

BUREAU OF ECONOMIC GEOLOGY

The University of Texas

Austin, Texas

Peter T. Flawn, Director

Report of Investigations — No. 56

Limestone and Dolomite Resources, Lower Cretaceous Rocks, Texas

By

**Peter U. Rodda, W. L. Fisher,
W. H. Payne, and D. A. Schofield**



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FRONTISPIECE. Mining and processing of limestone from Edwards Formation along Balcones Escarpment. U. S. Gypsum Company, New Braunfels, Comal County, Texas.

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LOWER CRETACEOUS LIMESTONE AND DOLOMITE RESOURCES OF TEXAS

Peter U. Rodda, W. L. Fisher, W. R. Payne, and D. A. Schofield

ABSTRACT

Limestone is one of the most important nonfuel mineral resources in Texas. Annual production exceeds \$30 million; value added in the manufacture of such products as cement and lime amounts to about \$100 million annually. Lower Cretaceous limestone is the source of more than 40 percent of the State's total production of limestone and is utilized chiefly as crushed stone (aggregate and constructional stone), sources of raw materials for lime and portland cement, chemical and industrial process stone, agricultural limestone, fluxstone, and dimension stone. Lower Cretaceous dolomite is deadburned to refractory dolomite.

Study of Lower Cretaceous limestone and dolomites (including Edwards, Comanche Peak, Goodland, Glen Rose, Devils River, and Salmon Peak Formations) from approximately 250 localities in 49 Texas counties in North Texas, Central Texas, Callahan Divide, Edwards Plateau, southeastern Balcones Escarpment, southern High Plains, and Trans-Pecos Texas, and of chemical analyses of approximately 1,000 samples delineates the occurrence, distribution, quality, reserves, and availability of these rocks as industrial raw materials. Best stone in terms of physical and chemical quality

occurs in the Edwards, Devils River, and Salmon Peak Formations; the only significant deposits of Lower Cretaceous dolomite are in the Edwards Formation. Other Lower Cretaceous limestones generally are too soft for use as a quality aggregate and insufficiently pure for use as chemical grade stone. Argillaceous limestone of the Goodland and Comanche Peak Formations is suitable raw material for portland cement.

Total tonnage of Lower Cretaceous limestone (Edwards and associated formations) in outcrop in Texas amounts to approximately 8 trillion tons, about 40 percent of which contains 97 percent or more calcium carbonate (high-calcium limestone). Total tonnage of Lower Cretaceous dolomite (Edwards and associated formations) in outcrop amounts to about 450 billion tons, of which about 30 percent contains at least 16 percent magnesium oxide (high-magnesium dolomite). Of the total tonnage of 8.4 trillion tons of limestone and dolomite, approximately 6 percent, or 500 billion tons, is within competitive hauling distance of existing markets. Current annual consumption of limestone in Texas amounts to about 30 million tons.

INTRODUCTION

The mining and preparation of limestone is one of the largest mineral industries in Texas with products used extensively in the construction and heavy chemical industries. The limestone industry and those directly dependent upon it play an important part in the industrial development of the State. Annual value of limestone produced for use as aggregate and other bulk constructional uses and as chemical and industrial process stone exceeds \$30 million. Value of cement (produced largely from chalk and oyster shell) and lime amounts to about \$100 million annually. Lower Cretaceous rocks are the source of about two-fifths of all limestone and limestone products produced in the State.

Definitions.—Rocks composed predominantly of the mineral calcite (CaCO_3) are called limestone; rocks consisting largely of the mineral dolomite ($\text{CaCO}_3 \cdot \text{MgCO}_3$) are called dolomite ($\text{MgCO}_3 > 23\%$). Rocks of intermediate composition are referred to as dolomitic or magnesium limestone. Designa-

tions used in this report are as follows:

Limestone: contains more than 50 percent CaCO_3

High-calcium limestone: contains more than 97 percent CaCO_3

Dolomitic limestone: contains 5 to 23 percent MgCO_3

Dolomite: contains more than 23 percent MgCO_3

High-magnesium dolomite: contains more than 36 percent MgCO_3

Limestones are further characterized on the basis of impurities or physical characteristics: siliceous or cherty limestones contain appreciable quantities of silica mostly in nodules; argillaceous limestone is generally a softer rock high in clay or aluminum silicates (chalk is a soft, earthy textured, argillaceous limestone); pulverulent limestone is soft, friable, and consists of very fine-grained (microscopic), rounded grains of calcite.

Scope of report.—Area of study is the extensive outcrop of Lower Cretaceous rocks in Texas (fig. 1 and Pls. I and II), principally in 60 counties of the Edwards Plateau, along the Balcones Escarpment and north to the Red River, and along the Callahan Divide of West Texas. Lower Cretaceous rocks in 9 counties along the southern margin of the High Plains and one in Trans-Pecos Texas also are included. The following counties are included in the area of study (fig. 1); an asterisk marks those from which samples were collected and analyzed.

