued)							
10.	8 31 7 3 W4 (east side Medicine Lodge coulee)	Whitemud	shale, white and green, siliceous, kaolinitic, silty; 11 ft succession	-	fair plasticity, sticky, slightly short	dries safely	4.2-6.3	-
		Eastend	shale, green and grey; 1 ft and two 2½ ft beds	-	good plasticity, somewhat sticky	cracks in slow drying	6.3-8.3	-
11.	15 31 7 3 W4 (high on east side Medicine Lodge coulee)	Whitemud	(1) shale, light grey; 1 ft bed	25.0	good plasticity, works well, slightly tough	cracks badly in rapid drying	7.6	14.5
			(2) shale, dark grey to brown, bentonitic; 1 ft bed	26.7	very plastic, works fairly well, sticky, slightly gritty	cracks very badly in rapid drying	8.8	28
12.	16 31 7 3 W4 (high on east side Medicine Lodge coulee)	Whitemud	(1) shale, greyish and brownish green, silty; 13½ ft succession	25.0	very plastic, works fairly well, slightly gritty	cracks badly in rapid drying	7.3-7.5	14-15
			(2) clay, light grey, sandy; 4½ ft bed	22.0	fairly plastic, works well	cracks in rapid drying	6.4	18
13.	2 32 7 3 W4 (east side Medicine Lodge coulee)	Whitemud	shale, light buff, silty, calcareous; 1½ ft bed	26.0	rather short, works fairly well	dries safely	6.2	12
14.	11 32 7 3 W4 (east side Medicine Lodge coulee)	Whitemud	clay, cream, slightly silty; 9½ ft succession	26.8	very plastic, slightly sticky, works fairly well	cracks badly in rapid drying	9.2	16
15.	8 34 7 3 W4 (east side Medicine Lodge coulee)	Ravenscrag	(1) clay, light grey, calcareous, bentonitic; 2 ft + bed	38.7	very plastic, sticky	cracks in slow drying	14.0	4
			(2) clay, grey buff, sandy, calcareous; 1½ ft bed	25.0	very short, poor workability	safe in rapid drying	6.7	14
16.	16 24 7 4 W4 (1½ miles southeast of Eagle Butte P.O.)	Whitemud	(1) clay, light grey, calcareous; 2 ft bed	26.2	good plasticity, works well	cracks badly in rapid drying	9.2	16
			(2) clay, brownish green, calcareous, bentonitic; 2 ft bed	31.2	very plastic, sticky	cracks in slow drying	12.0	11
17.	1 25 7 4 W4 (about 1½ miles southeast of Eagle Butte P.O.)	Whitemud	(1) clay, light grey and cream, slightly bentonitic; 5½ ft, 3 ft and three 2 ft beds	23.5-30.9	very plastic, slightly sticky, works fairly well	cracks badly in rapid drying	8.7-12.5	14-18
			(2) shale, dark grey to brown, slightly silty, tough; 4 ft bed	36.8	very plastic, works fairly well	cracks very badly in rapid drying	14.8	20+
			(3) clay, very sandy; 1 ft bed	19.9	very short, sandy, poor workability	dries safely	2.5	15
			(4) shale, brownish green, slightly silty; 5 ft bed	29.3	good plasticity, works well	cracks badly in rapid drying	9.7	11
18.	6 25 7 4 W4 (about 1 mile south of Eagle Butte P.O.)	Whitemud	clay, grey, brown; 3½ ft and 3 ft beds	26.5-30.0	good plasticity, works well	cracks badly in drying	8.4-11.7	15-16
19.	12 25 7 4 W4 (1 mile south of Eagle Butte P.O.)	Whitemud	clay, pale grey; 4 ft bed	25.3	good plasticity, works well	cracks slightly in rapid drying	6.4	14
20.	14 35 7 4 W4 (½ mile northwest of Eagle Butte P.O.)	Whitemud	(1) shale, brownish green to greenish grey; 2½ ft bed	30.0	very plastic, slightly sticky	cracks very badly in drying	10.0	9
			(2) shale, brown to green, silty, bentonitic; 7 ft and 2½ ft beds	22.8-23.1	varies from sticky and very plastic to slightly gritty and fairly plastic, works fairly well	cracks badly in rapid drying	7.7-7.9	9-11
21.	- 13 8 1 W4 (Graburn Gap, Cypress Hills)	Whitemud	(1) clay, white to pink, non-calcareous	25.3-25.9	good plasticity, works well	cracks slightly in rapid drying	7.3	17½-19
			(2) clay, cream	22.8	good plasticity, works well	safe in rapid drying	6.5	18+
			(3) clay, black, non-calcareous	32.5-36.9	very plastic, sticky and tough, works fairly well	cracks badly in rapid and slow drying	7.8-12.1	13-16
22.	5 13 8 1 W4 (on Graburn Creek, about 1 mile west of Alta.-Sask. boundary)	Whitemud	clay, black, grey, and white, non-calcareous; 4 ft and 2 ft beds	25.3-26.5	very plastic, tough, works fairly well, tendency to stick	cracks badly in rapid drying	7.4-8.8	19

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
02-5	2.1-6.3	-	buff - dark red	-	overfired @ cone 5	possibly dry-press brick		Crockford (1951), p. 41, 76.
02-5	4.2-8.3	-	light - dark red	-	overfired @ cone 5	possibly dry-press brick		
06-6	0.0-6.3	14.9-1.2	buff	fairly hard - steel hard	-	face brick, possibly sewer pipe and flue lining	Overburden 36 ft	Crockford (1951), p. 39, 40, 73.
03-10	3.4-4.4	9.8-4.2	dark cream - grey	hard - steel hard	-	semi-fireclay		
06-6	0.6-6.0	11.8-0.1	light salmon - brown	hard - steel hard	-	face brick, possibly sewer pipe and flue lining	Overburden 36 ft	Crockford (1951), p. 40, 41, 74, 75.
6-10	1.3-4.5	9.4-3.0	buff - greyish buff	fairly hard - very hard	-	semi-fireclay, possibly stoneware clay if blended to correct drying defects		
6-10	3.4-4.3	9.2-1.3	buff - grey (slightly scummed @ cone 6)	hard - vitrified	-	structural products; might take salt glaze if blended		Crockford (1951), p. 42, 77.
1-10	0.8-?	11.8-0.3	salmon - grey	fairly hard - vitrified	slightly warped	possibly dry-pressed bricks; might take salt glaze; impure stoneware-type clay	Overburden 62 ft	Crockford (1951), p. 41, 42, 77.
06-1	1.5-1.7	12.7-11.0	salmon, pink	hard	cracked on firing	if (1) and (2) blended, possibly structural clay products		Crockford (1951), p. 44, 45, 82, 83.
6-10	2.2-6.9	11.6-1.2	salmon - brown	fairly soft - vitrified	-			
03-6	6.0-4.7	6.2-2.4	buff	hard - steel hard	-	possibly structural products		Crockford (1951), p. 43, 79.
06-1	0.6-5.3	10.4-0.8	salmon - buff	hard - steel hard	warped on firing @ cone 1	possibly dry-press brick		
03-6	1.6-5.8	9.6-0.3	buff - salmon	hard - steel hard	-	tender-drying stoneware-type clay; possibly dry-press brick and quarry tile	Overburden 16½ ft	Crockford (1951), p. 44, 80.
06-1	3.3-7.3	11.1-1.9	buff - salmon	hard - steel hard	cracked on firing	doubtful value		
6-10	0.7-2.7	12.0-6.6	salmon grey	fairly soft - hard	-	no value alone, possible use in blending		
08-03	0.0-7.5	12.5-0.0	salmon	fairly hard - vitrified	-	possibly structural products (short firing range)		
03-1	1.8-5.3	10.5-5.0	salmon	fairly hard - very hard	-	dry-press brick, possibly stoneware if blended	Overburden 20 ft	Crockford (1951), p. 43, 78.
06-1	0.7-8.0	14.1-0.0	dark buff	fairly hard - steel hard	vitrified @ cone 1	stoneware clay	Clay bed is in slump block	Crockford (1951), p. 42, 43, 78.
08-03	0.0-7.4	13.1-0.2	salmon - brownish red	fairly hard - steel hard	nearly vitrified @ cone 03	possibly structural products	Overburden 21 ft	Crockford (1951), p. 36, 67.
03-1	2.2-5.7	6.6-1.2	red - dark red	very hard - steel hard	vitrified near cone 1	possibly structural products		
04-1	1.0-4.7	12.7-5.3	cream - buff	fairly soft - very hard	-	probably salt glazed sewer pipe, brick and tile if cracking in drying can be prevented, possibly stoneware		R.C.A. files (1948-49).
1-10	2.7-4.7	7.7-1.6	cream - light grey	hard - steel hard	vitrified @ cone 10	clean burning stoneware clay		
04-1	0.7-4.5	12.0-1.6	salmon buff - brown	hard - steel hard	cracked on firing	doubtful value owing to poor drying properties		
04-1	1.2-4.0	12.1-5.4	buff	fairly hard - very hard	-	common brick, possibly stoneware, might take salt glaze	Possibly in slump block	Crockford (1951), p. 27, 28, 49.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA I (continued)							
23.	5 23 8 1 W4 (north bank Battle Creek, about 2 miles west of Alta.-Sask. boundary)	Whitemud	(1) clay, cream, calcareous, silty; 7 ft bed	26.0	fairly plastic, works well, gritty	dries safely	7.2	15
			(2) clay, buff, bentonitic; 1 ft bed	23.7	very plastic, tough, works fairly well	cracks in slow drying	8.4	10
			(3) clay, cream, silty; 1½ ft bed	26.2	good plasticity, works well	cracks in rapid drying	9.2	14
			(4) clay, cream, silty, bentonitic; 5½ ft bed	28.2	very plastic, sticky, works fairly well, gritty	cracks very badly in rapid drying	10.3	11
24.	2 26 8 1 W4 (in Graburn gap)	Whitemud	shale, chocolate brown	31.5	very plastic, tough, works well	cracks very badly in rapid drying	11.0	26½
25.	5 26 8 1 W4 (about ½ mile west of Graburn gap)	Whitemud	(1) shale, light green, sandy, bentonitic; 3½ ft bed	32.8	very plastic, sticky, gritty	cracks badly in slow drying	11.6	11
			(2) clay, cream, slightly silty; 2 ft bed	28.0	good plasticity, works well, slightly gritty	cracks in rapid drying	9.1	14
			(3) clay, cream, very silty; 2½ ft bed	15.0	low plasticity, gritty, works fairly well	dries safely	5.8	15
26.	15 30 8 1 W4 (about 4 miles west of Graburn gap)	Eastend	(1) clay, light grey, very calcareous, slightly silty	30.9	good plasticity, works well	dries safely	8.2	3
			(2) shale, green, slightly sandy, bentonitic; 2 ft bed	29.0	highly plastic, sticky, works fairly well	cracks badly in rapid drying	10.2	9
27.	7 18 8 2 W4 (road cut southeast of Elkwater Lake, near top of hill)	Ravenscrag	clay, light grey, non-calcareous; 20 ft + succession	31.5	good plasticity, works well	cracks badly in rapid drying and slow drying	9.2	14½
28.	2 6 8 3 W4 (high on east side Medicine Lodge coulee)	Whitemud	(1) clay, light grey and brownish buff, slightly bentonitic; 5½ ft bed	24.1-25.0	very plastic, works fairly well, tough	cracks badly in rapid drying	7.5-8.6	13
			(2) clay, cream, very silty; 10½ ft bed	21.5	fairly short, works fairly well	dries safely	5.5	15
			(3) clay, dark brown; 1 ft bed	28.1	highly plastic, works fairly well, tough	cracks very badly in rapid drying	10.0	16
			(4) clay, pale grey, very silty, slightly calcareous; 4 ft bed	23.4	fairly plastic, works well	dries safely	8.3	13½
			(5) clay, light grey; 3 ft bed	31.2	very plastic, works fairly well	cracks very badly in rapid drying	10.3	12
29.	2 6 8 3 W4 (high on east side Medicine Lodge coulee, ⅛ mile south of deposit above)	Whitemud	shale, brownish green, silty; 9 ft succession	23.1	good plasticity, works well, gritty	cracks in rapid drying	7.9	14½
30.	1 7 8 3 W4 (1½ miles south of Fly Lake)	Whitemud	clay, light grey and white, silty, kaolinitic; 10 ft succession	-	fair plasticity, short	favorable	6.3	-
31.	2 9 8 3 W4 (near top of Cypress Hills, at base of north-facing escarpment)	Ravenscrag	clay, light grey, cream, very calcareous; 2½ ft bed	22.8	slightly tough, works well	cracks very badly in rapid drying	9.3	2
32.	1 14 8 3 W4 (road cut, top of plateau, south of Elkwater Lake)	Ravenscrag	clay, maroon, green, slightly bentonitic; 13 ft succession	26	very plastic, works well	cracks badly in rapid drying	11.0	14
33.	2 14 8 3 W4 (road cut south of Elkwater Lake, near top of Cypress Hills, ⅛ mile southwest of deposit above)	Ravenscrag	shale, greyish green, silty, very calcareous; 6 ft succession	24.2	good plasticity, works well	cracks badly in rapid drying	8.7	3½

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
6-10	1.7-6.0	9.3-1.1	light buff - grey	fairly hard - steel hard	overfired @ cone 10	good for blending with underlying clays		Crockford (1951), p. 28, 50.
06-1	0.3-4.7	10.7-0.2	salmon - dark red	fairly hard - steel hard	-	press brick and quarry tile		
03-1	2.0-4.0	8.4-3.9	buff	fairly hard - very hard	-	face brick, will possibly take a salt glaze		
06-1	0.3-5.7	11.5-0.4	salmon - brownish red	fairly hard - steel hard	-	face brick and tile		
06-10	2.3-8.3	13.7-1.1	buff - grey brown	hard - steel hard	-	semi-fireclay	Clay beds distorted due to slumping or ice thrusting	Crockford (1951), p. 28, 29, 51.
06-1	1.0-5.3	11.1-2.4	salmon - brownish red	fairly hard - steel hard	cracked badly on firing	possibly brick and tile if blended with (2) and (3)	Overburden 45 ft	Crockford (1951), p. 29, 52.
03-6	4.3-7.3	7.0-0.8	buff	hard - steel hard	-	stoneware type, improved by blending with (3)		
6-10	2.4-7.5	10.7-1.5	light buff - grey	fairly hard - steel hard	-			
03-1	3.3-10.0	15.8-0.1	salmon - buff	fairly hard - vitrified	overfired @ cone 1	unsuitable owing to very short firing range		Crockford (1951), p. 29, 53.
03-6	2.7-6.3	7.0-1.9	dark red	hard - steel hard	fired dense @ cone 1	face brick if dried slowly		
04-1	3.3-7.3	10.8-1.3	salmon - fair red	hard - steel hard	-	doubtful value owing to poor drying characteristics	Clay deposit is in slump block	Crockford (1951), p. 30, 54.
06-1	1.0-5.3	11.6-0.8	salmon - fair red	hard - steel hard	-	face brick		Crockford (1951), p. 38, 39, 70, 71
6-10	1.0-4.5	10.4-3.4	pinkish buff	fairly soft - very hard	-	for blending to assist drying properties of other clays		
06-10	1.0-4.7	11.9-2.4	salmon buff - brown	hard - steel hard	-	building tile and face brick		
03-1	2.0-3.1	8.7-6.3	salmon buff - grey	fairly hard - hard	vitrified @ cone 10, no further shrinkage between cones 1 and 10	stoneware		
06-03	1.3-3.7	10.1-0.2	light red - brownish red (badly scummed above cone 03)	hard - steel hard	little further vitrification between cones 03 and 1	building brick and tile, possibly certain types of stoneware		
06-6	0.0-4.4	12.0-4.2	salmon - red	fairly hard - very hard	-	face brick		Crockford (1951), p. 39, 72.
02-6	0.0-4.2	-	light buff	-	-	possibly sewer pipe and fire-proofing materials if blended with more plastic clays		Crockford (1951), p. 38, 69.
03-1	0.6-?	11.7-7.0	salmon buff	hard - very hard	warped on firing @ cone 1	no value - firing range too short	Overburden 54 ft	Crockford (1951), p. 31, 55.
06-1	1.0-5.4	10.4-0.9	brownish red	hard - steel hard	nearly vitrified @ cone 1	possibly face brick and quarry tile by dry-press process		Crockford (1951), p. 30, 54.
1	2.0	2.5	light buff	fairly hard	warped on firing	no value - firing range too short		Crockford (1951), p. 30, 55.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA I (continued)							
34.	16 17 8 3 W4 (about ½ mile east of Fly Lake)		(1) clay, light grey, sandy; 3½ ft bed	17	fairly plastic, gritty, works well	cracks slightly in rapid drying	9.0	20
			(2) clay, tan, slightly sandy; 6 ft bed	23	highly plastic, tough, slightly gritty	cracks badly in rapid drying	8.7	19
		Whitemud	(3) clay, light grey; 3 ft bed	23	good plasticity, works well	dries safely	6.2	17
			(4) clay, light grey, silty; 6 ft bed	22	good plasticity, works well	cracks badly in rapid drying	6.1	16
			(5) clay, grey, light brownish green; 7 ft bed	23	good plasticity, works well	cracks badly in rapid drying	7.8	15
35.	10 18 8 3 W4 (about 1 mile west of Fly Lake)	Battle	shale, dark brown, bentonitic; 37 ft succession	-	quite sticky if too much water added	cracks badly in drying	10.4	-
		Whitemud	shale, light grey, siliceous; 13½ ft succession	-	good plasticity, slightly sticky	dries safely	6.4	-
36.	4 19 8 3 W4 (1 mile northwest of Fly Lake)		(1) clay, light grey, sandy; 3½ ft and 3 ft beds	23.8	good plasticity, works fairly well, sandy	cracks badly in rapid drying	8.2	19
			(2) clay, light buff and brown, bentonitic; 2½ ft, 3 ft, and 2 ft beds	30.0-32.5	highly plastic, slightly tough, works well, tendency to be sticky	cracks badly in rapid drying	11.1-11.8	13-18½
		Whitemud	(3) clay, light cream, silty; 2½ ft bed	24.1	rather short, flabby, works fairly well	safe in rapid drying	6.0	16
			(4) shale, greenish white; 3 ft bed	29.4	very plastic, works fairly well	cracks badly in rapid drying	8.1	12
			(5) shale, dark brown; 1 ft bed	31.2	highly plastic, works well, somewhat tough	cracks very badly in rapid drying	10.7	16
37.	5 20 8 3 W4 (½ mile north of Fly Lake)	Whitemud	(1) clay, brown, greenish grey; 3 ft bed	28.0	very plastic, works well	cracks badly in rapid drying	8.7	28
			(2) clay, nearly white, silty; 5½ ft bed	20.5	fairly plastic, weak, works fairly well, gritty	safe in rapid drying	6.4	19
38.	2 2 8 4 W4 (½ mile northwest of Eagle Butte P.O.)	Whitemud	shale, pale grey, silty, bentonitic; 12 ft succession	26.5	very plastic, slightly sticky, poor workability	cracks very badly in rapid drying	8.7	11
39.	2 2 8 4 W4 (about ½ mile northwest of Eagle Butte P.O., ⅛ mile northwest of deposit above)	Whitemud	shale, brownish green; 8½ ft succession	31.0	very plastic, sticky	cracks very badly in rapid drying	10.0	10
40.	3 2 8 4 W4 (1 mile northwest of Eagle Butte P.O.)	Whitemud	shale, brownish green, slightly silty, bentonitic; 10 ft, 3 ft, 2½ ft, and 1½ ft beds	26.2-29.5	very plastic, slightly sticky	cracks very badly in rapid drying	10.3-11.3	9-10
41.	4 2 8 4 W4 (1 mile northwest of Eagle Butte P.O.)	Whitemud	(1) clay, light grey; 2 ft bed	24.0	fairly plastic, works well	cracks very badly in rapid drying	8.0	12
			(2) clay, light grey, sandy; 3 ft bed	23.4	very short, poor workability	safe in rapid drying	4.7	14
			(3) shale, light greenish grey, bentonitic; 2 ft bed	28.2	very plastic, sticky	cracks badly in rapid drying	9.1	10
42.	16 4 8 4 W4 (1½ miles northwest of Eagle Butte P.O.)	Whitemud	(1) shale, light grey; 1½ ft bed	31.2	very plastic, works well	cracks very badly in rapid drying	8.4	14½
			(2) shale, brownish green to grey; 6½ ft succession	30.5	good plasticity, works well	cracks badly in rapid drying	10.0	16

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
10	s.s.	5.8	buff (black specks)	hard	-	siliceous semi-fireclay, suitable for blending with underlying deposits	Overburden 23 ft	Crockford (1951), p. 31, 56, 57.
06-10	0.7-5.4	11.8-1.9	salmon - brown	hard - steel hard	vitrification slow above cone 03	structural products, off-color for stoneware products		
03-6	3.5-5.6	7.9-2.9	cream	hard - very hard	vitrified @ cone 10	high grade stoneware, terra cotta, artware, etc.		
1-10	2.1-6.4	9.2-0.3	dark cream - grey	fairly hard - vitrified	-	possibly stoneware if blended to prevent cracking in drying		
06-6	0.3-6.3	11.4-0.1	salmon - brown	fairly hard - steel hard	vitrified @ cone 6	face brick, sewer pipe and flue lining		
02-5	6.3	-	buff - light red	-	-	no value - cracks too badly		Crockford (1951), p. 33, 60.
02-6	2.0-6.3	-	brownish red	-	-	face brick, terra cotta, possibly sewer pipe		
6-10	0.8-2.5	8.5-4.8	dark buff	fairly soft - hard	-	possibly for blending		Crockford (1951), p. 32, 33, 58, 59
06-1	1.0-6.7	13.8-0.6	salmon - brownish red	hard - steel hard	-	structural products		
6-10	4.8-7.2	4.9-0.1	dark cream - grey	hard - vitrified	-	stoneware		
06-03	2.0-6.8	11.7-0.4	salmon - dark buff	fairly hard - very hard	vitrified @ cone 1	tender-drying stoneware if blended with non-plastic material		
06-1	1.7-4.7	10.3-2.9	salmon - brownish red	very hard - steel hard	-			
03-10	3.0-7.3	11.5-1.8	cream - brown	hard - steel hard	-	semi-fireclay	Overburden 70 ft	Crockford (1951), p. 32, 57.
6-10	1.8-4.5	8.0-2.8	white - very light grey	hard - steel hard	-	white-burning stoneware clay, improved if blended with more plastic clay		
06-1	0.6-5.8	10.0-0.4	salmon - dark red (slightly scummed @ cone 03)	fairly hard - vitrified	-	unspecified	Deposit probably part of a slump block. Overburden 48 ft	Crockford (1951), p. 37, 68.
06-03	1.0-7.2	12.6-0.3	salmon - brownish red	fairly hard - steel hard	vitrified @ cone 1	possibly quarry tile and structural products if blended with non-plastic material	Deposit probably part of slump block. Overburden 20 ft	Crockford (1951), p. 37, 38, 69.
08-03	0.0-6.5	11.7-0.3	light salmon - brownish red	fairly hard - steel hard	vitrified @ cone 1	face brick, possibly structural products and quarry tile	Overburden 32 ft	Crockford (1951), p. 35, 36, 66.
06-1	0.7-5.4	12.5-0.5	salmon - brownish red	fairly hard - steel hard	nearly vitrified @ cone 1	useful for blending with beds below	Overburden 40 ft	Crockford (1951), p. 35, 65.
6-10	2.2-6.2	11.0-1.2	salmon - brown	fairly soft - steel hard	nearly vitrified @ cone 10	if blended with above bed, possibly face brick		
08-03	0.7-7.9	13.6-0.1	salmon - brownish red	fairly hard - steel hard	-	face brick		
06-03	3.0-7.8	12.2-0.6	cream - buff	hard - steel hard	vitrified @ cone 1	tender-drying stoneware clay		Crockford (1951), p. 35, 64.
06-1	2.0-6.4	12.7-3.5	buff - salmon	hard - steel hard	-			

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA I (continued)							
43.	1 9 8 4 W4 (2 miles northwest of Eagle Butte P.O.)	Battle	shale, yellowish grey to black, bentonitic, very calcareous; 12 ft bed	25.0	very plastic, slightly tough	cracks in rapid drying	8.3	4
		Whitemud	(1) shale, brownish green, bentonitic; 3½ ft bed	19.7	very plastic, sticky	cracks in slow drying	12.1	14½
			(2) clay, pale grey; 2½ ft bed	27.2	good plasticity, works very well	cracks in rapid drying	7.6	16
			(3) shale, light grey to brownish green, 2½ ft bed	29.7	very plastic, works well	cracks badly in rapid drying	8.6	14
			(4) shale, greenish and brownish grey; 2½ ft bed	25.7	very plastic, somewhat sticky, slightly gritty, works fairly well	cracks badly in rapid drying	10.4	18+
44.	7 9 8 4 W4 (2 miles northwest of Eagle Butte P.O.)	Whitemud	(1) shale, light grey; 3 ft bed	27.5	good plasticity, works well	cracks badly in rapid drying	8.8	14
			(2) shale, dark brown; 4½ ft bed	31.8	very plastic, works well	cracks in air drying	11.4	18½
			(3) shale, grey; 7½ ft bed	26.0	good plasticity, works well	cracks in rapid drying	7.8	15
			(4) shale, chocolate brown; 3 ft bed	27.5	good plasticity, works well	cracks in rapid drying	9.3	20+
45.	- 32 10 11 W4 (Bow Island, about 4 miles northwest from station)	Foremost ?	(1) shale; 3 ft bed	25	plastic, gritty	dries safely	9.6	-
			(2) shale	25-30	very plastic	tendency to crack in drying	10.6-11.3	4
46.	- 31 11 2 W4 (Irvine)	Oldman ? (possibly Bearpaw)	(1) shale, red, gypsiferous; 50+ ft bed	36.6	very plastic, smooth	cracks in drying	9.7	-
			(2) clay, grey; 20+ ft bed	36	plastic, very smooth, sticky	cracks badly in air drying	9.4	-
47.	16 4 11 4 W4 (roadcut near Norton P.O., south side of valley)	Bearpaw	shale, greyish brown; 15+ ft succession	31.6	very plastic, tough, sticky, works fairly well	cracks badly in slow drying	13.1	10
48.	- 8 11 5 W4 (3-4 miles up valley of Bullshead Creek, southwest of Dunmore)	Oldman	(1) shale, light to dark grey, dark yellow; beds 7 ft and 12 ft thick	21	highly plastic, hard, very gritty	tendency to crack in air drying	6.8-8.0	3-7
			(2) shale, yellow, soft; 30 ft bed	20	good plasticity, smooth (flowed through die)	cracks in rapid drying	7	3
49.	- 31? 12 5 W4 (3 miles west of Medicine Hat city hall, "Big Coulee")	Foremost or Oldman	shale; 25 ft bed	24	good plasticity, smooth (flowed through die)	-	6.6	6
50.	NW 31 12 5 W4 (north bank Saskatchewan River)	Pleistocene	clay, blue	18	good plasticity, stiff, very gritty	-	5.2	-
51.	- 33? 12 5 W4 (east of Medicine Hat)	Pleistocene	clay (gumbo), dark grey, calcareous; in lenses and irregular patches	33.8	smooth, stiff, poor workability	cracks in drying	11.9	1+
52.	- 34-35? 12 6 W4 (south bank of South Saskatchewan River, near Medicine Hat)	Oldman	clay shale; 2 ft bed	-	plastic	dries safely	6.7	3-?
53.	- SE 13 6 W4 (test shaft, 1½ miles northwest of Medicine Hat)	Pleistocene	clay, calcareous	-	plastic, fairly smooth	-	10.7	-
54.	4 5 13 6 W4 (opposite Redcliff, Anslee coal mine)	Oldman	clay, mottled yellow and grey, non-calcareous, sandy	31	very plastic, smooth	cracks in drying	10.8	-

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
06-03	0.3-1.8	12.8-7.4	red	hard - very hard	-	face brick	Overburden 23 ft	Crockford (1951), p. 34, 35, 63.
03-6	4.6-5.6	5.5-3.0	light brown - red	hard - steel hard	-	doubtful value	Overburden 44 ft	
1-6	6.5-7.4	2.0-1.7	buff	steel hard	vitrified @ cone 10	flue lining, sewer pipe, face brick		
03-1	7.0-8.0	0.8-0.1	buff	steel hard	vitrified @ cone 6	sewer pipe, flue lining, face brick		
1-10	1.0-4.6	11.6-2.1	light butr - brown	fairly hard - steel hard	nearly vitrified @ cone 10	possibly face brick by dry-press process		
03-1	4.0-6.0	5.6-0.7	buff	very hard - steel hard	little further vitrification between cones 1 and 6	tender drying stoneware clay		Crockford (1951), p. 33, 34, 61.
06-1	2.7-5.3	12.2-4.1	buff - salmon	hard - very hard	-	structural products		
06-1	1.7-6.3	12.2-0.0	cream - dark buff	fairly hard - steel hard	vitrified @ cone 1	tender drying stoneware clay		
06-6	2.0-5.0	13.4-5.8	dark cream - buff	hard - very hard	-	semi-fireclay, possibly stoneware and structural products if blended		
010-1	0.0-1.4	11.6-8.8	reddish brown (scummed)	hard	-	dry-press brick		Ries (1914a), p. 14-16, 66.
010-1	1.0-7.7	13.7-0.3	red	hard - steel hard	nearly vitrified @ cone 1	dry-press brick		
03	6.0	10.3	red	-	-	doubtful value		Ries and Keele (1912), p. 56, 57, 221.
010-03	0.2-2.3	16.4-6.8	red (scummed)	-	cracked badly on firing	doubtful value		
06-1	1.7-4.7	10.9-1.4	salmon - red (badly scummed)	hard - steel hard	-	doubtful value		Crockford (1951), p. 93, 97.
010-03	0.0-3.6	11.1-2.4	salmon - red	hard - steel hard	vitrified @ cone 1	dry-press brick, good brick and fireproofing clay if cracking tendency overcome (warped slightly in roofing tile tests)		Ries and Keele (1913), p. 32-36, 98, 100.
010-1	0.0-3.0	9.6-4.2	light red	very hard - steel hard	-	dry-press brick, drain tile		
05-1	0.0-7.0	17.5-14.0	red	hard	-	common brick, possibly fireproofing		Ries (1914a), p. 12, 13, 66.
010-03	s.s.-0.7	12.5-9.8	red	hard	-	possibly brick	Thick overburden	Ries and Keele (1912), p. 34, 35.
010-03	1.0-0.7	10.6-9.3	red	steel hard	-	doubtful value	Present in silty clays as lenses or patches, avoided by brickmakers who used the silty clays	Ries and Keele (1912), p. 33, 34.
010-1	0.4-7.4	20.6-0.7	light - deep red	fairly hard - vitrified	vitrified rapidly above cone 03	possibly brick	Overlies lignite seam	Ries and Keele (1912), p. 73, 74, 221.
010-03	0.4-3.4	13.0-6.8	red	hard	-	dry-press brick		Ries and Keele (1912), p. 35.
010-03	0.6-5.3	12.0-2.1	red	-	vitrified below cone 3	dry-press brick		Ries and Keele (1912) p. 74, 75.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA II (LETHBRIDGE-TABER)							
	Utilized Deposits							
55.	- - 6 21 W4 (Lethbridge)	Pleistocene	surface clay, silty, calcareous (numerous lime pebbles)	19	fair plasticity	cracks in drying	4	-
56.	- 17 10 16 W4 (near Taber)	Oldman or Foremost	shale, dark grey, 6 ft bed	26	very plastic, smooth, rather sticky, works fairly well (flows through die)	cracks in rapid drying, scums badly	8	2
	Undeveloped Deposits							
57.	- 3 8 22 W4 (junction of Oldman and St. Mary Rivers)	Bearpaw ?	(1) shale, grey	28-29	fairly plastic (flows through die)	cracks in rapid drying	7.1-8.7	4
			(2) shale, grey	-	fairly plastic, rather lean and granular	-	5.0	6
58.	- 36 8 22 W4 (along Oldman River at Lethbridge)	Oldman?	shale, carbonaceous	25	very plastic, gritty	-	6.3	-
59.	- 18 10 16 W4 (north side Oldman River)	Foremost?	shale, black, somewhat gypsiferous; 3 ft bed	27	very plastic, stiff	-	8	1
60.	- 1 10 17 W4 (2 miles west of Taber, Rock Springs coal mine)	Foremost ?	(1) shale, brownish, soft, gypsiferous	22	good plasticity, rather stiff and sticky	cracks in drying	8	2
			(2) shale, dark grey, carbonaceous, soft	22	very smooth, plastic, tough	cracks in drying	8	3
61.	- 5? 10 21 W4 (along Oldman River, east of Diamond City)	Oldman	(1) shale, sandy; 20 ft succession	25	fairly plastic	-	8	-
			(2) shale, sandy; 75 ft succession	24	fairly plastic	-	7	-
	AREA III (CROWSNEST PASS-PINCHER CREEK)							
	Utilized Deposits							
62.	- 1 7 30 W4 (Pincher area)	Pleistocene	surface clay, very calcareous (scattered lime pebbles)	29	very plastic, tough, gritty, difficult to work	cracks, scums	8.8	1
63.	SW 16 7 3 W5 (north side Crowsnest River, north of Passburg)	Blairmore	shale, greyish buff, sandy	15.1	very short, sandy, poor workability	safe in rapid drying	2.4	9
64.	5 31 7 3 W5 (north edge of Frank)	Blairmore	(1) shale, dark brown, very calcareous, sandy	18.0	short, works fairly well	cracks in rapid drying	4.4	8
			(2) shale, brownish buff	19.1	good plasticity, works well	safe in rapid drying	4.9	12
65.	- 35 7 4 W5 (Blairmore)	Fernie	shale, black, carbonaceous	-	very low plasticity, gritty	-	-	9
66.	16 35 7 4 W5 (south edge of Blairmore)	Fernie	(1) shale, dark brown	20.3	short, poor workability	safe in rapid drying	5.2	12½
			(2) shale, dark brown, very calcareous	20.3	very plastic, works fairly well	cracks slightly in rapid drying	5.0	2

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
03	0	13.6	light red	fairly soft	-	brick	Used in 1910 by Lethbridge Brick and Terra Cotta Co.	Ries and Keele (1912), p. 41, 42.
010-03	1.0-5.8	13.5-5.2	light red	-	vitrified @ cone 1	common brick (warped slightly in roofing tile tests)	Brickyard site in 1911	Ries and Keele (1913), p. 36, 37, 97.
010-1	1.2-8.8	17.2-1.8	red	hard - steel hard	vitrified @ cone 3	dry-press brick and common brick, possibly fireproofing, drain tile if sandy material added		Ries (1914a), p. 20-23, 66.
03-1	11.0-11.6	11.1-11.7	brown	-	-	possibly common brick		
010-3	0.7-6.3	15.4-1.9	light - dark red	very hard - steel hard	vitrified below cone 5	brick	Thick overburden	Ries and Keele (1912), p. 59.
010-05	1.7-3.4	10.9-5.0	red	-	-	brick, if fired slowly to burn off carbon	Overlain by 4 ft coal seam	Ries and Keele (1913), p. 37.
010-03	0.0-6.0	16.1-2.7	red	-	-	brick, possibly fireproofing	Overlies 4 ft lignite seam; chemical analysis no. 2	Ries and Keele (1913), p. 37, 38.
010-05	1.0-3.3	6.7-6.3	red	-	-	brick, if fired slowly to burn off carbon	Underlies 4 ft lignite seam; chemical analysis no. 3	
010-1	0.3-1.0	12.7-8.1	brownish red	hard - steel hard	-	common brick		Ries (1914a), p. 19, 20, 66.
05	0	18.5	pink	steel hard	-	common brick		
010-03	1.3-3.7	11.7-1.5	red	-	cracked on firing @ cone 03	doubtful value	Used for common brick and sewer pipe around 1910	Ries and Keele (1912), p. 42, 43.
1-6	0.0-3.0	12.9-6.6	red	soft - hard	-	no value	Formerly used in brick making; beds dip steeply	Crockford (1951), p. 94, 98.
6	4.6	19.5	pale grey	fairly hard	-	possibly useful if blended with bed below		Crockford (1951), p. 93, 98.
03-1	3.0-4.0	6.5-3.4	red	hard - very hard	-	face brick		
05-1	2.5-?	7.5-4.4	red	hard - very hard	-	brick (very slow firing, necessary to burn off carbonaceous matter)	Dry-press brick manufactured at Blairmore around 1910-11	Ries and Keele (1913), p. 65, 66; MacKenzie (1914), p. 245.
03-1	3.3-6.0	10.0-5.9	brownish red - red	hard - fairly hard	-	face brick (workability improved by addition of a more plastic clay)	Formerly used for making bricks	Crockford (1951), p. 93, 97.
03-1	0.7-6.8	16.8-1.3	cream - greenish buff	fairly soft - very hard	-	no value, owing to short firing range	Formerly used in cement making	

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA III (continued)							
67.	13 9 8 5 W5 (east end of Crowsnest Lake)	Belly River	shale	19	moderately plastic	-	5.0	-
68.	6 17 8 5 W5 (northwest of Crowsnest Lake)	Belly River	shale, sandy	18	fair plasticity	-	5.5	5
	Undeveloped Deposits							
69.	NE 11 5 2 W5 (Mill Creek, southeast of Blairmore)	Alberta Group	shale, sandy	22	good plasticity	-	5.6	3
70.	- 16? 6 30 W4 (on Pincher Creek)	Tertiary	shale, calcareous	24	very plastic	-	7.7	-
71.	- 22 6 30 W4 (Pincher Creek townsite)	Tertiary	clay, brownish grey, silty	-	feebly-strongly plastic, gritty	-	-	"readily fused"
72.	- 19 6 1 W5 (about 7 miles west of Pincher Creek townsite)	Pleistocene	surface clay, calcareous	25	very plastic, works fairly well	-	6.5	-
73.	- SW 6 1 W5 (about 10 miles from Pincher Creek)	Belly River	(1) shale	-	plastic, somewhat gritty	-	6.4	-
			(2) shale, slightly calcareous in part; 100 ft + of section	21-24	very plastic, gritty	cracks in air drying	4.5-6.5	7
74.	11-12? 27 6 1 W5 (mine 6 miles northwest of Pincher Creek, south fork of Crowsnest River)	Willow Creek (possibly St. Mary River)	clay, light grey, slightly calcareous, coaly; 15 ft bed	28	-	checked in air drying	8.9	9
75.	NE 23 6 3 W5 (near Jackson Creek)	Alberta Group	(1) clay, yellowish grey, slightly calcareous	30	moderately plastic	-	8	-
			(2) clay, yellowish grey, calcareous	28	very plastic	-	6.9	7
76.	8 27 7 2 W5 (bank of Crowsnest River, 1 mile west of Lundbreck)	St. Mary River	shale, dark grey	-	fairly plastic, very gritty	-	4.6	-
77.	- - 7 2 W5 (railway cuts, between Lundbreck and Burmis)	St. Mary River	(1) shale, hard	-	plastic	-	4.7	1
			(2) shale, light grey, calcareous	-	very plastic	-	5.4	1
			(3) shale, green	-	plastic, slightly gritty	-	5.5	7
			(4) shale, dark grey, slaty	-	feebly plastic, somewhat gritty	-	4.0	6
78.	15 10 7 3 W5 (south side Crowsnest River valley at Passburg)	Blairmore	shale, grey; 10 ft bed	17.2	fairly plastic, works fairly well	safe in rapid drying	4.7	6
79.	- 11 7 3 W5 (Passburg)	Blairmore ?	(1) shale, light grey, silty in part, soft; 4 ft, 5 ft, and 8 ft beds	21	good plasticity (flows through die)	-	6.6-8.7	3
			(2) shale, sandy in part; 4 ft and 12 ft beds	-	plasticity good to fairly low, works well	-	7-8.5	7+

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
010-1	0.7-4.7	12.0-4.0	reddish brown	hard - steel hard	-	brick, fireproofing, sewer pipe	Pit opened about 1912 by Alberta Clay Products Co.	Ries (1914a), p. 32, 33.
010-1	s.s.-5	10.4-3.1	red	-	-	brick, sewer pipe if mixed with material somewhat more plastic and refractory	Used by Alberta Clay Products Co. about 1912 for making sewer pipe	Ries (1914a), p. 30-32.
05-1	2.0-2.7	14.3-5.5	red	-	-	brick, possibly fireproofing	Beds dip steeply, underlain by limestone	Ries (1914a), p. 28.
010-03	0.8-6.0	14.6-4.6	light - deep red	fairly hard - very hard	vitrified @ cone 1	dry-press brick		Ries and Keele (1912). p. 104, 105.
-	-	-	-	-	-	possibly brick	Chemical analyses nos. 4, 5	Wait (1909), p. 112.
03	0	16.9	red	-	-	brick	Beds have vertical dip	Ries and Keele (1912), p. 43.
010-03	0.7-6.6	11.5-0.9	light - deep red	steel hard - vitrified	-	brick	Beds have vertical dip	Ries and Keele (1912), p. 60-62.
010-1	s.s.-3.0	14.1-2.6	red - brown	very hard - steel hard	-	brick, sewer pipe, hollow blocks, fireproofing		
03-3	0-3.8	13.8-4.8	red - grey	steel hard	vitrified @ cone 5	sewer pipe, dry-press brick	Overlies bituminous coal seam, somewhat disturbed by faulting	Ries and Keele (1912), p. 94; ——— (1913), p. 86, 87.
05-3	1.3-5.0	14.0-9.8	buff	steel hard	-	dry-press brick	Clay present in beds 4 ft to 8 ft thick, interbedded with dark carbonaceous shales, considerably disturbed	Ries (1915), p. 54-59.
05-1	0.6-1.3	19.5-15.6	buff	steel hard	-	dry-press brick		
010-1	0.3-5.5	14.2-1.8	red - brown	hard - very hard	-	brick, paving brick	No overburden	Ries and Keele (1912), p. 95.
010-03	s.s.-2.7	12.8-5.8	red	-	vitrified below cone 1	brick		Ries and Keele (1912), p. 95-97.
010-03	0.6-0.7	14.0-12.8	red	hard	-	brick	Short supply	
010-1	0.3-2.3	10.4-0.0	light - dark red	hard - vitrified	nearly vitrified @ cone 03	brick		
010-1	s.s.-2.3	13.7-4.28	light red - red	hard - very hard	bloated @ cone 3	dry-press brick if fired slowly		
06-1	0.7-4.0	10.7-1.3	light - dark red	fairly soft - steel hard	-	face brick	No overburden	Crockford (1951), p. 94, 99.
010-1	0.0-5.4	11.5-0.1	light - dark red	hard - steel hard	vitrified near cone 1	dry-press brick, vitrified ware, drain tile, fireproofing, possibly sewer pipe		Ries (1915), p. 45-54.
05-3	1.3-8.0	14.2-1.5	red	steel hard	-	paving brick and possibly sewer pipe if blended with clay from beds above		