*Bandera	Garza	*Mills
*Bell	*Gillespie	Mitchell
*Bexar	Glasscock	*Montague
*Blanco	*Grayson	*Nolan
*Borden	*Hamilton	*Parker
*Bosque	*Hays	Reagan
*Brown	Hill	*Real
*Burnet	*Hood	*Runnels
*Callahan	*Howard	San Saba
*Coke	Irion	Schleicher
*Coleman	*Johnson	Scurry
*Comal	*Kendall	*Somervell
*Comanche	*Kerr	Sterling
Concho	*Kimble	Sutton
*Cooke	*Kinney	*Tarrant
*Coryell	*Lampasas	*Taylor
Crane	Lynn	Tom Green
Crockett	Mason	*Travis
Dawson	McCulloch	Upton
*Denton	*McLennan	*Uvalde
*Ector	*Medina	*Val Verde
*Edwards	Menard	*Williamson
*El Paso	Midland	*Wise
*Erath		

A principal objective of this report is to describe the occurrence and distribution of high-calcium limestone and high-magnesium dolomite in the Edwards Formation. Most samples were taken from the Edwards Formation, which is the purest of Lower Cretaceous limestones, is one of the higher purity rocks in the State, and also generally contains stone well suited for aggregate and other constructional use. Additional samples were obtained from the Goodland Formation of North Texas, the Comanche Peak Formation of Central Texas, the Glen Rose Formation of Central Texas and southeastern Edwards Plateau, the Devils River and Salmon Peak Formations of the southern Edwards Plateau, and undifferentiated Lower Cretaceous limestones of West and Trans-Pecos Texas. Geologic maps of Lower Cretaceous rocks (including the Edwards Formation and associated formations) of Texas, at a scale of 1:500,000, are included (Pls. I and II). Approximately 1,100 chemical analyses are reported from about 250 localities together with measured and described diagrammatic rock sections (Results of Tests, p. 41). Tonnages of limestone and dolomite, by county and by quality, are given.

ACKNOWLEDGMENTS

The writers express appreciation to the late John T. Lonsdale, Director, Bureau of Economic Geology, who initiated this project; to Peter T. Flawn, Director, Bureau of Economic Geology, for sustaining interest and constructive criticism; and to G. K. Eifler, Jr., Bureau of Economic Geology, and to Carl Chelf for reading the manuscript and for many helpful suggestions. L. E. Garner, Bureau of Economic Geology, collected and described localities in Ector County and assisted in other ways. John W. Dietrich, also of the Bureau staff, collected and described the locality in El Paso County. Mary Elizabeth Wheeler helped collect samples in Travis County. D. L. Pickett, Round Rock White Lime Company, and Shelly Burt, Servtex Materials Company, were especially helpful. Many courtesies were extended by personnel of the following companies:

Austin White Lime Company, McNeil

S. E. Evans Mining Company, Denison
McDonough Bros., Inc., Beckmann
Permian Sand and Gravel Company, Inc.,
Penwell

Round Rock White Lime Company,
Round Rock

San-Tex Stone Quarry, Inc., Liberty Hill
Servtex Materials Company, Ogden
Southwestern Portland Cement Company,
Penwell and El Paso

Superior Stone Products, Inc., Round Rock
Texas Crushed Stone Company, Georgetown
Texas Lime Company, Cleburne
Tonk Quarries, Crawford

Wray Wible Road Materials, Sherman
H. B. Zachry Company, Abilene

Josephine Casey edited the manuscript, prepared the index, and saw the publication through the press.

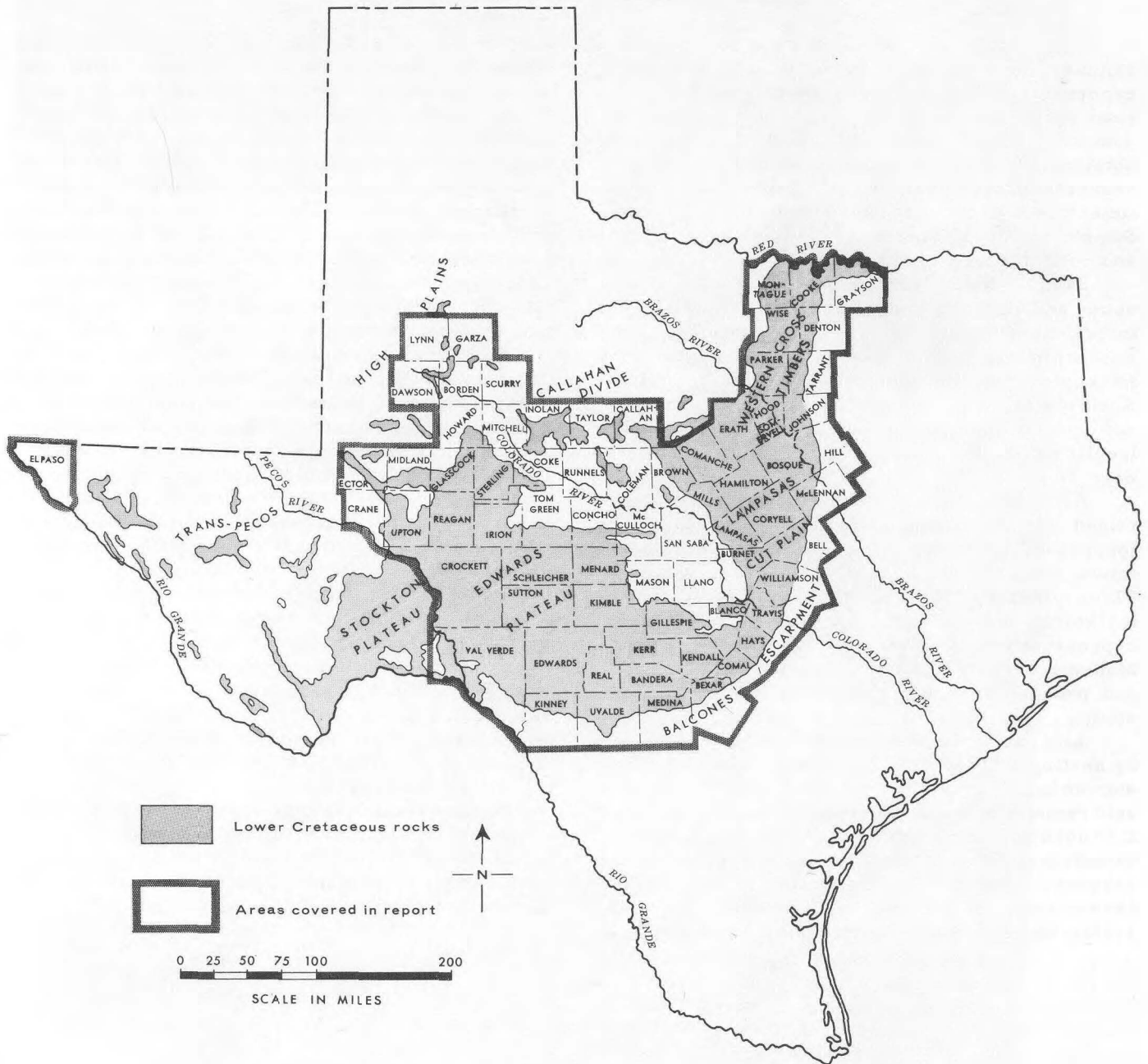


FIG. 1. Index map and generalized outcrop map of Lower Cretaceous rocks in Texas.