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA III (continued)							
80.	NE? 11 7 3 W5 (south side Crowsnest River valley, south of Passburg)	Blairmore	(1) shale, brownish buff; 12 ft bed	16.4	short, poor workability	safe in rapid drying	3.4	6½
			(2) shale, dark brown	21.0	fairly plastic, works well	slight cracking in rapid drying	5.5	5
81.	- 31 7 3 W5 (west edge of Frank slide)	Blairmore?	shale, grey, hard, splintery	-	poor plasticity	-	-	2
82.	- 27 7 4 W5 (2 miles southwest of Blairmore)	Alberta Group	shale, black, slaty; 100 ft + succession	21	poor plasticity	-	2.7	7
83.	14 34 7 4 W5 (near mouth York Creek)	Alberta Group	shale, dark grey, slightly carbonaceous	17	very feebly plastic, gritty, difficult to mold	dries safely	3	-
84.	- 5 8 4 W5 (1-2 miles southwest of Coleman)	Alberta Group	shale, black, slaty, sandy, carbonaceous; 40-50 ft succession	18	poor plasticity	-	3	7
85.	5? 7 8 4 W5 (2 miles west of Coleman)	Alberta Group	shale, black, carbonaceous, mixed with slightly calcareous clay	14	fair plasticity	-	4	-
86.	2 9 8 4 W5 (1 mile east of Coleman)	Alberta Group	shale, grey	-	low plasticity, gritty	-	4	2
87.	- 11 8 6 W5 (½mile from Crowsnest Station)	Alberta Group	shale, black, sandy, granular; about 50 ft succession	19.7	poor plasticity (too sandy to work through die, but could be wet-molded)	-	4	6
88.	- 11-14 8 6 W5 (Castle River and Jackson Creek)	Alberta Group	clay	31-32	very plastic	cracks in rapid drying	7.6-8.0	8
89.	NE 17 9 27 W4 (Porcupine Hills)	Tertiary	clay, banded pink, yellow and grey, calcareous (coarse lime particles)	23	very plastic, works fairly well	dries poorly	6	3
	AREA IV (CALGARY-TURNER VALLEY)							
	Utilized Deposits							
90.	7 2 21 1 W5 (Coulee at Sandstone, Alberta)	Porcupine Hills	(1) shale, blue and grey, hard, splintery, somewhat calcareous; in layers 8 ins to 2 ft thick alternating with sandstone	19	plastic, sticky	cracks in rapid drying	6	1
			(2) shale, light grey and green, slightly sandy; in layers up to 10 ft thick alternating with 8 ins to 2 ft sandstone beds	26.1	plastic, good workability	dries safely	8.0	-
			(3) shale, light to dark grey, green, calcareous, sandy; in layers up to 10 ft thick alternating with 6 ins to 2 ft sandstone beds	25.7	plastic, very good workability	dries safely	7.9	-
91.	16 23 24 2 W5 (Bow River, Calgary)	Porcupine Hills	shale, greenish brown, in beds 3 ins to 4 ft thick totalling 23½ ft; some sandstone interbeds	24.2	plastic, works very well	dries safely	8.0	5+
92.	13 24 24 2 W5 (Brickburn, Alberta)	Porcupine Hills	shale, brown, blue, sandy; in beds up to 3 ft thick alternating with sandstone layers (discarded)	17	plastic, gritty	-	5	1

Fired Characteristics								
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other	Potential Ceramic Use	Remarks	Reference(s)
06-1	s.s.-4.0	14.2-3.4	light - dark red	soft - steel hard	vitrified @ cone 6	possibly brick, improved if a more plastic material added	Beds dip steeply	Crockford (1951), p. 94, 99.
06-1	1.0-6.0	13.8-0.9	red - dark red	fairly soft - vitrified	-	possibly useful for blending with above bed	Beds dip steeply	
05-03	2.5	6.0-5.0	deep red	-	not yet vitrified @ cone 1	doubtful value owing to very short firing range		Ries and Keele (1913), p. 66.
1	1.0	25.0	grey buff	-	-	no value	Beds dip 55°	Ries (1914a), p. 29, 66.
010-3	0.8-3.0	11.0-6.0	red	-	bloated @ cone 5	sewer pipe if plasticity improved, possibly dry-press brick		Keele (1915), p. 40, 41.
010-1	0	12.4	greyish brown	fairly hard - hard	-	possibly for blending to reduce shrinkage in other clays		Ries (1914a), p. 30; —— (1914b), p. 230.
010-1	0.5-1.0	15.0-11.1	light red	very hard - steel hard	-	common brick, possibly dry-press brick		Ries (1915), p. 42-44.
010-03	s.s.-0.4	13.6-7.6	-	-	-	possibly common brick		Ries and Keele (1913), p. 66, 67; Leach (1914), p. 234.
010-03	1.0-2.0	10.0-5.4	red	very hard - steel hard	vitrified below cone 1	dry-press brick	Dips about 50°, succession could be worked without removing overlying beds	Ries (1914a), p. 34, 35; —— (1914b), p. 230, 231.
010-1	0.0-1.7	16.5-11.3	cream - grey	hard - steel hard	slaked badly in air after a few days when burned only to cone 010	possibly face brick if blended with black shales of the region	Chemical analysis no. 6	Ries (1914a), p. 25-28.
03	-	-	red (buff specks)	-	-	possibly dry-press brick	Forms small knolls in front of the Porcupine Hills escarpment	
010-03	0.4-2.3	14.9-9.5	red	hard - steel hard	-	unspecified	Used for dry-press brick by Canada Cement Co. in 1910	Ries and Keele (1912), p. 107-109.
010-1	0.2-5.8	14.7-3.5	red (yellow specks, slightly scummed)	steel hard	vitrified @ cone 3	unspecified	Used in portland cement manufacture	Worcester (1932), p. 6, 67-70, 80, 91, 114.
010-02	0.0-2.6	14.8-8.9	red (yellow specks, scummed)	steel hard	vitrified @ cone 1	stiff-mud brick	Used for dry-press brick. Much waste sandstone to dispose of	
02-1	0.7-4.0	13.7-5.3	light red (yellow specks)	steel hard	vitrified @ cone 3	stiff-mud brick, hollow building tile, possibly paving brick	Used for many years for dry-press brick by Crandell Pressed Brick Co.	Worcester (1932), p. 6, 76, 77, 91, 93.
010-03	0.6-2.3	13.4-8.7	red	steel hard	-	possibly stiff-mud brick	Used for dry-press brick by Calgary Pressed-Brick Co.	Ries and Keele (1912), p. 105-107.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA IV (continued)							
93.	2 26 24 2 W5 (Bow River, Calgary)	Porcupine Hills	shale, light greenish brown, sandy; in beds up to 5 ft thick totalling 18½ ft, some 1 ft to 2 ft sandstone interbeds (discarded)	22.2	plastic, works fairly well	dries safely	6.1	5+
94.	- 2, 3 26 4 W5 (Cochrane)	Pleistocene	surface clay, hard, silty, very calcareous	26	very plastic, smooth	-	7.9	1
	Undeveloped Deposits							
95.	2 17 14 28 W4 (6½ miles west of Stavely)	Porcupine Hills	(1) shale, greyish green and dark grey, slightly calcareous; 10½ ft succession	28	good plasticity, works well, slightly sticky	cracks badly in rapid drying	9.3	5½
			(2) shale, greyish green, highly calcareous; 7 ft succession	27	good plasticity, slightly sticky	cracks slightly in rapid drying	7	4
96.	2 13 16 28 W4 (2½ miles southeast of Nanton)	Porcupine Hills	clay, dark brown, varved, calcareous, sandy; 5 ft bed	20	fair plasticity, works fairly well	cracks badly in rapid drying	5.2	6½
97.	10 36 17 4 W5 (near mouth Trap Creek)	Alberta Group	shale, black to purple, carbonaceous, slaty; 70 ft succession, includes clay-ironstone and hard sandstone bands	16.1	very short, poor workability	dries safely	3.7	4+
98.	13 33 18 27 W4 (2¾ miles southeast of Blackie)	Paskapoo	clay, light grey, highly calcareous (possibly impure marl); 1½ ft bed	22	good plasticity, works well	cracks in rapid drying	4.5	6½
99.	13,14? 21 18 29 W4 (4 miles southwest of High River)	Porcupine Hills	clay, brown, highly calcareous; 3½ ft bed	22	good plasticity, works well	cracks badly in rapid drying	6.5	4
100.	6 8 18 2 W5 (Bull Creek, near old mines)	Belly River	shale, greenish grey, hard; 100 ft succession	26.8	plastic, rather fat, works well	dries safely	8.4	-
101.	7 8 18 2 W5 (Bull Creek, near old mines)	Edmonton	shale, grey to brown, sandy in part	27.7	very fat, works well	safe in slow drying	8.2	-
102.	7 9 18 2 W5 (Junction of Highwood River and Bull Creek)	Edmonton	shale, dark bluish grey	28.8-30.1	plastic, sticky, fair to good workability	cracks slightly in drying, warps	9.4-9.9	-
103.	7 10 18 2 W5 (east bank Highwood River, 1¼ miles below Bull Creek)	Edmonton	shale, greenish grey, sandy, bentonitic in part; 20 ft and 25 ft beds	27.0-30.3	highly plastic, sticky, works fairly well	cracks badly in drying, warps	8.3-10.3	-
104.	5 6 18 3 W5 (north side Highwood River, 1¼ miles below Trap Creek)	Belly River	shale, greenish grey; 34 ft succession	21.7	fat, good workability	dries safely	6.0	-
105.	5 6 18 3 W5 (Highwood River, 1½ miles below Trap Creek)	Alberta Group	shale, greyish purple; 44 ft succession	20.2	rather short, works fairly well	dries safely	5.7	-
106.	4 20 18 3 W5 (near mouth Sullivan Creek)	Alberta Group	shale, dark bluish grey, hard, silty; 250 ft succession, includes many bands of clay-ironstone concretions	16.2-18.5	short, poor workability	dries safely	3.7-3.8	8-9
107.	13 25 18 3 W5 (north bank Highwood River, 2 miles below Ings Creek)	Alberta Group	(1) shale, reddish brown, hard, fissile; 55 ft succession	17.4	short, poor workability	dries safely	3.8	8
			(2) shale, dark grey, sandy, hard, slaty; 86 ft succession	17.0	rather short, poor to fair workability	dries safely	3.8	4+

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
02-3	1.3-5.2	13.2-1.6	medium red (yellow specks)	steel hard - vitrified	vitrified rapidly above cone 1	face brick, stock and common brick, drain tile	Stiff-mud face brick manufactured prior to 1930 by Tregillus Clay Co.	Worcester (1932), p. 6, 75, 76, 81, 93, 102.
03	0.3	21.0	buff	-	-	doubtful value	Used for common brick making in 1912	Ries and Keele (1912), p. 43.
06-02	2.8-5.7	11.5-4.1	salmon - red	hard - steel hard	-	blend of (1) and (2) suitable for heavy clay products		RCA files (1953).
06-02	1.3-2.0	15.2-9.8	salmon - fair red	fairly hard - hard	-			
02	s.s.	17.9	light brown	very soft	-	no ceramic value; possibly lightweight aggregate raw material		RCA files (1953).
02-3	s.s.-1.7	13.7-8.6	light pink (badly scummed)	steel hard	-	doubtful value	Beds dip vertically	Worcester (1932), p. 5, 19, 20, 78, 82.
02	0.0	25.2	cream	soft	-	no value		RCA files (1953).
02	0.8	14.4	light brown	fairly hard	-	no value		RCA files (1953).
07-3	0.9-5.6	14.2-2.7	red	steel hard	-	unspecified	Beds dip steeply	Worcester (1932), p. 5, 25, 78, 83.
04-1	2.8-5.5	11.2-1.9	medium red (slightly scummed)	steel hard	vitrified @ cone 3	possibly roofing and quarry tile, face brick, common brick, paving brick, building tile	Beds dip steeply	Worcester (1932), p. 5, 24, 78, 83.
04-3	1.4-4.8	10.7-2.2	medium red (slightly scummed)	steel hard	vitrified @ cone 4	possibly brick, tile, and low-grade commercial ware	Beds strongly folded	Worcester (1932), p. 5, 18, 19, 78, 82, 114.
04-3	1.5-5.2	11.3-0.9	red	steel hard	overfired above cone 3	possibly building brick, hollow tile, drain tile	Beds dip moderately	Worcester (1932), p. 5, 17, 18, 78, 82, 104.
07-3	0.7-5.3	13.2-2.5	dark red	steel hard	nearly vitrified @ cone 3	quarry tile, roofing tile, terra cotta, face brick	Beds nearly vertical	Worcester (1932), p. 5, 22, 78, 83.
04-3	1.3-3.7	10.9-4.8	medium red (scummed)	steel hard	overfired above cone 3	roofing tile, face brick, common brick, paving brick	Beds nearly vertical	Worcester (1932), p. 5, 21, 78, 83.
07-3	0.1-2.8	14.9-7.8	red (yellow scum)	steel hard	-	possibly dry-press brick if very finely ground	Beds nearly vertical	Worcester (1932), p. 5, 22, 23, 78, 83.
04-3	0.3-1.3	12.9-10.1	bright red	steel hard	-	possibly face brick or tile by dry-press process if treated to improve workability	Beds nearly vertical	Worcester (1932), p. 5, 25, 26, 78, 83.
1-3	2.2-4.2	14.4-7.3	green - grey (red specks)	steel hard	-	doubtful value	Beds nearly vertical	

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA IV (continued)							
108.	2 1 18 4 W5 (Highwood River, ½ mile below Trap Creek)	Alberta Group	shale, dark grey; 80 ft succession	20.7	plastic, good workability	dries safely	5.7	-
109.	10 29 19 3 W5 (Sheep River, at mouth of Macabee Creek)	Alberta Group	shale, reddish brown to dark grey; 150 ft+ succession	15.8-17.2	very short, very poor workability	dries safely	2.9-3.4	6
110.	10,11 29 19 3 W5 (near mouth Macabee Creek)	Blairmore	(1) shale, brownish red; 15 ins bed	17.6	fat, granular, good workability	dries safely	4.5	-
			(2) shale, greenish grey; 15 ins bed	19.0	short, fair workability	dries safely	4.8	-
			(3) shale, light greenish grey; 28 ft succession	17.4	very short, gritty, fair to good workability	dries safely	4.1	7+
111.	- 8 20 28 W4 (near Aldersyde, north side Highwood River)	Paskapoo	shale, light brown to pinkish grey	29.9	very plastic, works very well	dries safely	9.4	-
112.	- 18 20 28 W4 (1 mile northeast of Aldersyde, east bank Highwood River)	Paskapoo	shale, light to dark grey, sandy in part; 18 ft+ succession	29.8	very plastic, somewhat gritty, works very well	dries safely	9.7	-
113.	- 19 20 28 W4 (east bank Sheep River, east of Okotoks)	Paskapoo	shale, grey to green; 24 ft succession	29.6	plastic, works very well	dries safely	9.7	-
114.	- 20 20 28 W4 (east bank Sheep River, east of Okotoks)	Paskapoo	(1) shale, greenish grey, sandy	28.8	plastic, works well	cracks in fast drying, warps	9.2	-
			(2) shale, green, hard, slightly sandy; combined with above - less than 8 ft thick	35.7	plastic, works well	cracks badly in drying	12.6	-
115.	- 30 20 28 W4 (Sheep River, 4½ miles east of Okotoks)	Paskapoo	shale, greenish grey, soft; 20 ft succession	26.3	fat, works very well	dries safely	8.4	-
116.	- 32 20 28 W4 (Highwood River, 1 mile above junction with Sheep River)	Paskapoo	(1) shale, green; 13½ ft succession	33.2	very plastic, works very well	cracks slightly in drying	11.2	-
			(2) shale, greenish grey, slightly sandy; 23 ft succession	23.7	plastic, somewhat gritty, works well	dries safely	6.6	-
117.	NW 22 20 29 W4 (Sheep River, near railway bridge below Okotoks)	Paskapoo (possibly Porcupine Hills)	shale, buff, sandy, soft; 16 ft succession	26.8	plastic, works well	dries safely	7.5	-
118.	- 24 20 29 W4 (north bank Sheep River, 3½ miles southeast of Okotoks)	Paskapoo (possibly Porcupine Hills)	(1) shale, buff to greenish grey, slightly sandy; 17½ ft succession	30.5	fat, works very well	dries safely	9.4	-
			(2) shale, dark greenish grey, sandy; 24 ft+ succession, some sandstone interbeds up to 2 ft thick	28.2	plastic, works well	dries safely	8.9	-
119.	- 29 20 29 W4 (Sheep River, upstream from Okotoks)	Paskapoo (possibly Porcupine Hills)	shale, dark grey, green, and buff, sandy; 20 ft succession with 3 sandstone interbeds	27.5	plastic, works well	dries safely	7.8	-
120.	4 25 20 1 W5 (Sheep River, 2 miles above Okotoks)	Porcupine Hills	(1) shale, green to buff; 19½ ft succession	27.6	plastic, works well	dries safely	8.0	-
			(2) shale, greenish grey; 10 ft succession	31.0	very plastic, works very well	dries safely	9.3	-

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
04-3	0.2-3.7	11.7-4.7	dark red (slightly scummed)	steel hard	-	face brick, common brick, paving brick, hollow tile, red terra cotta	Beds nearly vertical	Worcester (1932), p. 5, 20, 21, 78 82.
1-4	0.7-1.3	15.9-11.7	dirty red - grey buff	steel hard	-	doubtful value, possibly useful as grog in excessively plastic clays	Beds nearly vertical	Worcester (1932), p. 5, 38, 39, 79 87.
010-3	0.3-5.1	13.1-4.5	bright red	steel hard	-	face brick, quarry tile, roofing tile, red terra cotta, paving brick, flooring tile, pottery (excellent burnt color)	Beds nearly vertical; limited supply	Worcester (1932), p. 5, 39-41, 79, 87.
07-5	0.0-3.5	13.5-7.1	bright red	steel hard	-			
010-3	s.s.-3.2	12.6-4.8	bright red	steel hard	-	most structural red ware (excellent burnt color)	Beds nearly vertical	
010-02	0.8-6.7	12.9-1.7	dark red (badly scummed)	steel hard	nearly vitrified @ cone 02	all structural red wares if excessive drying shrinkage and scumming corrected	Thick overburden	Worcester (1932), p. 5, 59, 60, 80 90.
010-3	0.9-6.7	13.2-0.2	dark red	steel hard	vitrified @ cone 3	all red wares if drying shrinkage reduced		Worcester (1932), p. 5, 54, 79, 89
010-3	1.0-6.3	13.5-0.4	dark red (slightly scummed)	steel hard	vitrified @ cone 3	wide variety of red clay products		Worcester (1932), p. 5, 58, 59, 79, 90.
010-02	0.5-5.8	12.9-0.8	brownish red	steel hard	vitrified @ cone 02, cracked badly on firing	possibly dry-press products or for blending		Worcester (1932), p. 6, 63, 64, 80, 91.
010-07	1.4-7.5	11.9-1.1	brownish red	steel hard	cracked badly on firing, virtrified @ cone 07, bloated above cone 02	no value alone because of drying defects		
04-4	2.0-6.1	13.8-2.2	dark red (slightly scummed)	steel hard	fired dense @ cone 3, nearly vitrified @ cone 4	face brick, paving brick, common and stock brick, roofing and drain tile		Worcester (1932), p. 5, 57, 58, 79, 89, 100.
010-02	1.6-5.6	13.8-1.6	dark brown (heavy yellow scum)	steel hard	nearly vitrified @ cone 02	general line of red clay products if scumming and high drying shrinkage corrected	Overburden 100 ft, necessitates underground mining	Worcester (1932), p. 5, 55, 56, 79, 89.
04-3	2.5-6.7	11.8-0.5	medium red (heavy yellow scum)	steel hard	vitrified @ cone 3	all classes of building brick, hollow tile, roofing tile, possibly paving brick		
02-3	2.4-6.6	13.5-2.2	greyish red (slightly scummed)	steel hard	little further vitrification between cones 3 and 4	possibly common brick, building tile		Worcester (1932), p. 6, 61, 80, 90.
010-02	1.4-6.4	14.2-4.2	dark red	steel hard	vitrified between cones 02 and 3	paving brick if drying shrinkage reduced, possibly roofing tile, quarry and floor tile, hollow tile and brick		Worcester (1932), p. 6, 62, 63, 80, 90.
07-3	0.9-5.2	13.5-0.7	orange red (slightly scummed)	steel hard	fired dense @ cone 1, vitrified between cones 1 and 3	useful for blending with beds above		
04-1	1.7-6.7	13.3-2.4	orange red (slightly scummed)	steel hard	little further vitrification between cones 1 and 3	common brick, hollow building tile		Worcester (1932), p. 6, 66, 67, 80, 91.
04-3	2.6-7.0	11.7-1.6	medium red (slightly scummed)	steel hard	nearly vitrified @ cone 3, very slight bloating @ cone 4	possibly face, common, and stock brick, hollow tile, roofing tile		Worcester (1932), p. 6, 64-66, 80, 91.
010-1	1.4-7.7	15.0-0.6	medium red (slightly scummed)	steel hard	vitrification rapid above cone 04, vitrified @ cone 1	useful for blending with above beds		