SAMPLING AND TESTING PROCEDURES

Approximately 1,200 limestone and dolomite samples were collected from readily accessible exposures such as quarries (active and inactive), road cuts, stream banks, and other natural exposures. Core samples from drill holes were obtained locally. Sampling was designed to give representative coverage of Lower Cretaceous limestones from readily accessible outcrops. Sample density is greatest within and near current and potential large market areas.

Sample localities are designated by county name and listed numerically (e.g., BEXAR—4). Individual samples taken as chip samples from approximately 10-foot intervals are designated by Mineral Studies Laboratory numbers (e.g., 62105). Rock descriptions, chemical analyses, thicknesses, and locality descriptions are reported for sampled localities in the section on Results of Tests, page 41.

Acid neutralization values (ANV) were determined for all samples. Calcium and magnesium (expressed as oxides and carbonates) were determined for samples with neutralization values of 97 or greater. Silica, alumina, ferric oxide, moisture, and ignition loss were determined for representative samples, chiefly high-calcium and high-magnesium rocks. Determinations of sulfur and phosphorus are not included in this regional Study.

Acid neutralization values were determined by heating a 1/2-gram, air-dried, minus 60-mesh sample in 0.5 normal hydrochloric acid. The excess acid remaining in the cool solution was titrated with 0.25 normal sodium hydroxide solution using phenolphthalein indicator. Results are expressed as the percent calcium carbonate equivalence of the sample (Association of Official Agricultural Chemists, 1955). Calcium was determined by flame spectro-

photometry by a comparison technique utilizing reference solutions of similar composition and known concentration. The intensity of the light emitted in the hydrogen-oxygen flame at 556 millimicrons was measured with a Beckman DU spectrophotometer with photomultiplier tube and flame attachment. Magnesium was determined by flame spectrophotometry utilizing the Beckman DU spectrophotometer with flame attachment at a wavelength of 371 millimicrons and also was estimated by multiplying by 0.403 the difference between the acid neutralization value and the calcium carbonate content determined by flame photometry.

Silica was determined gravimetrically and by flame spectrophotometer. The gravimetric method was the standard procedure of double dehydration from hydrochloric acid solution and the volatilization of silica as silicon tetrafluoride. Spectrophotometric determination of silica involved the reduction of yellow silicomolybdate complex to molybdenum blue and measuring the absorbance at a wavelength of 650 millimicrons with a Beckman DU spectrophotometer. Alumina was determined as the difference between an ignited ammonium hydroxide precipitate and iron expressed as ferric hydroxide. Total iron was determined spectrophotometrically by the o-phenanthroline method and measurement of absorbance at a wavelength of 512 millimicrons with a Beckman DU spectrophotometer. Analysis was performed both on an ignited ammonium hydroxide precipitate and on a solution of the whole sample.

Moisture was determined by heating to constant weight in an electric oven set at 105°C to 110°C. Ignition loss was determined by heating the oven-dried sample to constant weight in an electric muffle furnace at 1050°C.

STRATIGRAPHY

Lower Cretaceous limestones and associated rocks crop out over wide areas in Texas, forming (1) the prairie between the Western and Eastern Cross Timbers north of the Brazos River in North Texas; (2) the Lampasas Cut Plain and Callahan Divide between the Brazos and Colorado Rivers in Central and West Texas; (3) the Edwards Plateau between the Colorado and Pecos Rivers; (4) the Stockton Plateau, a continuation of the Edwards Plateau west of the Pecos River; (5) the lower part of the escarpment along the southern and southeastern margin of the High Plains; and (6) isolated exposures in Trans-Pecos Texas (fig. 1).

Lower Cretaceous rocks of Texas generally are divided into three major units, the Trinity Group (oldest), the Fredericksburg Group, and the Washita Group (youngest). Most of the rocks sampled during this study are in the Fredericksburg Group; the regional descriptions that follow are mostly of rocks of this group. The Glen Rose Formation of the Trinity Group is a potentially important source of limestone in the southeastern part of the Edwards Plateau adjacent to the Balcones Escarpment. Rocks of the Washita Group are generally unimportant for purposes of this study.

Rock Sequences

The extensive outcrop area of the Fredericksburg Group includes a variety of rock sequences reflecting different depositional environments. Sequences range from relatively thin sections of marl, clay, and nodular limestone in the north (Walnut, Goodland, and Comanche Peak Formations) to thick sections of massive, shell-fragment limestone in the southern Edwards Plateau (Edwards and Devils River Formations) (Pl. III). These limestones commonly contain shells of rudists, other mollusks, and miliolid foraminifers (figs. 2, 3). Rudists are elongate, conical pelecypods (clams) common in Cretaceous rocks but now extinct (figs. 2a, b, 4). Miliolid foraminifers are microscopic chambered shells of one-celled animals (fig. 2e). Intermediate areas are characterized by a thinning of the northern argillaceous section, a thickening of the southern limestone section, and local development in the limestone units of rudist reefs, commonly mound-shaped, consisting of masses of rudists and other organisms (figs. 5, 6). Argillaceous limestone and gypsum occur locally in the central and southern Edwards Plateau. Beds generally are flat lying, though locally dips up to 35° have been reported.