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA IV (continued)							
121.	15 6 20 2 W5 (east bank Sheep River, Turner Valley)	Alberta Group	(1) shale, reddish brown to dark grey; 36½ ft succession	20.2	plastic, short, fair to good workability	dries safely	5.2	-
			(2) shale, dark grey; 54 ft succession	17.1	rather short, works fairly well	dries safely	4.2	9
			(3) shale, dark grey to black 57 ft succession	21.0	short, fat, fair to good workability	dries safely	5.1	10
122.	2 7 20 2 W5 (north bank Sheep River, Turner Valley, on east flank main anticline)	Alberta Group	(1) shale, dark grey to reddish brown, hard, platy, sandy in part; 150 ft succession	18.8-19.5	rather short, works fairly well	dries safely	4.5-4.8	-
			(2) shale, reddish brown to grey, hard, sandy; 48 ft succession	18.6	very short, poor workability	dries safely	3.7	6
			(3) shale, dark grey to black	20.7	plastic, works well	safe in slow drying	5.2	-
			(4) shale, dark grey; 66 ft succession	18.9	semi-plastic, works fairly well	dries safely, scums	4.6	-
123.	2 17 20 2 W5 (Sheep River, north of Black Diamond)	Edmonton	(1) shale, greenish grey, sandy; 75 ft succession	21.8	very short, gritty, poor workability	dries safely	4.0	-
			(2) shale, greyish buff and bluish grey; 15 ft succession	20.8	rather short, works fairly well	dries safely	4.4	-
			(3) shale, greenish grey and dark green, sandy; 175 ft succession	22.5-22.8	fairly plastic, works fairly well, gritty	dries safely	4.3-5.7	-
			(4) shale, greenish grey; 50 ft succession	25.8	rather short, poor to fair workability	dries safely	6.4	-
124.	9 21 20 2 W5 (west side Sheep River, 2 miles below Black Diamond)	Paskapoo	shale, light grey; in beds up to 4 ft thick totalling 13 ft, thin sandstone layers present	26.7	plastic, works well	dries safely	7.7	-
125.	2 33 20 2 W5 (south bank Quirk Creek, ¾ mile above Sheep River)	Porcupine Hills	(1) shale, dark grey to buff, sandy; 5 ft bed	22.6	rather short, works fairly well	dries safely	5.5	-
			(2) shale, dark grey; 4 ft bed	25.7	plastic, works very well	dries safely	6.6	-
			(3) shale, light grey, sandy; 4 ft bed	21.3	rather short, works fairly well	dries safely	4.9	-
126.	3,4 35 20 2 W5 (1½ miles below junction of Sheep River and Quirk Creek)	Porcupine Hills	(1) shale, light greenish-grey to dark grey; in beds up to 9 ft thick totalling 60 ft, some sandstone interbeds up to 2½ ft thick	24.4	plastic, works very well	dries safely	6.3	-
			(2) shale, light to dark greenish grey, sandy; 11 ft succession	25.3	very plastic, works very well	dries safely	7.2	-
127.	5,6 1 20 3 W5 (west flank main Turner Valley anticline below Lineham ford)	Belly River	shale, dark grey, sandy; 120 ft succession, includes several interbeds of hard nodular sandstone	22.0-22.8	rather short to plastic, fair to good workability	dries safely	6.2-6.4	-
128.	9 2 20 3 W5 (Sheep River, near Lineham)	Belly River	shale, dark grey; 33 ft bed	23.2	plastic, works well	dries safely	6.9	-
129.	- - 21 3 W5 (vicinity of Sheep River)	Alberta Group	clay, light grey	24	very plastic, smooth but stiff, poor workability	dries poorly	8	11

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
010-02	0.3-5.1	15.1-6.5	medium red (yellow specks)	steel hard	overfired above cone 02, not yet vitrified @ cone 3	useful for blending to lower the burning temperatures of other clays		Worcester (1932), p. 5, 36-38, 79, 86, 109.
07-3	0.1-2.1	12.2-7.8	greyish red	steel hard	-	low grade ware, probably by dry-press process only		
07-3	0.7-4.8	14.0-6.1	medium red	steel hard	-	dry-press ware, possibly stiff-mud brick		
07-4	0.7-4.4	13.3-4.7	greyish red	steel hard	-	common and stock brick by dry-press process		Worcester (1932), p. 5, 34-36, 79, 85, 86, 109, 114.
1-3	0.7-1.7	14.4-13.4	light greyish red (slightly scummed)	steel hard	-	doubtful value	Beds dip steeply, overburden 30 ft	
010-02	s.s.-5.6	16.0-4.4	medium red (badly scummed)	steel hard	little further vitrification between cones 02 and 3, overfires @ cone 4	common and stock brick, possibly paving brick, hollow tile		
07-1	1.1-4.6	12.4-4.6	medium red (scummed)	steel hard	little further vitrification above cone 1, bloats slightly @ cone 5	"concretion-free" shale properties are within commercial ranges	Clay-ironstone concretions abundant - removal likely not practicable	
04-3	0.4-5.7	14.9-2.5	dark red	steel hard	vitrification rapid above cone 02	common and stock brick		Worcester (1932), p. 5, 26-29, 78, 84, 103, 165.
04-4	0.0-5.4	15.8-3.1	dark red	steel hard	-	general line of red ware and heavy clay products		
04-3	0.7-5.9	13.8-3.5	dark red	steel hard	overfired above cone 3	common, face, and paving brick, quarry tile, roofing tile, hollow blocks, drain tile	Beds dip at 40°	
04-4	0.3-5.2	16.5-5.5	purplish red (badly scummed)	steel hard	-	common brick, building and drain tile		
04-3	0.9-6.6	16.2-1.4	dark greyish red (slightly scummed)	steel hard	nearly vitrified @ cone 3	common and face brick, building tile, possibly paving brick		Worcester (1932), p. 5, 43, 44, 79,
04-3	0.1-4.5	16.0-7.5	greyish red (slightly scummed)	steel hard	overfired, swelled @ cone 5	common and stock brick, hollow building tile	Capped by 3 ft sandstone bed	Worcester (1932), p. 5, 42, 43, 79, 87, 88, 101.
04-3	0.7-7.2	18.1-0.7	greyish red	steel hard	vitrified @ cone 3	common and stock brick, hollow building tile, possibly face brick		
02-3	s.s.-4.3	18.7-10.6	pinkish buff	steel hard	overfired, swelled between cones 3 and 5	possibly common brick and tile		
04-3	0.3-6.1	16.3-1.8	light greyish red	steel hard	vitrification rapid above cone 1; overfiring, swelling above cone 3	common brick, building and drain tiles		Worcester (1932), p. 5, 44-46, 79, 89.
07-1	1.8-6.0	11.8-2.4	medium clear red (slightly scummed)	steel hard	overfired, swelled between cones 1 and 3; bloats @ cone 5	face and common brick, building tile, possibly paving brick		
07-1	0.4-5.2	14.8-4.1	medium dark red	steel hard	little further vitrification above cone 1	stiff-mud face brick, paving brick, quarry tile, roofing tile, other similar wares		Worcester (1932), p. 5, 29-31, 78, 84, 85, 106.
04-1	1.9-5.3	10.0-2.4	dark red	steel hard	vitrified @ cone 3	stiff-mud face brick, paving brick, quarry tile, roofing tile		Worcester (1932), p. 5, 29-31, 78, 84, 85.
010-3	1.6-4.0	12.0-4.8	buff - grey	steel hard	little further vitrification above cone 3	dry-press face brick, possibly sewer pipe if cracking defects overcome		Keele (1915), p. 41, 42.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA IV (continued)							
130.	5 5 21 3 W5 (south side Quirk Creek, above Fisher Creek)	Belly River	(1) shale, light green; in beds up to 48 ft thick totalling 120 ft, several interbeds up to 14 ft thick of sandstone	23.0	fairly plastic, works fairly well	dries safely	6.0	-
			(2) shale, bluish grey, sandy; 124 ft succession, some interbeds up to 2 ft thick of sandstone	20.9	rather short, gritty, poor to fair workability	dries safely	5.7	-
			(3) shale, dark bluish grey, hard, splintery; 66 ft succession	17.3	rather short, fair workability	dries safely	4.1	7
131.	14 5 21 3 W5 (Quirk Creek, west of Millarville)	Belly River	shale, light buff to grey, sandy; in beds up to 19 ft thick totalling 50 ft, some interbeds up to 4½ ft thick of sandstone	20.9	rather short, gritty, fair workability	dries safely	4.9	-
132.	4 12 21 3 W5 (Quirk Creek)	Recent	(1) clay, light greenish and brownish grey, calcareous, soft; 15 ft succession	39.5	exceedingly fat, sticky, difficult to work	dries safely in slow drying (small trial pieces)	14.8	-
			(2) clay, light to dark buff, calcareous, slightly silty, soft; 15 ft succession	31.6	plastic, works very well	dries safely in slow drying (small trial pieces)	11.2	-
133.	9 4 22 3 W5 (east side Fish Creek, 4 miles above Priddis)	Edmonton ?	shale, brownish grey; 12 ft succession	24.5	fat, works very well	dries safely	6.9	-
134.	7 10 22 3 W5 (Fish Creek, 2 miles above Priddis)	Edmonton ?	shale buff to dark grey; 8 ft bed	25.0	plastic, works very well	dries safely	7.9	-
135.	12 23 22 3 W5 (Fish Creek, Priddis)	Paskapoo ?	(1) shale, buff to greenish grey, sandy; 16 ft succession	25.6	rather short, works fairly well	dries safely	5.1	-
			(2) shale, buff to greenish grey, slightly sandy; 18 ft succession	28.3	slightly short, works well	dries safely	7.1	-
		Edmonton ?	shale, buff to dark grey; 11 ft succession	32.6	plastic, works very well	dries safely in slow drying (small trial pieces)	10.0	-
136.	1 34 22 4 W5 (south side of road, 17 miles west of Midnapore)	Belly River (possibly Edmonton ?)	(1) shale, greyish green; 50 ft bed	22.0	very plastic, works well	cracks in fairly rapid drying	8.0	7
			(2) shale, light to dark grey; 50 ft bed	22.5	very plastic	cracks in fairly rapid drying	7.2	6½
137.	10 19 23 4 W5 (west bank Elbow River, 2½ miles below Bragg Creek bridge)	Belly River	shale, ochreous to greenish grey, sandy; 54 ft succession	27.5	short, works fairly well, slightly gritty	dries safely	6.4	6
138.	7 11 23 5 W5 (east side Elbow River, 1 mile above Bragg Creek P.O.)	Alberta Group	shale, brownish grey, fissile; 41 ft succession	18.1	short, very poor workability	dries safely	4.0	9
139.	12 12 23 5 W5 (Elbow River, Bragg Creek P.O.)	Blairmore	(1) shale, greenish grey, silty, hard; 30 ft bed	17.4	short, very poor workability, gritty	dries safely	3.8	9+
			(2) shale, maroon and greenish grey, silty; 2½ ft bed	17.0-18.2	short, poor workability, gritty	dries safely	3.8-4.4	7
140.	2 13 23 5 W5 (Elbow River, 1 mile below Bragg Creek P.O.)	Blairmore	shale, greenish grey, sandy; 50 ft succession	18.5	plastic, gritty, works fairly well	dries safely	4.9	9+
141.	- - 24 1 W5 (Riverside, Calgary)	Pleistocene	clay, numerous pebbles	19.4	good plasticity, gritty	-	6.9	5
142.	13 24 24 2 W5 (pit at Brickburn, near top of escarpment above Bow River)	Porcupine Hills	shale, dark grey, soft; 6 ft bed	18	good plasticity, gritty	dries safely	6	15

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
07-3	0.7-4.8	14.6-3.6	medium dark red	steel hard	-	stiff-mud face brick, paving brick, quarry tile, roofing tile, other similar red wares		Worcester (1932), p. 5, 31-34, 78, 85, 108.
04-4	1.7-4.0	12.5-5.8	medium light red	steel hard	overfired above cone 3	common, stock, and face brick, hollow building tile	Beds dip steeply	
02-3	0.7-2.7	12.9-7.3	greyish red (slightly scummed)	steel hard	-	stock brick		
04-4	0.9-4.5	14.4-5.3	medium red	steel hard	-	stiff-mud face brick, paving brick, quarry tile, roofing tile, other similar red wares		Worcester (1932), p. 5, 31-34, 78, 85, 107.
04-02	2.2-5.3	12.6-1.9	medium bright red (slightly scummed)	steel hard	cracked on firing, bloated @ cone 1	doubtful ceramic value owing to short firing range; good light-weight aggregate raw material		Worcester (1932), p. 5, 41, 42, 79, 87, 96.
04-3	1.3-6.6	13.2-0.2	medium red (badly scummed)	steel hard	vitrified @ cone 3	possibly common brick		
07-1	0.8-5.8	16.1-3.2	brownish red	steel hard	overfired, swelled above cone 1	face, common and paving brick; roofing, floor and quarry tile, hollow building tile, other similar red wares		Worcester (1932), p. 5, 47, 49, 50, 51, 79, 89.
010-02	0.0-5.1	13.5-1.2	medium red	steel hard	vitrified above cone 02	all structural wares, possibly also paving brick and quarry tile		Worcester (1932), p. 5, 47, 49, 79, 89.
04-4	1.1-6.6	16.8-5.1	medium red	steel hard	-	possibly face brick and roofing tile especially if blended to lower the absorption	Overlies massive 25 ft sandstone bed, separating it from shale below	Worcester (1932), p. 5, 46-49, 79, 88.
07-3	1.6-6.4	14.4-3.8	light red	steel hard	overfired above cone 3	face brick, building and drain tile		
010-02	1.0-6.7	15.6-2.9	dark red	steel hard	overfired above cone 02	face, common and paving brick, roofing and quarry tiles, building tile, possibly dry-press brick	Possibly in slump block	
06-02	1.8-7.5	11.5-0.3	salmon red - red	fairly hard - steel hard	-	probably brick and tile if cracking tendency overcome	Beds dip at 30°	R.C.A. files (1954).
06-02	1.7-7.7	13.4-0.9	light - dark red	fairly hard - very hard	-			
04-3	1.2-4.2	16.2-8.8	light red (slightly scummed)	steel hard	-	common brick, hollow structural ware	Beds nearly vertical	Worcester (1932), p. 6, 52, 53, 80, 92, 107.
010-3	0.0-3.5	15.3-7.4	light orange (badly scummed)	steel hard	-	doubtful value		Worcester (1932), p. 6, 50, 80, 92.
07-02	0.6-3.8	13.8-7.9	light red (slightly scummed)	steel hard	little further vitrification between cones 02 and 3	dry-press brick		Worcester (1932), p. 6, 50, 51, 80, 92.
010-02	0.0-3.8	15.2-6.3	dark velvet red	steel hard	little further vitrification between cones 02 and 5	wide range of red clay products		
010-02	s.s.-2.3	13.9-8.4	medium red	steel hard	little further vitrification above cone 02, overfires above cone 1	common brick, hollow tile		Worcester (1932), p. 6, 52, 80, 92, 113.
010-03	0.2-4.4	11.6-3.1	red	-	overfired, swelled between cones 03 and 1	possibly brick		Ries and Keele (1912), p. 41.
010-3	0.0-3.6	13.2-4.5	red	-	little further vitrification between cones 3 and 5, vitrified @ cone 9	brick, fireproofing, sewer pipe (takes good salt glaze), (did not warp in roofing tile tests)		Ries and Keele (1913), p. 62-64, 98.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA IV (continued)							
143.	SE 24 24 2 W5 (Brickburn, railroad cut on south side of track)	Porcupine Hills	shale, light to dark grey and greyish green, sandy in part; 18 ft succession	22	very plastic, works well	cracks in rapid drying	8	5½
144.	NE 26 24 2 W5 (west bank Bow River)	Porcupine Hills	clay, light grey, calcareous; 6 ft bed	24.0	plastic, works well	cracks in rapid drying	7.4	5½
145.	6 7 24 5 W5 (12 miles south of Radnor, 1 mile south on road to Jumpingpound Ranger Station)	Edmonton	shale, olive green, dark grey and black; 18 ft succession, with 1 ft bed of sandstone near top	18.5-21.0	works well	cracks in rapid drying	5.4-6.7	4-5½
146.	- 35 24 10 W5 (railroad spur to Canmore coal mines)	Recent?	surface clay, in small pockets under boulder till, silty, calcareous	22	-	-	4.2	-
147.	15 33 25 4 W5 (near mouth Jumpingpound Creek, south of bridge)	Recent	clay, earthy, chalky white, silty, highly calcareous; 30 ft succession	19.5	plastic; poor to fair workability	dries safely	4.7	-
148.	4 1 26 4 W5 (north of railway track, 1¼ miles east of Cochrane)	Porcupine Hills	(1) shale, brownish grey, very calcareous	25.4	good plasticity, works well	cracks in rapid drying	6.5	3½
			(2) shale, brownish grey, very calcareous	26	very plastic, works well	cracks in rapid drying	6.6	3½
149.	- 2? 26 4 W5 (railroad cut east of Cochrane)	Porcupine Hills	shale, bluish grey, calcareous; 40 ft+ succession	20-21	good plasticity, gritty	cracks slightly in rapid drying	5.1	1
150.	8 3 26 4 W5 (Cochrane area)	Porcupine Hills	clay, dark grey, calcareous	19	excellent plasticity, (flows through die)	-	7	3+
151.	14 5 26 4 W5 (south side Bow River, ⅜ mile downstream from CPR bridge west of Cochrane)	Edmonton ?	(1) shale, dark grey, hard, calcareous; 16 ft succession	22.9	plastic, works well	dries safely	6.8	-
			(2) shale, greenish grey, sandy; 25 ft succession	23.0	plastic, works well, somewhat gritty	dries safely	5.8	-
152.	- 9? 26 5 W5 (along CPR tracks, west of Mitford)	Belly River	shale, dark grey, soft, sandy, non-calcareous; 30 ft succession	17	moderately plastic (flows through die), gritty	dries safely	5	3
153.	9 13 26 5 W5 (Grand Valley, west of Cochrane)	Belly River?	shale, greenish grey to dark green, sandy, carbonaceous, soft; 32 ft succession	28.3	plastic, gritty; works well	dries safely	7.4	-
154.	11 17 26 5 W5 (Spencer Creek, west of Cochrane)	Alberta Group	shale, dark grey to black, hard, silty; 30 ft succession	16.0	very short, gritty, very poor workability	dries safely	2.9	7

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
06-02	1.7-3.7	11.6-5.2	light red	fairly hard - very hard	-	possibly brick and tile if cracking tendency overcome	Capped by 15 ft of interbedded sandstone and shale	R.C.A. files (1954).
02	1.9	22.5	cream buff	soft	-	no ceramic value, possibly useful as a fine grained inert filler (in lightweight aggregate tests, clay fused without bloating)		R.C.A. files (1954).
06-02	0.7-6.8	14.6-0.3	light - dark red	fairly hard - very hard	-	possibly brick and tile if drying defects overcome	Overburden up to 28 ft, includes massive sandstone and thin coal seam	R.C.A. files (1954).
010-03	s.s.	35.4-?	light cream	-	-	no value	Insufficient amount for working	Ries and Keele (1912), p. 116, 117.
3-5	s.s.-9.0	31.6-9.2	cream	steel hard	expanded between cones 07 and 3, absorption increases up to cone 1	doubtful value, possibly common brick by soft-mud process, products of extreme absorbency		Worcester (1932), p. 6, 74, 75, 81, 93, 97.
04-01	0.5-0.8	17.6-8.7	salmon - brownish red	fairly soft - very hard	-	possible common brick and tile		R.C.A. files (1948).
06-01	0.8-6.9	15.8-1.3	dark salmon - brownish red	fairly hard - steel hard	vitrification rapid above cone 04			
010-03	0.7-2.0	18.7-15.6	red	steel hard	-	possibly dry-press brick		Ries and Keele (1912), p. 109-11.
05-1	0.8-4.0	18.1-2.6	red	-	-	possibly brick and tile		Ries (1915), p. 60.
04-1	1.2-6.3	13.8-0.0	medium red (yellow specks)	steel hard	vitrified @ cone 1	face brick, stock and common brick, roofing tile, possibly paving brick	Capped by 40 ft sandstone. Beds dip fairly steeply	Worcester (1932), p. 6, 73, 74, 81, 93, 103.
04-1	1.3-4.5	11.6-4.0	medium red	steel hard	little further vitrification between cones 1 and 3	face brick, stock and common brick, roofing tile, hollow ware	Beds dip fairly steeply	
010-1	1.0-5.0	11.1-3.1	red	-	-	dry-press brick, fireproofing		Ries and Keele (1913), p. 60-62.
010-1	0.2-6.5	17.9-2.6	dark red	steel hard	vitrification rapid between cones 04 and 02, little further vitrification between cones 1 and 3	face brick, roofing tile, quarry tile, floor tile, paving brick, possibly red terra cotta	Beds dip steeply, overlie 6 ft coal seam	Worcester (1932), p. 6, 71, 72, 81, 93.
07-3	0.0-2.2	14.6-8.3	medium red (yellow specks)	steel hard	-	perhaps as grog for blending with high-shrinkage clays, good road-surfacing material	Beds dip steeply	Worcester (1932), p. 6, 71, 80, 93.

Locality Number	Location of Deposit Lsd.	Sec.	Tp.	R.	Mer.	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA V (CENTRAL ALBERTA)											
	Utilized Deposits											
155.	13?	21	35	28	W4 (Innisfail, clay bank at old brick plant)	Pleistocene	stiff clay alternating with bands of silty clay and sand	-	-	dries safely	-	-
156.	-	17?	38	27	W4 (Red Deer, near old brickyards)	Pleistocene	(1) laminated sandy clay, light grey, calcareous; up to 6 ft thick	22	good plasticity	-	4.8	2
							(2) joint clay, yellowish grey, silty, hard; 2 ft to 3 ft thick	25	good plasticity	-	7.6	1
157.	-	14	46	24	W4 (Wetaskiwin)	Pleistocene	surface clay, sandy clay loam, 4 ft bed	-	-	-	-	-
	Undeveloped Deposits											
158.	2	7	22	21	W4 (northwest of Cluny)	Pleistocene	clay, glacial lake, varved, light brown, dark grey and black, calcareous; 13 ft bed	-	"sensitive to temper"	cracks in drying	"high" ?	-
159.	SW	18	22	22	W4 (near Gleichen)	Pleistocene	clay, light grey, calcareous	26.4	slightly sticky, works well (flows through die)	safe in slow drying	8.8	-
160.	-	NE	22	23	W4 (½ mile west of Gleichen; stream on north side CPR main line)	Paskapoo (possibly Edmonton)	(1) shale, dark grey, hard; 15 ft bed	26	fairly plastic	cracks in drying	7	7
							(2) shale, light grey, slightly calcareous; 7 ft bed	34	good plasticity (flows smoothly through die)	cracks badly in drying	12.3	4
161.	5	24	22	23	W4 (1 mile northwest of Gleichen)	Paskapoo (possibly Edmonton)	(1) shale, dark grey, tough; 35 ft succession	46.2	very tough, fair workability	cracks badly in slow drying	13.1	15
							(2) shale, greenish grey, sandy; 4 ft and 3 ft beds	28.8-31.2	very plastic, sticky, works fairly well	cracks in slow drying	8.5-9.9	11-15
162.	-	15	28	18	W4 (mouth of Willow Creek, 6 miles east of Drumheller)	Edmonton	shale, light grey; 12 ft bed	32.8	very plastic, tough, works fairly well	cracks badly in slow drying	10.0	10
163.	15	23	28	2	W5 (railroad cut, 6 miles west of Crossfield, 1000 ft west of Nier)	Pleistocene ?	clay, probably glacial, light brown, highly calcareous, a few small pebbles; 6 ft bed	21	good workability	dries fairly safely	6.0	4
164.	-	15	29	23	W4	Paskapoo (possibly Edmonton)	clay, dark greenish grey, slightly calcareous and ferruginous	-	poor plasticity, slightly gritty	-	-	"easily fused"
165.	SE	32	30	3	W4	Bearpaw ?	clay, highly calcareous, slightly magnesian and ferruginous	-	poor plasticity, slightly gritty	-	-	"easily fused"
166.	-	9	31	23	W4	Paskapoo	clay, bluish grey, slightly calcareous and ferruginous, cooly, silty	-	poor plasticity, slightly gritty	-	-	"easily fused"
167.	-	18	31	1	W5 (Didsbury area)	Porcupine Hills	shale, yellowish, calcareous	-	very plastic, smooth	dries safely	5.6	-
168.	4	18	31	1	W5 (½ mile south of CPR station at Didsbury)	Porcupine Hills	(1) shale, dark grey, calcareous; 6 ft bed	-	good plasticity, works well	dries safely	5	-
							(2) shale, grey, very calcareous; 3 ft bed	21	good plasticity, works very well	dries safely	5	-
169.	14	36	35	1	W5 (4 miles west of Innisfail, south bank Red Deer River)	Paskapoo	shale, 15 ft bed	-	highly plastic, works well	-	-	4

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
-	-	-	-	-	-	common brick	Used for making stiff-mud brick by Innisfail Brick Co. in 1913	Keele (1915), p. 29, 30.
010-03	s.s.	24.4-23.7	red	hard	vitrified suddenly @ cone 1	doubtful value	Used for making common soft-mud brick at Red Deer before 1910	Ries and Keele (1912), p. 35, 36.
010-03	1.6-3.4	18.2-13.2	light red	very hard	-	possibly dry-press brick		
-	-	-	-	-	-	common brick	Used in 1911 for making stiff-mud brick; overlies 10 ft of stiff, stratified clay which could probably be worked also	Ries and Keele (1913), p. 14.
010-03	2.2-2.6	16.7-14.2	light - dark red	very hard - steel hard	-	doubtful ceramic value owing to scumming and high shrinkage (tested favorably for lightweight aggregate)		R.C.A. files (1952).
07-02	0.0-4.2	15.7-6.0	red	hard - steel hard	-	common brick, drain tile, possibly structural tile		R.C.A. files (1950).
010-03	1.6-4.0	14.7-11.7	red brown	-	-	common brick if blended with (2) below		Ries (1914a), p. 16-18, 66.
010-05	1.2-6.0	11.9-1.3	light - deep red	steel hard	little further vitrification between cones 03 and 1	common brick		
06-1	4.0-7.0	10.2-6.9	salmon - light brownish red	fairly hard - very hard	-	doubtful value		Crockford (1951), p. 95, 100.
06-1	1.0-5.7	13.3-2.3	salmon - red	fairly hard - steel hard	-			
06-1	1.3-6.0	13.4-2.2	salmon - brownish red	fairly hard - steel hard	-	doubtful value - cracks too badly	Overburden 30 ft	Crockford (1951), p. 95, 101.
02	1.0	17.0	light buff	soft	-	no value		R.C.A. files (1954).
-	-	-	reddish brown	-	-	possibly common brick		Wait (1909), p. 113.
-	-	-	light reddish brown	-	-	possibly common brick		Wait (1909), p. 113.
-	-	-	dull reddish brown	-	-	possibly common brick		Wait (1909), p. 113.
03-1	0.4-5.7	24.8-13.2	buff	hard	-	possibly brick	Overburden 20 ft, includes sandstone capping	Ries and Keele (1912), p. 111-12.
06-1	0.0-6.0	14.0-0.0	red - brown	-	vitrified @ cone 1, begins to soften @ cone 3	stiff-mud brick, sewer linings, fireproofing and hollow building blocks, possibly face brick		Keele (1915), p. 36-38.
03	0.3	21	cream	-	began to soften @ cone 3	face brick if blended with (1) above, common brick by dry-press or stiff-mud process		
06	-	"dense body"	bright red	-	-	brick, fireproofing		Keele (1915), p. 38.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA V (continued)							
170.	- 35 37 14 W4 (Castor, near Coalbeck Colliery)	Edmonton	(1) shale, grey	-	highly plastic, stiff, sticky, poor workability	cracks badly in drying	-	3
			(2) clay, dark brown, coaly	-	-	dries safely (small trial pieces)	-	5
171.	- 23 37 22 W4 (7 miles east of Delburne, along Red Deer River)	Edmonton	(1) shale, cream, bentonitic, slightly silty; 7 ft bed	30.3	very plastic, sticky, works fairly well	cracks very badly in slow drying	-	-
			(2) shale, steel grey, flaky; 2½ ft bed	32.2	very plastic, tough, works fairly well	cracks very badly in slow drying	-	-
172.	1 28 38 22 W4 (9 miles east of Delburne, along Red Deer River)	Edmonton	(1) shale, cream, sandy, bentonitic; 4½ ft bed	34.7	highly plastic, sticky, poor workability	cracks very badly in slow drying	-	15
			(2) clay, cream, very sandy, bentonitic; 11½ ft bed	40.0	sticky, very gritty, works fairly well	cracks in slow drying	3.5	9
173.	SE 17 38 27 W4 (Red Deer River, above railway bridge at Red Deer)	Paskapoo	shale, grey, very calcareous; 10 ft bed	25	good plasticity	cracks in rapid drying	6.9	1
174.	N 15 39 22 W4 (CPR railroad between Alix and Nevis)	Edmonton	shale, white, hard, sandy; 2 to 4 ft bed	22	highly plastic, sticky	dries poorly	6	16
175.	- 3? 39 23 W4 (railroad cut near Stone siding between Bullocksville and Alix)	Pleistocene	clay, yellowish grey, silty, slightly calcareous, soft, interlaminated with layers of hard grey clay; 20 ft succession	24	very plastic	-	8	2
176.	- 28 40 22 W4 (near Mirror)	Pleistocene	clay, buff, silty, slightly calcareous	-	very plastic, gritty, rather sticky	dries poorly	5	-
177.	- 18 44 8 W5 (east bank North Saskatchewan River)	Pleistocene	clay (lake), light grey, highly calcareous	33.0	good plasticity, somewhat sticky, works well	cracks in rapid drying	9.0	3
178.	- 21? 46 20 W4 (railroad cut 3 miles south of Camrose)	Edmonton	(1) shale, yellow, soft, contains thin layers of ironstone concretions	29	smooth, sticky, poor workability	cracks badly in drying	8.8	3
			(2) shale, yellowish grey	26	very stiff, poor workability	cracks in drying	7	1
			(3) shale, dark brown	25	-	cracks in drying	5.6	3
179.	- 19 46 22 W4 (railroad cut, 1 mile east of Gwynne)	Edmonton	shale, grey, silty, soft; 13 ft bed	24	fair plasticity, somewhat sticky, gritty (flows smoothly through die)	cracks in drying	8	2
180.	- 23 46 23 W4 (1½ miles west of Gwynne)	Edmonton	shale, olive green, soft; 15 ft succession	25	very plastic, sticky, poor workability	cracks in drying	8.5	2
181.	- 2? 47 20 W4 (Camrose, in valley of small stream flowing through town)	Edmonton	clay, grey, sandy, highly calcareous	25	medium to low plasticity, very gritty (flows smoothly through die)	dries fairly safely	6	2
182.	- 2? 47 20 W4 (Camrose Collieries)	Pleistocene ?	clay (glacial), rather silty, with pebbles of granite, quartzite and limestone	-	fairly plastic (narrow tempering range)	cracks in slow drying (large pieces)	-	-
183.	- 11? 48 20 W4 (Dinant siding, 8 miles north of Camrose)	Edmonton	shale	26	very stiff and sticky	cracks in drying (small trial pieces)	7.5	2

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
-	-	-	red	-	-	possibly common or dry-press brick or fireproofing if treated to improve workability and drying properties		Keele (1915), p. 35-36.
06	-	-	red	very hard	-	brick, if fired slowly to avoid bloating		
-	-	-	-	-	too badly cracked to fire	no value		Crockford (1951), p. 95, 101.
-	-	-	-	-	too badly cracked to fire	no value		
-	-	-	-	-	too badly cracked to fire	no value		Crockford (1951), p. 96, 102.
6	1.5	14.5	light brown	fairly hard	-	no value		
03	1.0	18.5	pink	-	-	possibly common brick, dry-press brick		Ries and Keele (1912), p. 112-13.
06-5	1.0-4.0	13.0-4.3	cream - buff	-	little further vitrification between cones 1 and 5, vitrified @ cone 10	possibly dry-press face brick	Overburden 50 ft Chemical analysis no. 7	Keele (1915), p. 33-35.
06-03	0.3-7.0	18.5-3.0	red (scummed)	very hard	-	common brick by either stiff-mud or soft-mud process		Keele (1915), p. 28, 29.
010	0.0	"dense"	-	steel hard	not softened @ cone 1	common brick, possibly hollow building tile if drying quality improved		Keele (1915), p. 29.
06-02	1.3-2.3	16.2-12.2	salmon (scummed)	fairly hard - hard	-	no value	In slump block 100 ft thick	R.C.A. files (1971).
010-03	1.0-5.8	14.6-3.6	red (scummed)	hard - steel hard	vitrified @ cone 1	possibly facing brick by dry-press process	Overlies three thin lignite seams	Ries and Keele (1913), p. 57, 58, 86.
010-03	0.6-8.3	16.2-0.8	red	hard - steel hard	vitrified @ cone 03, shrinkage reduced by preheating	unspecified	Lies between lignite seams	
010-03	3.4-9.6	10.7-1.6	red	steel hard	-	unspecified	Underlies lowest lignite seam	
010-03	1.3-5.3	14.5-8.7	red	very hard - steel hard	-	common brick (warped in roofing tile test)		Ries and Keele (1913), p. 55, 97.
010-05	1.4-2.0	10.6-9.3	red	very hard	began to soften @ cone 1, bloated and cracked unless fired very slowly	no value, unless subjected to preheating treatment to improve drying properties and drive off carbonaceous content	Organic carbon content 0.88%	Ries and Keele (1913), p. 54, 55, 86, 88.
03	0.6	13.4	red	steel hard	began to soften @ cone 1	possibly stiff-mud wire-cut brick, drain tile		Ries and Keele (1913), p. 56.
05	"normal" ?	11.2	red (scummed)	-	-	doubtful value without special processing		R.C.A. files (1947).
010-03	1.0-7.5	12.5-4.0	red	steel hard	softened @ cone 1	unspecified	Overlies lignite seam which was mined to a limited extent about 1911	Ries and Keele (1913), p. 59.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA VI (EDMONTON)							
	Utilized Deposits							
184.	- 18 52 14 W4 (Vegreville)	Pleistocene	clay, brownish grey, very sandy, non-calcareous; from surface to depth of 12 ft	-	very plastic, works very well	cracks badly in rapid drying	7	-
185.	- - 52 24 W4 (South Edmonton)	Edmonton	shale, bluish grey	25	very plastic, stiff, sticky (flows smoothly through annular die)	safe in slow drying	10	3
186.	- - 53 24 W4 (Edmonton)	Recent	(1) clay (floodplain), sandy, silty, calcareous; 7 to 10 ft bed	20	plastic, very gritty	-	5.6	2
			(2) clay (less sandy layers of floodplain succession)	25	-	-	8	-
187.	NE 21 53 25 W4 (north of Edmonton)	Pleistocene	clay, yellowish, sandy, calcareous	-	fairly plastic, very gritty	-	7.2	5
188.	SW 27 59 17 W4 (½ mile from White Mud Creek, near Smoky Lake)	Belly River ?	clay, yellowish, sandy; 4 ft bed	-	gritty	dries fairly safely	-	-
	Undeveloped Deposits							
189.	- 1? 51 19 W4 (Tofield)	Edmonton ? (possibly Bearpaw)	shale, dark grey, soft	-	plastic	cracks badly in drying	8.7	13
190.	- - 52 24 W4	Edmonton	(1) shale, grey, calcareous	28.6-35	very plastic, smooth, sticky, difficult to mold	cracks in rapid drying	10.4-13.1	5-6
			(2) shale, grey, sandy	33	very plastic, sticky, gritty	cracks in rapid drying	8.1	-
191.	- 30? 52 24 W4 (Edmonton, University of Alberta grounds)	Pleistocene	clay (glacial lake), tough	34	very plastic, sticky, smooth	-	8.9	5
192.	NE 15 53 25 W4 (north of Edmonton)	Pleistocene	clay (glacial lake)	25	very smooth, plastic	-	8.2	5
193.	2,3 15 53 4 W5 (coal strip mine on north side Wabamun Lake)	Paskapoo	(1) clay, grey, non-calcareous; 1 ft and 1½ ft beds	28.9-29.7	good plasticity, works well (extrudes very well under 28-inch Hg vacuum)	cracks in slow drying	7.3-8.3	11-12
			(2) clay, dark brown, kaolinitic, non-calcareous, coaly, hard; 1 ft bed	35.8	low plasticity, short, (extrudes with difficulty under 28-inch Hg vacuum)	cracks in rapid drying	4.7	30+
194.	- 29 53 7 W5 (Entwistle, south bank Lobstick River)	Paskapoo	(1) shale, yellowish, silty, soft; 7 ft bed	24	good plasticity, gritty, (flows through 3 inch annular die)	dries fairly safely	6	7
			(2) shale, grey; 11 ft bed	22	good plasticity, rather smooth, good workability	cracks in rapid drying	5.7	3
195.	15 30 53 7 W5 (northwest of Entwistle, on Lobstick River)	Paskapoo	(1) shale, grey, blue, and green, slightly calcareous; 10 ft bed	24	good plasticity, slightly gritty	cracks in rapid drying	6.7	3
			(2) shale, grey, brown, and green, sandy in part, calcareous; 9 ft and 13 ft beds	22.0-22.5	plastic, smooth, somewhat gritty	cracks in rapid drying	4.7-4.8	3-5+
			(3) shale (underclay), dark grey, carbonaceous; 3 ft+ bed	35	very plastic, sticky, difficult to work	cracks badly in slow drying	10.2	15
			(4) shale, grey, calcareous, silty; 6 ft bed	24	medium plasticity, gritty	dries safely	5.4	5

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
06	-	-	red	very hard	-	possibly brick by soft-mud process if dried slowly	Used for brick making by Vegreville Brick Co. in 1913	Keele (1915), p. 31.
010-03	0.6-2.3	12.5-10.6	red	very hard	vitrification rapid above cone 03, vitrified @ cone 1	dry-press brick	Used for making dry-press brick by Western Clays Ltd. in 1911	Ries and Keele (1913), p. 48, 49.
03-1	s.s.-4.0	17.8-1.8	light red - brown	hard - vitrified	-	doubtful value - too sandy	Used for making dry-press and soft-mud brick by Edmonton Brick Co. in 1910	Ries and Keele (1912), p. 37, 38.
010-03	s.s.-5.3	19.0-5.9	red - dark red	hard	vitrified below cone 1	dry-press brick		
05-03	0.8-1.3	19.4-11.7	red	-	vitrified @ cone 3	soft-mud brick	Used for making common and pressed brick by Acme Brick Co., quarry opened in 1911	Ries and Keele (1913), p. 17, 18.
-	-	-	buff	fairly soft	-	common brick	Used for making stiff-mud brick by Zuchka Brick Co. in 1920	Allan (1921).
-	-	-	-	-	overfired @ cone 4 (when blended with 25% calcined clay and 2% salt)	(sewer pipe tests unfavorable - probably would not take salt glaze)	Underlies lignite seam. Chemical analysis no. 8	Ries and Keele (1913), p. 85, 86, 89, 93, 94.
010-3	0.2-6.7	14.2-1.2	light - dark red	-	-	doubtful value owing to very high shrinkage, possibly dry-press brick		Ries and Keele (1912), p. 98-100.
03	2.4	14.1	red	-	cracked on firing	doubtful value		
010-03	1.4-4.3	13.8-4.6	light red - red	steel hard	-	dry-press brick		Ries and Keele (1912), p. 39.
010-03	0.2-2.4	16.6-11.0	light red - red	steel hard	vitrified below cone 1	common brick, possibly sewer lining		Ries and Keele (1912), p. 39, 40.
08-02	0.7-7.2	14.8-0.5	light - reddish buff	very hard - steel hard	vitrification rapid above cone 04, vitrified between cones 02 and 2	structural clay ware if poor drying behavior and high shrinkage corrected by addition of sand or grog	Clay seams in coal measures, currently being scraped off and rejected in the coal-stripping operation of Alberta Coal Ltd. Chemical analyses nos. 9, 10	R.C.A. files (1971).
5	7.3	19.8	off white ?	fairly soft	-	white-burning, semi-fireclay		
010-1	0.0-4.3	14.5-5.0	red	-	vitrified between cones 1 and 3	brick, tile, fireproofing, possibly sewer pipe (although sewer pipe tests unfavorable)		Ries and Keele (1913), p. 50-53, 94, 97.
010-03	2.0-7.0	12.0-2.7	red	-	vitrified @ cone 1	dry-press brick, fireproofing, drain tile, (in roofing tile tests, dried safely and burned to good red color but warped badly)		
010-03	s.s.-4.4	14.6-6.0	light red	steel hard	vitrified, swelled @ cone 1	dry-press brick		Ries and Keele (1912), p. 100-104;
010-03	s.s.-3.6	18.0-8.7	red	very hard - steel hard	vitrified @ cone 1	common brick, possibly paving brick, sewer pipe or hollow brick		——— (1913), p. 50, 51.
010-03	0.6-7.3	14.5-1.0	light red - red brown	-	little further vitrification between cones 03 and 5, vitrified @ cone 13	unspecified	Underlies coal seam. Overburden 150 ft+	
010-1	0.0-6.4	18.0-3.5	light - dark red	-	vitrified @ cone 3	brick, dry-press brick, fireproofing		