North Texas (Cooke, Denton, Grayson, Montague, Parker, Tarrant, and Wise counties). —

The Fredericksburg Group of North Texas consists of calcareous, fossiliferous clays, marls, and nodular to massive argillaceous limestones, and includes the Walnut and Goodland Formations (fig. 6). The Walnut Formation is about 20 to 30 feet of calcareous clay interbedded with flaggy, nodular, and oyster-shell limestones; in the northern part of the area the lower part of the formation is sandy. The Goodland Formation consists of about 30 feet of nodular to massive, argillaceous limestone similar to, and contiguous with, the Comanche Peak Formation to the south (fig. 6). The Goodland and Comanche Peak Formations are separated arbitrarily at the northern limit of the Edwards Formation (fig. 6). In North Texas the Goodland Formation is quarried locally for base material, but generally the Lower Cretaceous limestones of this area are too soft for use as aggregate.

Fredericksburg rocks of part of this area are described in recent papers by Hendricks (1957), Leggat (1957), Lozo (1959), and Perkins (1960).

Central Texas (Bell, Bosque, Brown, Burnet, Comanche, Coryell, Erath, Hamilton, Hill, Hood, Johnson, Lampasas, McLennan, Mills, Somervell, and Williamson counties). —The Fredericksburg sequence of the area between the Brazos and Colorado Rivers generally includes the Walnut, Comanche Peak, and Edwards Formations and is intermediate to the marginal facies to the north and the limestone facies to the south (Pl. III and fig. 6). Nodular limestones of the Goodland and Comanche Peak Formations grade laterally into hard, shell-fragment and rudist reef limestones of the Edwards Formation; massive limestone (Cedar Park Member) occurs locally in the Walnut Formation.

The Walnut Formation ranges in thickness from about 50 feet in the northern part of the area to a maximum of about 150 feet in Bell and Williamson counties. Thin sections of interbedded clay and shell limestone to the north grade to thicker sections of more massive marls and limestones in the south. The Comanche Peak Formation is nodular, argillaceous limestone, similar to the Goodland Formation of North Texas. It is about 100 to 150 feet thick throughout most of the area but thins south of McLennan and Coryell counties, grading laterally and vertically into the Edwards Formation in the vicinity of the Colorado River. The Edwards Formation consists of rudist reefs, bedded, fine- to coarse-grained limestones commonly containing fragments of rudists and other shells, dolomite, and local beds of marl and chalky or pulverulent limestone. Silica, chiefly as chert (flint) nodules, lenses, and beds, but locally replacing shells, is common. Solution alteration and