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA VI (continued)							
196.	- 10? 58 3 W5 (Belvedere P.O.)	Pleistocene	(1) clay, yellowish, non-calcareous	-	very plastic, stiff	dries poorly	"high" ?	2
			(2) clay, yellow, sandy, very calcareous	-	poor plasticity, gritty	-	-	-
	AREA VII (NORTHERN ALBERTA)							
	Utilized Deposits							
197.	NE 9 66 22 W4 (east side Tawatinaw River valley, 1½ miles south of Athabasca)	Pleistocene	(1) clay (glacial lake), brownish grey, very calcareous	30.8-30.9	good plasticity, works well	cracks in rapid drying	7.5-8.4	-
			(2) clay (glacial lake), brownish grey, very calcareous, silty	28.1	flabby	dries safely	6.5	-
198.	NE 14 71 6 W6 (east side Bear Creek, ½ mile south of Grande Prairie)	Pleistocene	clay (postglacial), yellowish laminated, earthy, silty, calcareous; 8 ft bed	-	plastic (narrow tempering range)	dries safely (scums)	"low" ?	-
	Undeveloped Deposits							
199.	16 6 49 27 W5 (near coal mines at Pocahontas, south side Athabasca River)	Pleistocene	clay (glacial lake), dark grey, highly calcareous	25-26	very plastic, tough (flows smoothly through annular die)	safe in slow drying	7-7.5	4
200.	- 7 49 27 W5 (north side Athabasca River, opposite Pocahontas)	Lower Cretaceous ?	shale, calcareous; 6 ft bed	24	very plastic	-	4	4
201.	- 4? 54 16 W5 (west bank Wolf Creek, near Edson)	Paskapoo	shale; 4 to 5 ft bed	33	good plasticity (flows through die)	-	8.5	3-4
202.	- 24 56 25 W5 (near mouth Pinto Creek)	Pleistocene	clay (glacial lake), greyish buff, very calcareous	22.0	fair plasticity, works fairly well, tendency to be flabby	dries safely	5.7	3
203.	SE 9 70 6 W6 (from bottom of a muskeg)	Recent	clay, from bottom of muskeg, medium dark, few small pebbles, non-calcareous	-	fair plasticity, somewhat sticky when tempered	-	"high" ?	-
204.	- S½ 70 6 W6 (south of Wapiti River)	Recent	clay, dark, granular, non-calcareous, a few small pebbles; up to 20 ft thick	-	fair plasticity, slightly sticky when tempered	-	"high" ?	-
205.	- 2 72 10 W6 (near Beaverlodge)	Recent	clay, greyish, few small pebbles, calcareous	-	fair plasticity	dries safely	"satisfactory"	-
206.	15 8 89 9 W4 (Abasand Oils pit near Fort McMurray)	Lower Cretaceous (oil sands underclay)	(1) clay, brownish grey, non-calcareous; lenticular bed up to 8 ft thick	25	very plastic, works well, somewhat tough	cracks badly in rapid drying	8.0	18
			(2) clay, dark grey, calcareous; lenticular bed up to 9 ft thick	28.9	very plastic, tough, works well	cracks badly in rapid drying	7.8	14
			(3) clay, brownish black, non-calcareous; lenticular bed up to 4½ ft thick	24.7	good plasticity, works well	cracks badly in drying	7.3	15½
			(4) clay, creamy grey, non-calcareous; lenticular bed 3½ to 8 ft thick	23.6	very plastic, works well	cracks badly in drying	7.8	17½
			(5) clay, light greyish buff, non-calcareous; lenticular bed up to 9 ft thick	30.8	good plasticity, works well	cracks badly in drying, scums	8.0	14½
207.	- 14 89 9 W4 (Clearwater Pit #1)	Lower Cretaceous ?	clay, light brown	26	plastic, rather stiff	-	6.5	8

[1] includes drying plus fired shrinkage

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
010	-	"dense"	-	steel hard	-	common brick with addition of about 25% sand		Keele (1915), p. 30.
-	s.s.	"very porous"	buff	"chalky"	-	doubtful value, possibly common brick if blended with (1) above		
02-3	1.0-8.3	16.2-0.0	pale salmon - brownish red	soft - vitrified	no test firings between cones 02 and 3	doubtful value	Blended with other clays for use by Northwest Brick and Tile at Edmonton since 1958. Deposit more than 50 ft thick	R.C.A. files (1969).
02-3	0.1-6.4	22.8-2.8	pale buff - brownish buff (scummed)	very soft - steel hard	no test firings between cones 02 and 3	doubtful value		
05-01	6.4-16.3 (total[1])	17.9-0.6	light pink - yellowish green	-	overfired @ cone 01	possibly common brick	Used for sand-mold brick by K.J. Dalen Co. of Grande Prairie before 1946	Allan and Carr (1946), p. 41, 42.
1	1.9-2.7	25.0-27.6	cream	-	-	common brick, possibly facing brick, drain tile	Chemical Analysis no. 11	Ries (1914), p. 43, 44; — (1915a), p. 59, 60.
05-1	0.6-1.7	20.5-15.1	cream	hard - very hard	-	common brick	Associated with coal seam	Ries (1914), p. 42, 43.
010-05	1.5-8.7	15.5-0.0	deep red	hard - steel hard	vitrified @ cone 05, little further change up to cone 1	vitrified ware, fireproofing, possibly drain tile	Overburden 35 ft	Ries (1914), p. 39-41.
02	0.3	16.0	pale buff (scummed)	soft	-	no value		R.C.A. files (1971).
-	-	-	red	-	vitrified @ low temperature, bloated severely	doubtful ceramic value; possibly lightweight aggregate material		Allan and Carr (1946).
-	-	-	red	-	vitrified @ low temperature, bloated severely	doubtful ceramic value; possibly lightweight aggregate material		R.C.A. files (1945).
06	-	-	light red (scummed)	-	overfired abruptly @ cone 02	common brick		Allan and Carr (1946), p. 41.
06-2	1.3-3.1	12.4-3.9	pale - medium brown	fairly hard - very hard	-	dry-press brick; sewer pipe, brick and tile by stiff-mud process if drying qualities improved		Halferdahl (1969), p. 5, 6, 12-15.
06-04	1.8-s.s.	5.7-5.2	brown	very hard	overfired, bloated slightly @ cone 02	doubtful value		
06-5	0.9-2.3	16.6-11.2	light - medium brown	fairly hard - very hard	little further vitrification between cones 2 and 5	possibly clay ware as in (1) above if blended with more easily vitrified clays	Underlies 40 to 50 ft of oil sands overburden; rests on Paleozoic carbonates. Chemical analyses nos. 12-16	
06-5	0.5-2.3	11.5-6.9	light pinkish buff - buff	fairly hard - very hard	little further vitrification between cones 2 and 5	dry-press brick; sewer pipe, brick and tile by stiff-mud process if drying qualities improved		
010-02	0.3-6.7	12.1-0.0	salmon - brownish red	fairly hard - nearly vitrified	overfired, swelled slightly @ cone 2	face brick, also brick, tile and sewer pipe if drying qualities improved		
06-03	1.0-3.7	14.1-10.8	pinkish brown - dark brown (scummed)	steel hard	-	common brick, tile, possibly face brick if treated to correct scumming		Mines Branch, Inv. in Ceram. & Road Mtls. (1924), p. 4; Ells (1926), p. 9; Halferdahl (1969), p. 22.

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA VII (continued)							
208.	NE 20 89 9 W4 (east bank Athabasca River, ⅓ mile above Fort McMurray)	Lower Cretaceous (oil sands underclay)	clay, dark grey, containing some asphaltic carbon	-	exceedingly plastic, smooth	-	-	16
209.	- 17 91 9 W4 (2 miles north of Stony Island, east shore Athabasca River)	Lower Cretaceous (oil sands underclay)	clay, dark grey, non-calcareous; 8 ft succession	21	quite plastic, works fairly well	dries poorly	6.3	17½
210.	- 17 91 9 W4	Lower Cretaceous	(1) clay, light grey	23	rather flabby	-	3	27
			(2) clay, dark grey	24	fairly plastic, works well	-	8	7½
211.	SE 29 92 9 W4 (Steepbank River, 5 miles above mouth)	Lower Cretaceous	clay, grey, containing carbonaceous matter	28	highly plastic, works well	safe in slow drying	8	-
212.	SW 29 92 9 W4 (Steepbank River, 4¼ miles above mouth)	Lower Cretaceous	clay, light grey, rather calcareous	27	fairly smooth, works well	dries safely	5.8	3
213.	SW 31 92 9 W4 (Steepbank River, 2⅛ miles above mouth)	Lower Cretaceous	clay, containing thin bands of limestone	-	-	-	-	-
214.	NW 13 92 22 W5 (Notikewin district)	Recent	clay, dark grey, laminated, slightly calcareous	-	moderate plasticity, slightly sticky with a small amount of tempering water	cracks badly in slow drying (warps)	10 (approx.)	-
215.	NE 13 93 12 W4 (McKay River, 27¼ miles above mouth)	Lower Cretaceous	clay	-	-	cracks in drying	"excessive"	-
216.	SE 24 93 12 W4 (McKay River, 26¾ miles above mouth)	Lower Cretaceous	clay, silty	26	rather short, works fairly well	dries safely	-	-
217.	- 5-8? 94 10 W4 (northwest shore of Muskeg River, between head of portage and mouth of river)	Lower Cretaceous	(1) clay, light grey; 10 ft bed	-	very plastic, works well	dries safely	-	27
			(2) clay, light grey	27	fairly smooth	dries safely	8	3
			(3) clay	37	plastic, works well	-	10	-
218.	NE 29 94 11 W4 (McKay River, 11¼ miles above mouth)	Lower Cretaceous	clay	23	very plastic, smooth, works well	safe in slow drying	7	15
219.	- 18? 95 10 W4 (east side Athabasca River, about 10 miles north of Muskeg River mouth)	Lower Cretaceous (oil sands underclay)	clay, light grey, non-calcareous; 6 ft + bed	19	fairly plastic	dries safely	6.2	16½
220.	- 26? 95 11 W4 (west side Athabasca River, about 12 miles north of Muskeg River mouth)	McMurray	clay, light grey, non-calcareous; bed about 15 ft thick, between beds of oil sands	17	fairly plastic, works well	dries safely	5	18½
221.	- 21, 28 95 11 W4 (Ells River, from points 6½ to 6¾ miles above mouth)	Lower Cretaceous (oil sands underclay)	(1) clay, grey, carbonaceous, soft; 16 ft bed	-	very plastic, smooth, rather stiff and difficult to work	-	-	-
			(2) clay, grey, soft	-	good plasticity, works well	dries safely	6	14
			(3) clay, very sandy	14	plasticity and working qualities low	-	3	18
			(4) clay, dark grey to black, large percentage of asphaltic carbon; 12 ft to 15 ft bed	-	very plastic, smooth, rather stiff, slightly sticky	very slow drying	6.5	20

[1] includes drying plus fired shrinkage

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
"low temp." ?	-	-	light red	-	difficult to burn without bloating	no value		Ells (1915), p. 13, 14; Keele (1915), p. 43.
09	-	-	light buff	-	cracks or shatters into small bits on firing, very nearly vitrified @ cone 07	stiff-mud brick, foundry clay, stove linings	Overburden 8 to 30 ft; rests on Devonian limestone	Hume (1924), p. 17; Halferdahl (1969), p. 22.
03	0.3	-	buff	fairly hard	-	moderate heat duty fireclay, improved by blending with plastic clay		Mines Branch, Inv. in Ceram. & Road Mtls. (1924), p. 4;
010-03	0.7-3.3	13.7-6.0	reddish buff	fairly hard - steel hard	-	wire-cut face brick, possibly vitrified ware		Ells (1926), p. 10; Halferdahl (1969), p. 22.
010-06	1.3-4.6	10-4	-	steel hard	bloated above cone 06 unless fired very slowly	doubtful value owing to carbonaceous content		Ells (1915), p. 2; Halferdahl (1969), p. 22.
03	0	23	buff	-	-	common brick by stiff-mud or soft-mud process		Ells (1915), p. 3; Halferdahl (1969), p. 22.
-	-	-	red (numerous white specks)	-	white particles of CaO formed from limestone fragments	doubtful ceramic value, but suitable for portland cement manufacture		Ells (1915), p. 3.
010-02	-	-	medium - dark red (scummed)	-	narrow vitrification range, severaly bloated and cracked	no value	Chemical analysis no. 17	R.C.A. files (1945).
-	"excessive"	-	red	-	cracked on firing	no value		Ells (1915), p. 5, 6.
010-06	"low"	-	red	-	overfired @ cone 03	common brick		Ells (1915), p. 5, 6; Halferdahl (1969), p. 23.
3	9 (total[1])	"dense"	cream	steel hard	-	stoneware, fireclay		Ells (1915), p. 4, 5; Keele (1915), p. 43; Halferdahl (1969), p. 22.
010-03	0.7-4.0	11-0	light - dark red	-	vitrified @ cone 03	structural products - building brick and hollow block, possibly vitrified ware if blended with higher grade clay		
010	1.3	12	light red	steel hard	-	common brick if sand added up to 25% to correct drying defects		
010-1	0.0-3.4	10-2	buff	-	overfired @ cone 5	face brick, sewer pipe, fireproofing		Ells (1915), p. 5, 6; Halferdahl (1969), p. 23.
012-05	0.0-1.0	11.0-8.1	light red - buff	steel hard	-	stiff-mud brick, possibly semi-refractory purposes	Oil sands overburden up to 20 ft thick	Hume (1924), p. 18; Halferdahl (1969), p. 23.
012-05	0.0-0.6	11.6-8.9	light cream	hard - steel hard	-	soft-mud brick, possibly semi-refractory purposes		Hume (1924), p. 18, 19; Halferdahl (1969), p. 23.
"low temp." ?	"high"	"dense"	salmon - grey	-	checks and becomes brittle @ high temperatures	possibly sewer pipe if high shrinkage corrected (takes salt glaze)	Underlies oil sands	Ells (1915), p. 7-9; Keele (1915), p. 42, 43; Halferdahl (1969), p. 23.
010-5	0.0-4.6	12-0	salmon - grey	-	vitrified between cones 1 and 5	face brick, sewer pipe, fireproofing		
03-5	0.0	8-7	buff	-	begins to soften @ cone 14	no value alone; possibly sewer pipe, etc. if mixed 50:50 with clay from (1) above		
-	-	-	light red - buff	-	difficult to burn without bloating, vitrifies @ cone 5	stoneware-type clay, but no value owing to carbon content		

Locality Number	Location of Deposit (Lsd. Sec. Tp. R. Mer.)	Group or Formation	Description	Unfired Characteristics: Tempering Water (%)	Working Properties	Drying Behavior	Drying Shrinkage (%)	PCE
	AREA VII (continued)							
222.	- 24? 95 11 W4 (location indefinite, given by Ells as "near point where south boundary of Murphy bituminous sand claim meets east shore of Athabasca River")	Lower Cretaceous (oil sands undercclay)	(1) clay, carbonaceous	-	highly plastic, rather sticky, stiff and hard to work	safe in slow drying	9	4
			(2) clay, light grey; 20 ft bed	-	highly plastic, smooth, works well	safe in slow drying	5.5	17
223.	NW 34 95 11 W4 (Ells River, 3⅓ miles above mouth)	Lower Cretaceous (oil sands undercclay)	clay, dark grey	-	very plastic, smooth	-	-	18
224.	SE 28 95 11 W4 (Ells River, 5½ miles above mouth)	Lower Cretaceous (oil sands undercclay)	clay	21	good plasticity, smooth	safe in slow drying	6	13
225.	SE 35 95 11 W4 (west bank Athabasca River, about 1½ miles south of Ells River mouth)	Lower Cretaceous (oil sands undercclay)	clay, containing some carbon; 9 ft+ bed	25	highly plastic, rather sticky	safe in slow drying	7.5	-
226.	SE 2 96 11 W4 (Ells River, 1¾ miles above mouth)	Lower Cretaceous (oil sands undercclay)	clay, light grey (slightly reddish tinge)	17	good plasticity, very smooth, rather stiff	not tested but "probably good"	5	16
227.	SE 3 96 11 W4 (Ells River, 2¼ miles above mouth)	Lower Cretaceous (oil sands undercclay)	clay, light brown, silty	-	low plasticity, poor workability	-	-	3
228.	- 24 97 11 W4 (west bank Athabasca River, about 1½ miles north of Calumet River mouth)	Lower Cretaceous ? (possibly Pleistocene)	clay, light yellow, highly calcareous; 40 ft succession	-	rather low plasticity, short, crumbly	-	-	-
229.	- 17 99 7 W4 (Firebag River)	Pleistocene	clay, grey, slightly calcareous, carbonaceous	21	poor plasticity	dries safely (scums)	6.3	3
230.	16 35 99 8 W4 (bridge site on Firebag River)	Pleistocene	clay, pink, non-calcareous	27.8	good plasticity, works well	cracks moderately with fast drying	7.1	16
231.	- 36 99 8 W4	Pleistocene	clay, grey, calcareous	21	fair plasticity	-	-	-
232.	- 10 100 8 W4 (west bank Firebag River, 17½ miles above mouth)	Pleistocene	clay, pinkish, slightly calcareous	33	quite plastic, works well	-	6	16
233.	- 19? 100 8 W4 (north bank Firebag River, ¼ mile above first rapids)	Lower Cretaceous ? (possibly Pleistocene)	clay, mottled light red	-	very plastic, rather sticky	-	-	10

Fired Characteristics						Potential Ceramic Use	Remarks	Reference(s)
Cone No.	Fired Shrinkage (%)	Absorption (%)	Color	Hardness	Other			
010	-	-	dull salmon	steel hard	difficult to burn without bloating	no value owing to high shrinkage and carbon content		Ells (1915), p. 12, 13; Halferdahl (1969), p. 24.
06-5	0.0-2.0	10-5	buff - grey	-	vitrified between cones 5 and 9	stoneware, pottery, semi-refractory purposes	Overburden 10 to 20 ft low grade oil sand	
3	"high" ?	"dense"	salmon	-	-	stoneware-type clay	Heavy overburden of oil sands; rests on Devonian limestone	Ells (1915), p. 7; Keele (1915), p. 43, 44; Halferdahl (1969), p. 23.
010-1	1.3-4.0	9-0	salmon - grey	-	vitrified @ cone 1	unspecified		Ells (1915), p. 9, 10; Halferdahl (1969), p. 23.
010	-	-	salmon	steel hard	swelled above cone 010 unless fired very slowly		Overburden 10 to 15 ft low grade oil sand	Ells (1915), p. 11, 12; Halferdahl (1969), p. 24.
06-5	0.0-2.0	10-3	salmon - buff	-	vitrified @ cone 9	stoneware, pottery (temperature of cone 5 or 6 required for clay to take good salt glaze)		Ells (1915), p. 10, 11; Halferdahl (1969), p. 24.
"low temp." ?	-	"porous"	red	-	-	low grade common brick		Ells (1915), p. 10.
03	-	"very porous"	buff	-	chalky	no value	Rests on Devonian limestone, with relatively light overburden	Ells (1915), p. 13.
06	1.7	16.9	reddish brown (scummed)	steel hard	bloated @ cone 01, nearing vitrification @ cone 01	soft-mud and stiff-mud brick if burned carefully to drive off carbon		Ells (1926), p. 10, 11; Halferdahl (1969), p. 24.
06-5	0.9-6.3	15.5-2.3	pale salmon - red	fairly hard - steel hard	-	sewer pipe, brick and tile by stiff-mud process	Chemical analysis no. 18	Halferdahl (1969), p. 6, 7, 13, 15.
010-06	-	-	buff - reddish brown (scummed badly)	hard - steel hard	-	soft-mud brick		Mines Branch, Inv. in Ceram. & Road Mtls. (1923), p. 5.
06-03	1.7-6.7	19.8-8.1	reddish - dark red (scummed badly)	steel hard	-	face brick, building or drain tile if treated to prevent scumming, probably also vitrified ware		Mines Branch, Inv. in Ceram. & Road Mtls. (1924), p. 5; Ells (1926), p. 10; Halferdahl (1969), p. 24.
3	"high"	-	red	-	vitrified @ cone 3	possibly sewer pipe		Ells (1915), p. 14; Halferdahl (1969), p. 24.

Table 2. Chemical Analyses of some Ceramically Tested Clays and Shales of Alberta

Locality Number (Table 1)	Analysis Number	Constituents (weight percent)														
		SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	Na_2O	K_2O	H_2O^-	H_2O^+	CO_2	C	S	Other	Total
2	1	74.25	-	14.29	2.89	-	0.37	tr	1.19	2.52	-		4.21			-	99.72
60	2	63.20	-	19.20	5.40	-	0.60	1.20	-	-	-		9.00	(LOI)		-	98.60
	3	68.40	-	18.00	4.00	-	0.40	1.00	-	-	-		7.70			-	99.50
71	4	60.40	0.60	10.23	2.05	0.82	7.10	4.32	-	-	2.98	4.65	7.60	-	-	-	100.75
	5	55.04	0.60	14.89	3.64	1.10	3.50	2.20	2.45		5.48	8.50	2.60	-	-	-	100.00
88	6	59.23	0.21	20.00	3.36	-	3.86	1.51	2.34		-		8.03	(LOI)		-	98.54
174	7	66.37	tr	26.62	1.28	-	0.42	tr	0.42		-		5.15			tr[1]	100.26
189	8	65.23	-	18.60	2.97	-	0.66	0.64	2.23	2.40	-	5.44	0.42	1.44	0.00	0.00[1]	100.03
193	9	64.41	0.70	16.44	4.37	-	0.99	1.06	0.76	2.42	0.00	5.09	-	2.70	-	0.03[1]	98.94
	10	50.96	0.52	27.66	1.74	-	1.01	0.16	0.25	0.42	0.00	8.88	-	8.48	-	0.02[1]	100.08
199	11	40.07	0.50	12.11	4.80	-	15.54	2.60	4.38		-		18.95	(LOI)		-	98.95
206	12	68.42	0.92	16.20	3.16	-	0.50	0.65	0.33	1.37	0.74	5.45	0.96	0.95	0.00	0.11[2]	99.76
	13	61.49	1.06	16.01	4.00	-	2.02	1.09	0.49	2.14	1.16	5.21	2.15	1.32	0.16	0.19[2]	98.49
	14	67.18	1.29	10.12	4.87	-	0.84	0.74	0.37	0.66	1.13	5.11	2.42	4.00	0.00	0.18[2]	98.91
	15	74.69	1.25	13.38	0.85	0.96	0.31	0.59	0.35	0.96	0.66	4.24	0.32	0.12	0.00	0.03[2]	98.71
	16	61.89	1.09	18.01	2.57	2.32	0.42	1.45	0.42	3.45	0.68	4.71	1.14	0.18	0.00	0.14[2]	98.47
214	17	59.96	-	20.44	4.14	-	2.22	1.02	3.84		-		8.18	(LOI)		0.20[1]	100.00
230	18	84.53	0.30	7.41	1.64	0.47	0.67	0.86	0.28	1.12	0.58	1.62	0.00	0.28	0.00	0.04	99.80

[1] SO_3

[2] $MnO + P_2O_5$

APPENDIX B

COMMERCIAL UTILIZATION OF ALBERTA CLAYS AND SHALES

Table 3. Clay Product Plants of Past and Present in Alberta

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA I (MEDICINE HAT-CYPRESS HILLS)					
Alberta Brick Co.	Medicine Hat	1907	Brick	Surface clays	
Medicine Hat Brick Works Co.	Medicine Hat	1907	Brick	Surface clays	
Medicine Hat Coal and Brick Co.	Medicine Hat	1907	Brick	Surface clays	
Purmal and Pruitt Brickyard; Purmal Brick Co.	Medicine Hat	1907-1910	Brick	Laminated silty clay, pockets of gumbo	Destroyed by fire in 1910, rebuilt and renamed Purmal Brick Co.
		1910-1912	Brick	As before	
Canadian Brick Co.	Medicine Hat	1908-1912	Soft-mud brick	Local clays	
Hoffman's Brickyard	Medicine Hat	1910	Brick	Surface clays	
Alberta Clay Products Ltd. (Evans, Coleman and Evans) (Medicine Hat Brick and Tile Co.)	Medicine Hat	1910-1912	Dry-press brick	Local shales of the Oldman Fm. in Sec. 3, Tp. 12, R. 5, W.4M	Plant enlarged in 1912.
		1912-1923	Dry-press brick, sewer pipe	Local shales, plus Belly River shales from Crowsnest Pass for sewer pipe; later, shales from Brickburn (Calgary) used for sewer pipe	
		1923-1944	Brick, drain tile, hollow blocks, flue lining, sewer pipe, firebrick		
		1944-1961	Sewer pipe	Shales from Alberta and Saskatchewan	Company took over Medicine Hat Potteries around 1944, became a division of Evans, Coleman and Evans in 1958, and a division of Medicine Hat Brick and Tile Co. in 1961; destroyed by fire in 1961.
Medicine Hat Potteries; Medalta Stoneware (Alberta Clay Products); Hycroft China, No. 1 plant; New Medalta Ceramics; Sunburst Ceramics	Medicine Hat	1912-1947	Flower pots, hotel china	Local clays, imported clays. After 1912, only imported clays used; by 1919, nearly all clay came from Saskatchewan	Renamed Medalta Stoneware in 1915; became a division of Alberta Clay Products in 1944.
		1947-1955	Whiteware	Some local Oldman Fm. clays as well as imported clays	Probably taken over as Hycroft China No. 1 plant in 1955; became New Medalta Ceramics in 1957.
		1957-1960	Pottery	Canadian stoneware clays	Property taken over by Sunburst Ceramics in 1960.
		1960-1965	Crockery, flower pots, artware, wall and bathroom tile	Some local clay, but mainly stoneware clay from Saskatchewan (Whitemud Fm.) and other sources outside Alberta	Plant relocated in Lethbridge in 1966.

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA I (continued)					
Dominion Clay Products Co.	Medicine Hat (Dunmore)	1913			
Medicine Hat Brick and Fireproofing Co.	Medicine Hat	1913	Brick, fireproofing		
Medicine Hat Brick Co.	Medicine Hat	1913-1915	Brick	Surface clays	Plant built on Purmal Brick Co. site, used natural gas for fuel.
Fire and Ornamental Brick Co. Ltd.	Medicine Hat	1914-1915			
Gas City Brick Co.	Medicine Hat	1915-1923	Brick, pottery		Operated on Medicine Hat Brick Co. site.
Gas City Pottery Ltd.	Medicine Hat	1917-1919	Pottery		
Gas City Clay Products Ltd.	Medicine Hat	1921-1923			
Canada Pottery Ltd.	Medicine Hat	1923	Pottery		
Medalta Potteries Ltd.; Hycroft China, No. 2 plant	Medicine Hat	1923, 1929, 1944-1955	Stoneware, whiteware, terra cotta	All materials imported, including clays, feldspar and mica	Company was sometimes referred to as Medalta Whiteware; plant closed in 1955, reopened the same year as Hycroft China, No. 2 plant.
		1955-	Chinaware, dinnerware	Imported clays	
Medicine Hat Brick and Tile Co. Ltd. (I-XL Industries Ltd.)	Medicine Hat	1944-1958	Brick, hollow building tile	Local clays	
		1958-	As before, plus quarry tile, conduits, sewer pipe, wall coping, firebrick, terra cotta	Local and imported clays	Formed association with several independently operating companies to become largest manufacturer of heavy clay products in Alberta; reorganized as division of I-XL Industries Ltd. about 1972.
National Porcelain (Medicine Hat Brick and Tile Co. Ltd.) (I-XL Industries Ltd.)	Medicine Hat	1949-1974	Electrical porcelain	Imported ball and china clay, flint, feldspar	Became division of Medicine Hat Brick and Tile Co. Ltd. in 1958, I-XL Industries Ltd. in 1972. Plant destroyed by fire in 1974
Red Cliff Brick Co.	Redcliff	1907-1911	Common brick, terra cotta	Shale pit located in 1910 at Sec. 8, Tp. 13, R. 6, W.4M	Natural gas used for fuel
Redcliff Clay Products Co.	Redcliff	1912-1919	Brick	15-foot section of Oldman Fm. shales with 18 feet of overburden	Bricks tended to check in burning; probably none produced after 1915.
Redcliff Brick and Coal Co. Ltd.	Redcliff	1912 to at least 1929	Red pressed brick, drain tile, hollow blocks; flue lining was made from Saskatchewan fireclays	Shales of Oldman Fm. mined by tunnels 61 feet below surface	
Redcliff Pressed Brick Co. (Medicine Hat Brick and Tile Co. Ltd.) (I-XL Industries Ltd.)	Redcliff	1914-	Pressed brick, drain tile	Surface clays used before 1944, local Oldman Fm. shales after 1944	Original company holding I-XL trademark, became associated company of Medicine Hat Brick and Tile Co. Ltd. in 1958, division of I-XL Industries Ltd. in 1972.
Redcliff Premier Brick Co. Ltd. (Medicine Hat Brick and Tile Co. Ltd.)	Redcliff	1923-1965	Pressed brick	Oldman shales and glacial till	Became associated company of Medicine Hat Brick and Tile Co. Ltd. around 1958. Plant closed about 1965.
Ross Clay Products Ltd.	Redcliff	1923	Brick		Organized in 1917, but probably did not produce brick until 1923; not

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA I (continued)					
Gunderson Brick and Coal Co.; Perry Brick and Tile Co. Ltd.; Redalta Brick Ltd.	Redcliff	1944-1965	Brick, drain tile, floor tile, hollow building tile, conduits	Oldman and Foremost Fm. shales mixed with sandy surface clay, stoneware clays from Saskatchewan used after 1961	Operations taken over in 1950 by Perry Brick and Tile Co. Ltd., name changed in 1953; taken over by Redalta Brick Ltd. in 1963.
Alberta Potteries Ltd.; Medalta Potteries (1966) Ltd.	Redcliff	1945-1966	Flower pots, vases, other stoneware items	Local clays and Saskatchewan (Whitemud Fm.) clays	Operations taken over in 1966 by Medalta Potteries (1966) Ltd.; plant burned down 7 months later, rebuilt and reopened in 1968.
		1966-	Earthenware, stoneware crocks, flower pots, bean pots, pottery, ash trays	Mainly Saskatchewan (Whitemud Fm.) clays	
Ceramics Art Works	Redcliff	1949	Art pottery, hard stoneware, made-to-order pieces		
Redcliff Potteries	Redcliff	1951	Pottery		Connected with Gunderson Brick and Coal Co.
AREA II (LETHBRIDGE-TABER)					
John Bruce	Lethbridge	1907-1917	Brick		Produced about 500,000 common bricks in 1907 using a hand pug mill.
Lethbridge Brick and Terra Cotta Co.	Lethbridge	1907-1917	Brick	Sandy Pleistocene clays	Kiln capacity in 1907 was 35,000 bricks per day. Probably did not operate after 1917; may have been taken over in 1920 by Lethbridge Brick Co. Ltd.
A. Bonanico	Lethbridge	1908, 1911			
Diamond City Coal Co.	Diamond City	1908-1920	Brick		Probably did not operate after 1915.
Chinook Coal Co. Ltd.	Diamond City	1912	Brick		
Chinook Coal Co.	Commerce	1913	Brick		
A. and J. Knowlton	Lethbridge	1913			
Rocky Coulee Brick and Stone Ltd.	Lethbridge	1913			
McLeod Quarrying and Contracting Co. Ltd.	Lethbridge	1914-1915			
Lethbridge Face Brick and Clay Products Ltd.	Lethbridge	1914-1920			Probably did not operate after 1917.
Lethbridge Brick Co. Ltd.	Lethbridge	1920 to at least 1923	Brick, drain tile		

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA II (continued)					
J. Hamilton	Lethbridge	1947	Brick, tile		
Sunburst Ceramics	Lethbridge	1966-	Dinnerware, kitchenware, ashtrays, giftware, custom items	All materials currently imported from U.S.A., including talc, nepheline syenite, stoneware clay, and Georgia kaolin	Plant relocated from Medicine Hat.
Arch R. Marchessault (H. Hobson)	Taber	1907-1908	Brick		Same pit and equipment probably used by H. Hobson in 1908.
Unknown	Taber (Sec. 17, Tp. 10, R. 16, W.4M)	1911	Brick	Oldman or Foremost Fm. shale	
Canada West Coal Co.	Taber	1913-1914	Brick		
Rock Springs Coal and Brick Co. Ltd.	Elcan	1912-1915	Brick		
R.S. Betts and Son	Raymond	1907-1917	Brick		In 1907 to 1908 capacity was 16,000 bricks per day; plant probably did not produce any bricks in 1917.
D.M. Ross	Monarch	1910, 1913	Brick	Local surface clay	
Henry S. Pelletier	Monarch	1911-1912	Brick	Local surface clay	
J. Mills	Ft. MacLeod	1910			
J.G. Hood	Ft. MacLeod	1911			
John Kearns	Ft. MacLeod	1912-1916			
MacLeod Face Brick Co. Ltd.	Ft. MacLeod	1912-1923			Probably did not operate after 1915.
Claresholm Brick Co. Ltd.	Claresholm	1910-1915			Probably did not operate after 1915.
Imperial Brick Co. Ltd.	Grassy Lake	1910-1914	Brick		
Bow Island Sewer Pipe and Tile Co. Ltd.	Bow Island	1914-1915			
AREA III (CROWSNEST PASS-PINCHER CREEK)					
Pincher Creek Brick, Power, and Lighting Co.	Pincher Creek	1908-1911	Brick	Pleistocene clays	
Wm. McFarlane	Pincher Creek	1910-1913	Brick	Pleistocene clays	
Blairmore Brick Co.	Blairmore	1910-1912	Brick		

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA III (continued)					
J.W. Budd	Blairmore	1910-1911	Dry-press brick	Kootenay (Fernie ?) Fm. shale	
Pelletier Steam Brick Co.	Blairmore	1910			
Southern Alberta Fire Clay Co. Ltd.	Blairmore	1912-1915			
Blossomwood Clay Products Co. Ltd. (Calgary)	Frank	1912-1915			
Calgary Clay, Coal, and Coke Co. Ltd. (Calgary)	Blairmore	1912-1915			
Crows Nest Clay Products Ltd.	Blairmore	1914-1915			
Crowsnest Ceramics Ltd.	Blairmore	1963	Art pottery		May have operated as early as 1958.
AREA IV (CALGARY-TURNER VALLEY)					
Jacob Koehler	Calgary	1907			
Williams and Gwilt	Calgary	1907			
Golden West Realty Co.	Calgary	1907-1911	Dry-press brick		
Calgary Pressed Brick and Sandstone Co.; Crandall Pressed Brick and Sandstone Co.	Calgary (Brickburn)	1907-1911	Brick	Tertiary shales quarried at Lsd. 13, Sec. 24, Tp. 24, R. 2, W.5M	Became Crandall Pressed Brick and Sandstone Co. in 1912.
		1912 intermittently to 1930	Dry-press brick, floor tile	Paskapoo shales	
R.L. Burn	Calgary	1910			
Burnvale Brick, Pipe, and Enamelling Co. Ltd.	Calgary	1910-1914			
Carbon Brick and Coal Co.	Calgary	1910-1915			
Alberta Brick and Terra Cotta Co. Ltd.	Calgary	1911-1914			
Alberta Sewer Pipe Co. Ltd.	Calgary	1911-1913			
Calgary Terra Cotta Co. Ltd.	Calgary	1912			
Tregillus Clay Products Ltd.	Calgary (Lsd. 2, Sec. 26, Tp. 24, R. 2, W.5M)	1912-1915	Brick	Paskapoo shales	Firm in liquidation in 1917; by 1920 plant almost entirely dismantled
Glenbow Brick Works; Glenbow Brick and Supplies Ltd.	Calgary	1913-1914			
Ceramics Limited	Calgary	1914-1915			
Shale Brick Co. Ltd.	Calgary	1914			
Victor Clay Products Ltd.	Calgary	1914-1917			
Great West Brick and Tile	Calgary	1956-1963	Precast terrazzo, ceramic tile		
Ceramic Arts	Calgary	1958-	Art pottery	Canadian and imported clays	

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA IV (continued)					
Irricana Pressed Brick Co. Ltd. (Calgary)	Irricana	1911-1914			
Cochrane Brickyard Co.	Cochrane	1907-1912	Brick	Silty, hard, laminated, calcareous clay from beneath river terrace	One million bricks produced in 1907.
Peter Collins	Cochrane	1907-1923	Brick		
Quigley Brick Manufacturing Co.	Cochrane	1908-1919			Probably no production after 1917.
Cochrane Brick Co.	Cochrane	1908-1920			Probably did not operate after 1917.
G. Bruel	Cochrane	1913-1919			Probably no production after 1917.
Alberta Portland Cement Co.	Sandstone	1907-1908	Dry-press brick	Tertiary clay from open pit in Lsd. 7, Sec. 2, Tp. 21, R. 1, W.5M	Property probably taken over by Canada Cement Co.
Canada Cement Co.	Sandstone	1910-1923	Brick		
Sandstone Brick and Sewer Pipe Co.	Sandstone	1911-1920	Brick		Probably did not operate after 1917.
A. Serviss	Okotoks	1907-1913			
High River Brick Works	High River	1908			
Mills Bros.	High River	1910			
J.G. Hood	High River	1911			
AREA V (CENTRAL ALBERTA)					
Didsbury Pressed Brick and Tile Co. Ltd.	Didsbury	1907-1908	Brick	Shale, overlain by 20 feet of sandstone and glacial drift	Output in 1907 was 350,000 bricks. Mining of shale difficult due to heavy overburden. Plant later moved to Camrose, probably to become Camrose Brick Co. Ltd.
Innisfail Brick Co.; Innisfail Tile and Brick Works; Kremer Tile and Brick Works	Innisfail	1907-1920	Common brick, hollow partition brick	Stratified Pleistocene clay from near the brick works	In 1913, considered the best brick made in Alberta from surface clays; plant was renamed Innisfail Tile and Brick Works in 1915, Kremer Tile and Brick Works in 1920; probably not operating after 1920.

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA V (continued)					
Red Deer Brick Co.	Red Deer	1907-1911	Soft-mud brick	Stratified Pleistocene clay	
Piper Brick and Tile Co.	Red Deer	1907-1923	Soft-mud brick		Operated under various names to at least 1923.
Cement Builders Ltd.	Red Deer	1912-1913	Brick		
Hives Bros.	Penhold	1907			
Lunan and McCormick	Wetaskiwin	1907	Brick		
Wetaskiwin Brick Co.	Wetaskiwin	1911 intermittently to 1923	Stiff-mud brick	Surface clay	Used natural gas for fuel.
Lucas Baer	Camrose	1907-1908	Brick		
Camrose Brick Co. Ltd.	Camrose	1910-1915	Stiff-mud brick	Glacial clay	
Camrose Clay and Lumber Products Ltd. (Edmonton)	Camrose	1912			
Unknown	Wainwright	1910	Common bricks	Silty and sandy surface material with some clay pockets	Weak, porous product; small quantity made during summer.
Taylor-Clark Brick Works; Clark-Taylor Ltd.	Wainwright	1911-1915	Stiff-mud brick	Glacial drift (only small quantities of workable clay available)	Company became Clark-Taylor Ltd. in 1913.
Castor Brick and Coal Co.	Castor	1911-1912			May have been taken over by Coalbeck Coal and Clay Products Ltd.
Coalbeck Coal and Clay Products Ltd.	Castor	1913-1914			May have been taken over by National Coal Co.
National Coal Co. Ltd.	Castor	1915-1917			
Unknown	Stettler	1911	Brick		Bricks cracked badly
Lacombe Brick Co.	Lacombe	1911-1915	Brick	Stratified Pleistocene clay	
Chas. Stone (Bullocksville)	Alix	1913			
Bassano Brick Co. Ltd.	Bassano	1912 intermittently to 1923	Brick	Some may have come from a clay pit at Drumheller in 1923	No production reported from 1917 to 1921.
Rosedale Coal and Clay Products Ltd. (Calgary)	Rosedale	1913-1915			

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA VI (EDMONTON)					
J.B. Little Co.; J.B. Little and Sons Ltd.	Edmonton	1893-1956	Soft-mud brick	Pleistocene floodplain clays from deposit 12 to 15 feet thick	Sons entered business in 1928. Used cord wood for fuel until 1930, wood and coal to 1935, and natural gas thereafter. Average yearly production 2-2 1/2 million bricks.
		1956-			Ceased production in 1956 and became distributor for Medicine Hat Brick and Tile Co. Ltd. products.
E.A. East	Edmonton (Strathcona)	1907	Brick		
Warner	Edmonton (Strathcona)	1907	Brick		
Reuben Steeves	Edmonton	1907	Brick		
W. Humberstone	Edmonton	1907	Brick		
Edmonton Pressed Brick Co.	Edmonton	1907	Brick		
West Park Brick Co. Ltd.	Edmonton (Strathcona)	1907-1908	Brick		Produced 200,000 bricks in 1907.
Edmonton Brick Co.	Edmonton	1907-1917	Stiff-mud bricks	Pleistocene floodplain clays	Formerly known as Sanderson Brick Co.; became connected with J.B. Little Co. in 1915. Tough, silty clays resulted in very porous product.
Pollard Bros.	Edmonton (Strathcona)	1907-1917	Brick	Pleistocene floodplain clays	Very porous product
P. Anderson Brick Co.	Edmonton	1907-1919	Stiff-mud brick (sandy clays), dry-press brick (clayey portions)	Pleistocene clays	Very porous product. Probably no production after 1917.
Acme Brick Co.; Alexandra Brick and Tile; Northwest Ceramics Ltd.; Northwest Brick and Tile	Edmonton (Cannell)	1910-	Brick, building tile, drain tile	Pleistocene lake clay from quarry first opened in 1911. In 1958, quarry at Athabasca opened in Pleistocene clay, blended with clay quarried on the plantsite	Renamed Alexandra Brick and Tile in 1952; became Northwest Ceramics in 1958, an associate company of Medicine Hat Brick and Tile Co. Ltd.; renamed Northwest Brick and Tile in 1966.
Western Clays Ltd.	Edmonton	1911-1917	Dry-press brick		Production recorded only in 1912; bricks had a tendency to check in firing.
Terra Cotta Brick Co. Ltd.	Edmonton (Strathcona)	1912-1917			Probably did not operate in 1917.
Alberta Brick Co. Ltd.	Edmonton (Cannell)	1912 intermittently to 1923			May have been taken over by or renamed Millar Brick and Supply Co. Ltd.
Western Pressed Brick Ltd.	Edmonton	1914			
Pioneer Fire Clay Co. Ltd.	Edmonton (Independence)	1914 intermittently to 1920			
Millar Brick and Supply Co. Ltd.	Edmonton (Cannell)	1926			