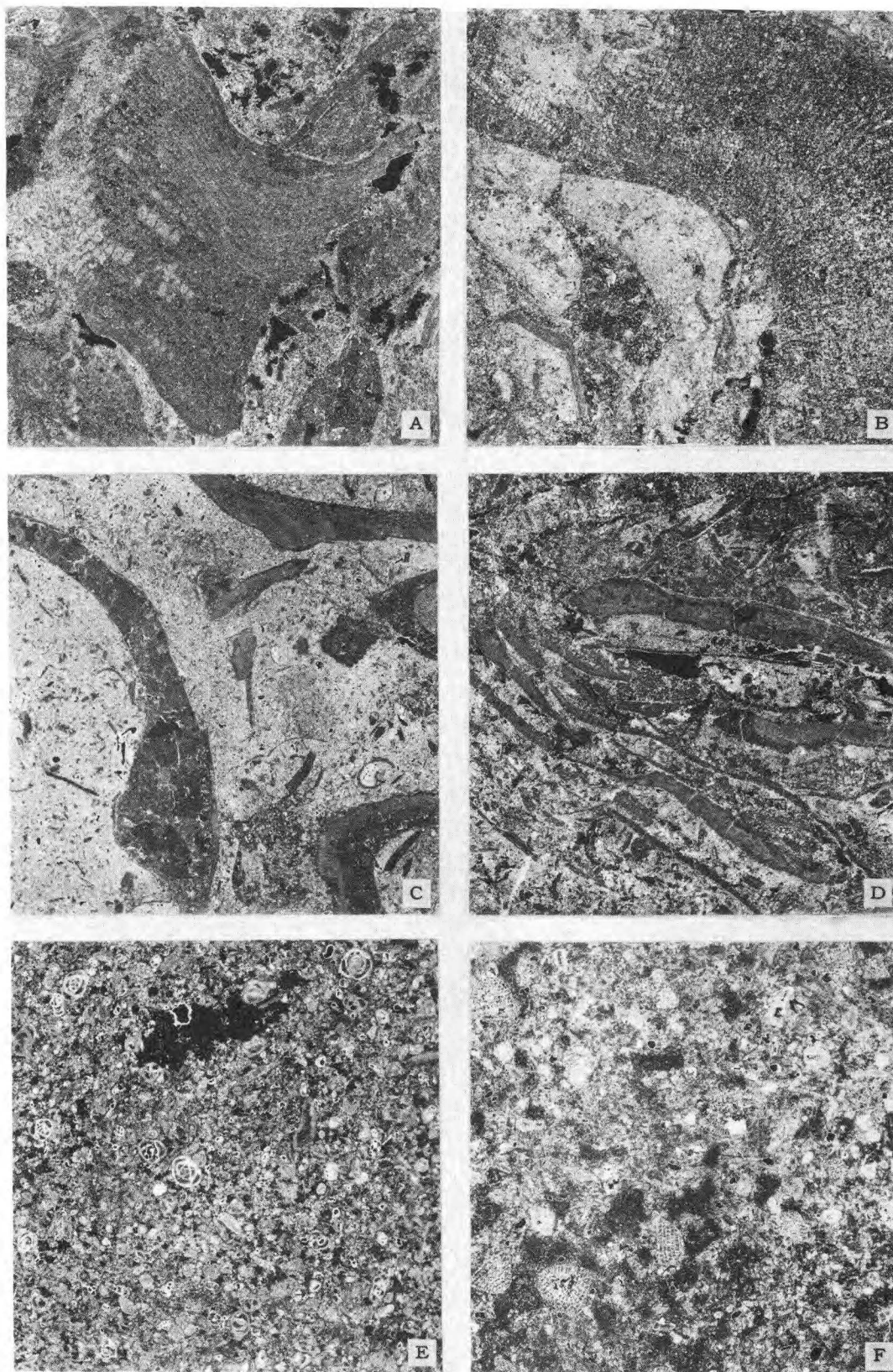


FIG. 2. Acetate-peel prints of common rocks in Edwards and associated formations. A, B, rudist limestone ($\times 4$); C, D, shell-fragment limestone ($\times 4$); E, miliolid limestone ($\times 15$); F, foraminiferal limestone with *Dictyoconus* ($\times 7$).

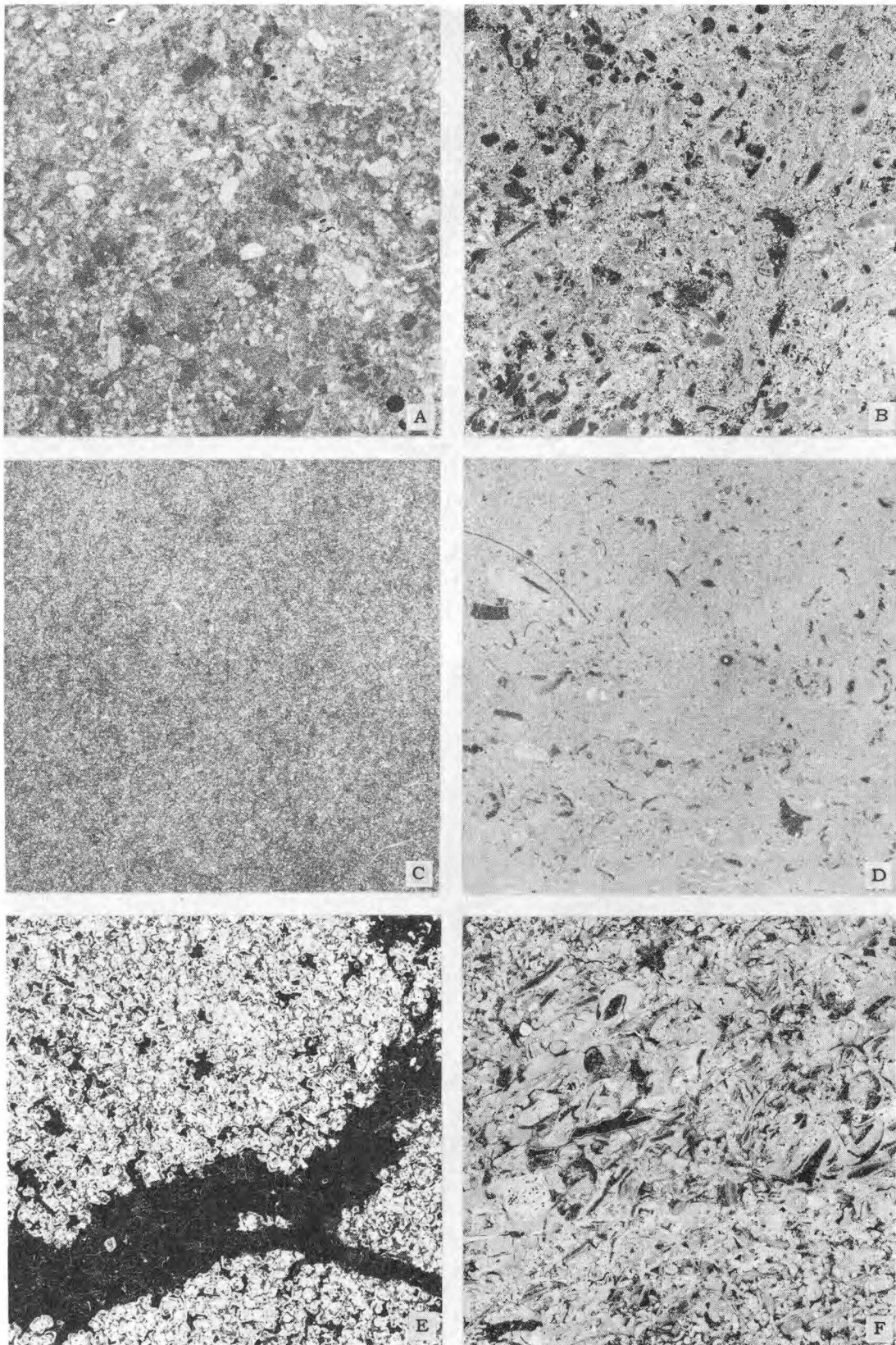


FIG. 3. Acetate-peel prints of common rocks in Edwards and associated formations. A, B, medium-grained limestone ($\times 4$); C, fine-grained limestone ($\times 15$); D, fine-grained, argillaceous limestone ($\times 7$); E, dolomite (light colored) and sparry calcite ($\times 15$); F, algal coated shell-fragment limestone ($\times 4$).

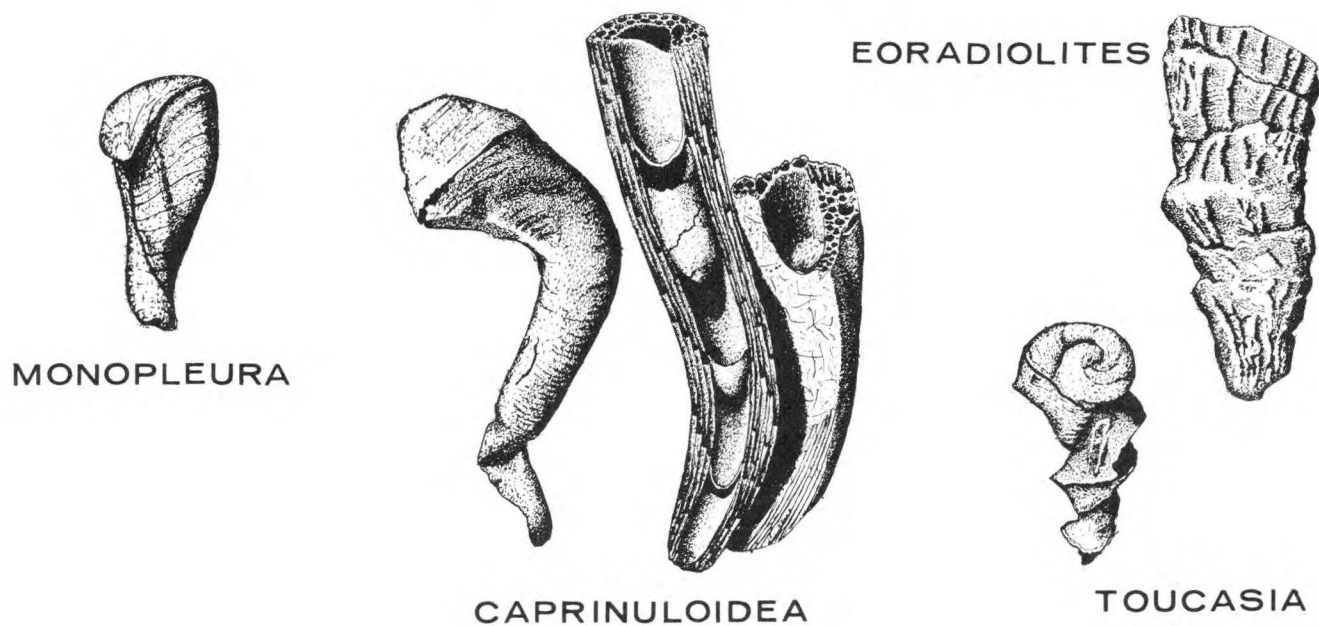


FIG. 4. Common rudists in Edwards and associated formations (adapted from Young, 1959).

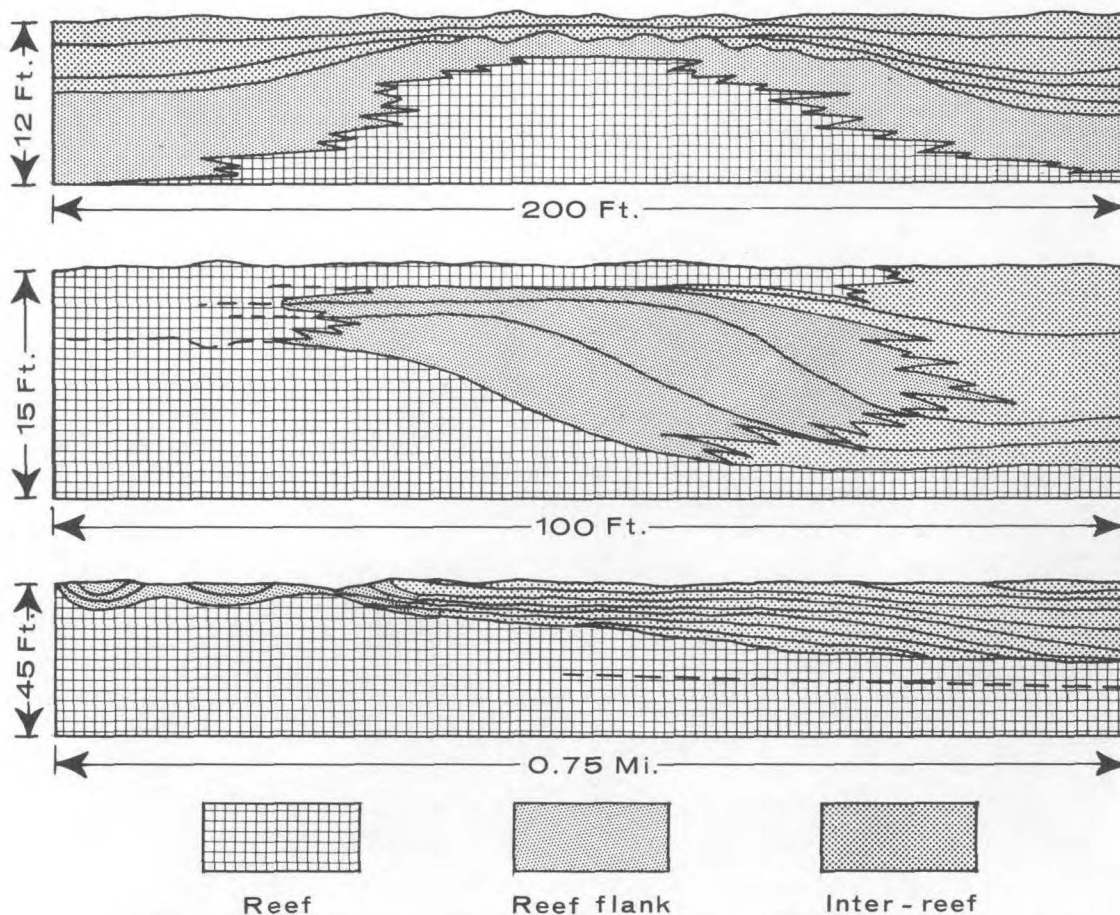


FIG. 5. Diagrammatic cross sections of rudist reefs in Edwards Formation (adapted from Nelson, 1959).

secondary calcite also are common. The Edwards Formation is about 40 to 50 feet thick throughout much of Central Texas; it gradually thickens southward from a few feet in the northern sections in Hood and Johnson counties to about 300 feet near the Colorado River (fig. 6).