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA VI (continued)					
Lyon Moret	Fort Saskatchewan	1907			
Fort Saskatchewan Brick-yard Co.	Fort Saskatchewan	1908-1913			
Fort Saskatchewan Brick Works	Fort Saskatchewan	1914-1921			Probably did not operate after 1917.
St. Albert Brick Co.	St. Albert	1911-1919			Operated by the Jacob Bros., probably no production after 1917.
Cameron; Cameron and Sons	Vegreville	1907, 1910-1917	Brick		Sons entered business in 1910.
Huyke and Walker; Vegreville Brick Co.; A.I. Walker Brick Co.	Vegreville	1908-1913	Brick		Name changed to Vegreville Brick Co. in 1908; A.I. Walker Brick Co. in 1910 to 1911, then back to Vegreville Brick Co.
D. Gillis Brick Yard	Vegreville	1913-1919			Probably did not operate after 1917.
O'Dell Brickyard	Vegreville	1913			
Charles Gordon	Vegreville	1919-1923			
Eason Brick Co.	Vermilion	1908-1912			
Vermilion Brick Co. Ltd.	Vermilion	1911-1919			Probably did not operate after 1917.
Fisher and Clark	Tofield	1912	Brick	Local surface clay	
Tofield Clay Products Ltd.	Tofield	1913	Brick	Local surface clay	
Dominion Brick Co. Ltd.	Tofield	1914-1915	Brick	Local surface clay	
Robinson Brick Co.	Tofield	1915-1921	Brick	Local surface clay	Probably did not operate after 1917.
Zuchka Brick Co.	Smoky Lake	1920-1923	Stiff-mud brick (buff colored)	Yellowish clay of Belly River Fm., about 5 feet below surface	
Bonnyville Brick Yard	Bonnyville	1946 or 1947			
AREA VII (NORTHERN ALBERTA)					
Edson Brick Co. Ltd.	Edson	1914-1915	Brick		
Athabasca Brick Works	Athabasca	1915			Operated by C. Thillet.
Athabasca Clay Products Ltd.	Athabasca	1963-1969	Art pottery	Pleistocene lake clay from banks of Athabasca River	
E.J. Riopelle	Grouard	1915			
T. Stewart	Grouard	1915			

Company	Plant Location	Years of Operation	Product Manufactured	Source of Raw Materials	Remarks
AREA VII (continued)					
J.P. Hughes	Fort McKay	About 1922		Clay from along Athabasca River below Fort McKay	
Ole Benson	Grande Prairie	1929	Brick		
Grande Prairie Brick Yard; K.J. Dalen and Sons	Grande Prairie	1944 intermittently to 1959	Common brick	Silty floodplain clays	

Table 4. Clay and Shale Quarries Worked in Alberta since 1950 for Clay Products Manufacture [1]

Quarry No.[2]	Location					Plant Site	Operator	Year Opened	Years Worked[3]	Remarks
	Lsd.	Sec.	Tp.	R.	Mer.					
Q66	6	11	7	2	W4	Medicine Hat	Medicine Hat Brick and Tile Co.	1967	1967-1969	
Q25	10	18	7	2	W4	Medicine Hat	Alberta Clay Products Ltd.	1956	1956	Overburden 6 ft; clay 18 ft, used for sewer pipe and flue liner.
Q52	12	24	8	1	W4	Medicine Hat	Medicine Hat Brick and Tile Co.	1960	1960, 1963	
Q46	1, 8	18	8	2	W4	Medicine Hat	Evans, Coleman, and Evans Ltd., Alberta Clay Products Division	1960	1960	
Q34	5, 6, 11, 12	20	8	3	W4	Medicine Hat	Medicine Hat Brick and Tile Co.	1957	1957-	Whitemud Formation - shale.
Q45	10, 15	9	8	4	W4	Medicine Hat	Medicine Hat Brick and Tile Co.	1959	1959-	Eastend Formation - shales of upper unit, used for red face brick.
Q39	5	20	8	4	W4	Medicine Hat	Medicine Hat Brick and Tile Co.	1959	1959-1964, 1966, 1967, 1969, 1971	Ravenscrag Formation.
Q35	NE	27	11	5	W4	Medicine Hat	Alberta Clay Products Ltd. (In 1960, Evans, Coleman, and Evans Ltd., Alberta Clay Products Division)	1957	1958-1960	
Q10	-	27, 34	11	5	W4	Medicine Hat	Alberta Clay Products Ltd.	1930	1950-1952	
Q14	1, 2	31	12	4	W4	Medicine Hat	Medicine Hat Sand and Gravel (After 1952, Medicine Hat Brick and Tile Co.)	1950	1951-1962, 1964-1969	1951: overburden 27 ft; shale 50 ft. 1954: overburden 25 ft; shale 50 ft. Shale, probably Oldman Formation, used for brick and tile.
Q9	13	28	12	5	W4	Medicine Hat	Medicine Hat Brick and Tile Co.	1930	1950-1952	Overburden 8 ft; clay 60 ft, used for brick and tile.
Q4	11, 15	5	13	6	W4	Redcliff	Gunderson Brick and Coal Co. (After 1953, Perry Brick and Tile Co. Ltd.)	1908	1950-1964	1951: shale 50 ft. 1954: overburden 10 ft; shale and clay 37 ft. Clay and shale used for brick and structural tile.
Q6	NW	9	13	6	W4	Redcliff	Redcliff Premier Brick Co. Ltd.	1912	1950-1952, 1954, 1957	1951: no overburden; shale 40 ft. Shale, probably Oldman Formation, used for brick.
Q7	SW	9	13	6	W4	Redcliff	Redcliff Pressed Brick Co. (After 1959, Medicine Hat Brick and Tile Co.)	1913	1950-1969	1951: shale 80 ft. 1954: overburden 20 ft; clay and shale 60 ft. Shale, probably Oldman Formation, used for brick.
Q55	14	8	22	21	W4	Redcliff	Perry Brick and Tile Co. Ltd.	1961	1961	Clay and sand.
Q51	1, 2	11	47	27	W4	Edmonton	Northwest Ceramics Ltd.	1960	1960	
Q1	-	-	53	24	W4	Edmonton	J.B. Little and Sons	1893	1950-1956	Overburden 1 ft; clay 15 ft, used for brick.
Q5	NE	21	53	25	W4	Edmonton	Acme Brick and Tile Co. (After 1952, Alexandra Brick and Tile Co.; after 1958, Northwest Ceramics Ltd.; after 1967, Northwest Brick and Tile)	1911	1950-1958, 1960-	1951: overburden 11 ft; clay 23 ft. 1954: overburden 1 ft; clay 21 ft. Clay used for structural clay products.
Q36	NE 5, 6	9 16	66 66	22 22	W4 W4	Edmonton	Northwest Ceramics Ltd. (After 1967, Northwest Brick and Tile)	1958	1958-	Pleistocene clay.
Q16	NE	14	71	6	W6	Grande Prairie	K.J. Dalen	1951	1951-1955	Overburden 6-12 ins; clay 6-12 ft, used for brick.

[1] Compiled from annual reports of the Mines Division, Alberta Department of Mines and Minerals.

[2] Official number designated by the Mines Division, Alberta Department of Mines and Minerals.

[3] Prior to 1950, no records were kept of quarrying operations.

APPENDIX C

TEMPERATURE EQUIVALENTS OF CONE NUMBERS, WITH PYROMETRIC CONE EQUIVALENT (PCE) VALUES FOR PRINCIPAL CERAMIC CLAY TYPES

Orton Cone No.[1]	Seger Cone No.[2]	Temperature (°C)	Temperature (°F)	Range of PCE Values for Ceramic Clay Types
022		585	1085	
	022	600	1110	
018	020	670	1240	
	018	710	1310	
014		795	1460	
	014	815	1500	
010		890	1630	
	010	900	1650	
	06	980	1795	
06		1005	1840	
	04	1020	1870	
04		1050	1920	
	02	1060	1940	
02		1095	2005	
	2	1120	2050	
2		1135	2075	
	4	1160	2120	
4		1165	2130	
6		1190	2175	
	6	1200	2190	
8		1225	2235	
9	8	1250	2280	
10		1260	2300	
	10	1300	2370	
12		1310	2390	
13	12	1350	2460	Common "brick" clay
14		1390	2535	
15	14	1410	2570	
16		1450	2640	
	16	1460	2660	Stoneware clay
18		1485	2705	
	18	1500	2730	
20	19	1520	2770	
	20	1530	2785	
23	26	1580	2875	
26		1595	2905	
30	29	1650	3000	
	30	1670	3040	Ball clay
	34	1750	3180	Kaolin
34		1760	3200	
38		1835	3335	
	38	1850	3360	
	42	2000	3630	
42		2015	3660	

Fireclay

[1] Cones 022 to 20 heated at 20°C per hour; cones 23 to 38 heated at 100°C per hour; cones above 38 heated at 600°C per hour.

[2] Heated at 5°C per minute (in the softening range)

LEGEND

GEOLOGY (PLAINS)

TERTIARY

NONMARINE (Porcupine Hills, Cypress Hills Formations): *sandstone and shale, conglomerate*

UPPER CRETACEOUS AND TERTIARY

NONMARINE (Paskapoo-Willow Creek-Ravenscrag Formations): *sandstone and shale*

UPPER CRETACEOUS

NONMARINE (Edmonton Group-St. Mary River-Whitemud/Eastend Formations, Wapiti Formation): *shale and sandstone*

MARINE (Bearpaw Formation): *shale*

NONMARINE (Belly River-Oldman/Foremost Formations): *sandstone and shale*

MARINE (Smoky Group-Labiche Formation): *shale*

NONMARINE-MARINE (Dunvegan Formation): *sandstone and shale*

LOWER CRETACEOUS

NONMARINE-MARINE (Grand Rapids, Joli Fou, Pelican Formations): *sandstone and shale*

MARINE (Clearwater-Loon River, Peace River, Shaftesbury Formations): *shale, minor sandstone*

NONMARINE (McMurray Formation): *sandstone, minor shale*

PALEOZOIC

Devonian: *carbonate, evaporite, shale*

PRECAMBRIAN

Athabasca Formation: *quartzite, sandstone*

Plutonic and metasedimentary rocks: *granite, gneiss, sandstone*

GEOLOGY (FOOTHILLS AND MOUNTAINS)

Upper Cretaceous, Tertiary

Lower Cretaceous, Jurassic, Triassic

Paleozoic

Precambrian

CLAY OR SHALE DEPOSIT—CERAMIC TEST SAMPLE LOCALITY

● Low grade—common "brick" clay

■ Intermediate grade—stoneware or refractory clay

○ Clay with no apparent value for ceramic use

QUARRY

⚒ Presently operating

⚒ Formerly operated

Main highway

Main railway

Bedrock geology from Research Council of Alberta Map 35, Geological Map of Alberta, published 1972.

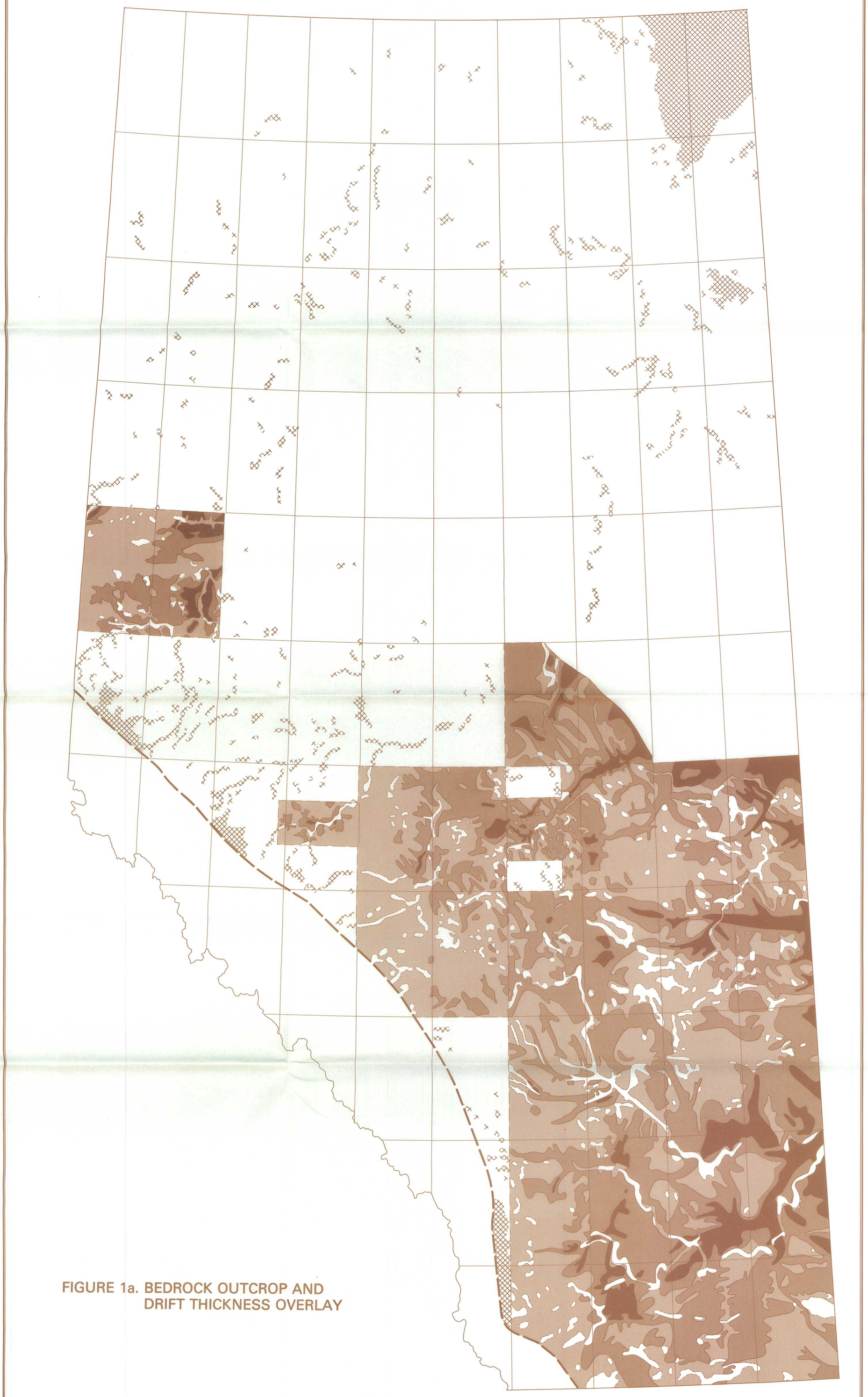
To accompany Alberta Research Economic Geology Report 3

FIGURE 1. BEDROCK CLAY AND SHALE RESOURCES OF ALBERTA

SCALE 1:2,027,520
1 inch to 32 miles

Miles 20 0 20 40 60 Miles

Kilometers 20 0 20 40 60 80 Kilometers



LEGEND

DRIFT THICKNESS IN FEET

- 0-50
- 50-150
- >150

BEDROCK OUTCROP

- within area of mapped drift thickness
- outside area of mapped drift thickness

Drift thickness information obtained largely from compilation by V.A. Carlson (formerly of Groundwater Division, Alberta Research) based on information from bedrock topography maps published or in preparation by Alberta Research.

Bedrock outcrop information compiled from maps published by Alberta Research and the Geological Survey of Canada.

To accompany *Alberta Research Economic Geology Report 3*

FIGURE 1a. BEDROCK OUTCROP AND DRIFT THICKNESS OVERLAY

LEGEND

GEOLOGY

- Recent
- Aeolian deposits: *sand in sheet and dune form*
- Lacustrine deposits: *bedded silt, clay, sand*
- Outwash, ice-contact deposits: *sand, gravel*
- Ground and hummocky moraine: *till*
- Preglacial gravels
- Bedrock

CLAY DEPOSIT—CERAMIC TEST SAMPLE LOCALITY

- ● Low grade—common "brick" clay
- ○ Clay with no apparent value for ceramic use

QUARRY

- Presently operating
- Formerly operated
- Main highway
- Main railway

Surficial geology compiled 1972 by L. A. Bayrock (formerly of Geology Division, Alberta Research) from surficial geology and soils maps published by Alberta Research and Geological Survey of Canada; modified and updated 1974 by W. N. Hamilton.

To accompany Alberta Research Economic Geology Report 3

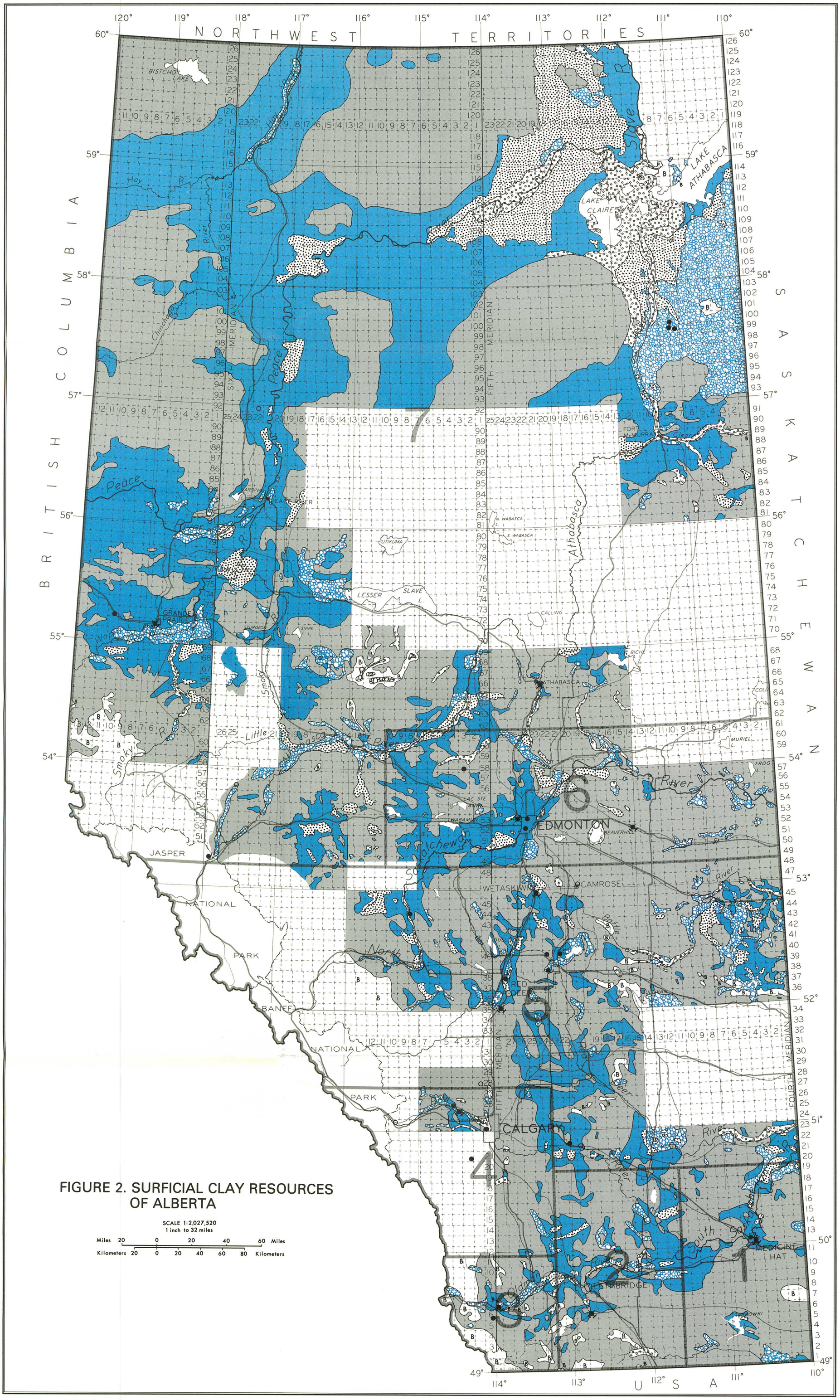


FIGURE 2. SURFICIAL CLAY RESOURCES OF ALBERTA

SCALE 1:2,027,520
1 inch to 32 miles

Miles 20 0 20 40 60 Miles
Kilometers 20 0 20 40 60 80 Kilometers