Limestone from the Edwards Formation of Central Texas is quarried extensively for aggregate, base material, riprap, ballast, and other use, and for manufacturing lime. Dolomite from the Edwards is deadburned to produce a refractory material. Locally, limestones from the Walnut Formation and from the Edwards Formation are quarried as building and dimension stone.

Fredericksburg rocks of Central Texas have been described recently by Lozo (1959), C. H. Moore (1964), Nelson (1959), Shelburne (1959), and Young (1959).

Callahan Divide (Callahan, Coke, Coleman, Mitchell, Nolan, Runnels, and Taylor counties). — Fredericksburg rocks occurring as outliers along the Callahan Divide (Pl. III and fig. 6) are similar to those of Central Texas. The lower argillaceous part (Walnut and Comanche Peak Formations) thins from about 100 feet in the eastern part of the

Callahan Divide to about 20 feet in westernmost outliers. This east-west thinning is similar to north-south thinning of these units in Central Texas; the Edwards Formation thickens as these lower units thin. The Comanche Peak and Walnut Formations of the Callahan Divide are nodular, argillaceous limestone, marl, and clay similar to the section in the northern part of the Central Texas area. The Edwards Formation of the Callahan Divide has a maximum preserved thickness of about 100 feet, though commonly only a thin remnant caps the outliers. The Edwards Formation is medium- to thick-bedded, granular limestone with rudist and other shell fragments; rudist reefs occur locally but are not as common as in Central Texas. Dolomite, generally in laterally persistent beds, is characteristic of the formation in this area. Chert nodules and discontinuous chert beds are locally abundant, though some sections are largely free of chert. Solution alteration and secondary calcite are not as common as in the Central Texas area.

Limestone from the Edwards Formation is quarried south of Abilene and Sweetwater for crushed stone and for use in the manufacture of

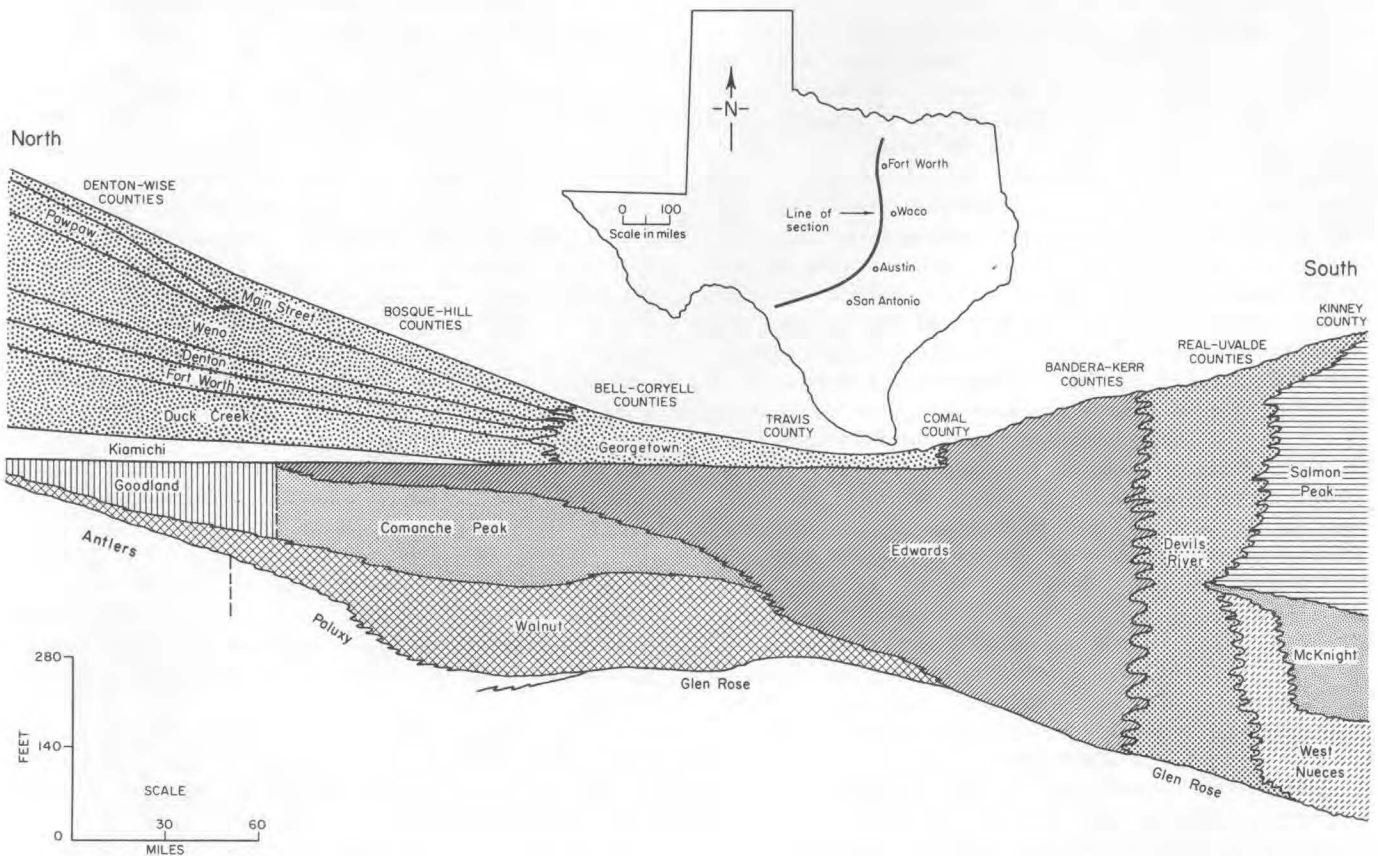


FIG. 6. Diagrammatic north-south cross section of Fredericksburg and lower Washita Groups in Texas.

portland cement.

Southeastern Balcones Escarpment (Bexar, Comal, Hays, and Travis counties).—Limestones of the Fredericksburg Group, chiefly the Edwards Formation, make up the prominent topographic and structural escarpment between Austin and San Antonio (frontispiece). The Edwards Formation of this area consists of 300 to 500 feet of fine- to coarse-grained, shell-fragment, rudist, and miliolid limestones. Rudist reefs, characteristic of the Edwards Formation of Central Texas, occur only locally along the southeastern Balcones Escarpment. The lower argillaceous part of the Fredericksburg Group here includes only about 20 feet of marl of the Walnut Formation (fig. 6). Limestone of the Edwards Formation is quarried at several places along the Balcones Escarpment for aggregate, base materials, riprap, ballast, chemical and industrial process stone, and manufacture of lime.

The Lower Cretaceous rocks of this area have been described recently by Arnow (1959), DeCook (1963), George (1952), and C. H. Moore (1964).

Edwards Plateau (Bandera, Blanco, Coke, Concho, Crane, Crockett, Edwards, Gillespie, Glasscock, Irion, Kendall, Kerr, Kimble, Kinney, Mason, McCulloch, Medina, Menard, Reagan, Real, San Saba, Schleicher, Sterling, Sutton, Tom Green, Upton, Uvalde, and Val Verde counties).—The Fredericksburg Group of the southern part of the Edwards Plateau (central Val Verde, northern Kinney, southern Edwards, Real, and Bandera, northern Uvalde, and Medina counties) consists of 500 to 600 feet of miliolid, shell-fragment, and rudist limestones, with a basal 50-foot section of nodular limestone similar in lithology to the Comanche Peak Formation of Central Texas (Pl. III). About 10 percent of the section is dolomite and dolomitic limestone. The sequence in the southern part of the Plateau is similar to the Edwards Formation of the southern part of the Central Texas area and along the Balcones Escarpment; the overlying limestone and marl of the Georgetown Formation of Central Texas grade southward into limestone generally indistinguishable from the Edwards Formation. This thick uniform sequence in the southern Plateau is designated the Devils River Limestone (Pl. III and fig. 6), and it is equivalent to both the Fredericksburg and lower part of the Washita Groups of Central Texas. Near the middle of the Devils River Formation is a 50-foot thick limestone breccia, which is the result of solution of gypsum, collapse of overlying limestone, recrystallization of calcite, and dolomitization. Similar solution-collapse breccias are present to the north and the south. Rudist reefs are rare.

Along the southern edge of the Edwards Plateau, in parts of Uvalde, Kinney, and Val Verde counties, shell-fragment, rudist, and miliolid limestones of the Devils River Formation grade laterally to the sequence of the Maverick Basin, a mostly subsurface structural and depositional basin centered

in Maverick County. On the outcrop this sequence includes the West Nueces, McKnight, and Salmon Peak (highest) Formations (Lozo and Smith, 1964). The West Nueces Formation is 145 feet thick and comprises a lower unit of nodular, argillaceous limestone similar to the Comanche Peak Formation of Central Texas and an upper unit of fine-grained argillaceous to granular miliolid and shell-fragment limestones similar to the Devils River and Edwards Formations. The McKnight Formation has a maximum thickness of 145 feet in outcrop and consists of upper and lower units of thin-bedded, granular limestone with abundant chert, separated by about 40 feet of laminated calcareous mudstone. Prominent collapse breccias are present in the middle and upper parts of the formation. The Salmon Peak Formation is about 380 feet thick and is mostly thick-bedded, very fine-grained, argillaceous limestone; large chert nodules are common in the middle part. The upper 75 feet is granular rudist and shell-fragment limestones, mostly not exposed on outcrop.

Rudist, shell-fragment, and miliolid limestones of the Devils River Formation in the southern Edwards Plateau grade northward in the Plateau to a sequence containing rudist and shell-fragment limestones, gypsum, dolomite, nodular limestone, and mudstone, a sequence similar to that in the Maverick Basin to the south. In the central and northern Edwards Plateau, the name Edwards Formation is retained for this rock sequence, though Lozo and Smith (1964, pp. 291–292) have divided it into two unnamed units. In the central and northern Plateau the lower part of the sequence consists of a 200-foot unit of argillaceous limestone, shell-fragment and miliolid limestones, locally cherty, and gypsum. The upper unit, about 250 feet thick, consists of cherty, rudist, shell-fragment, and miliolid limestones grading northward to nodular, argillaceous limestone, and mudstone (Pl. III). Dolomite generally is in laterally persistent beds. Rudist reefs are uncommon; small mound-like reefs such as those near Sonora in Sutton County occur locally. Gypsum and collapse breccia are in the upper part of the lower unit of the Edwards Formation throughout the central part of the Edwards Plateau.

The Lower Cretaceous rocks of the Edwards Plateau are described by Barnes (1944, 1952a–n, 1954a–d, 1956a, b), Holt (1956), Long (1958, 1962), Lozo and Smith (1964), Reeves and Lee (1962), Rodda and Fisher (1961), and Welder and Reeves (1962).

High Plains (Borden, Dawson, Ector, Garza, Glasscock, Howard, Lynn, Midland, and Scurry counties).—The Fredericksburg Group exposed along the southern and southeastern margin of the High Plains is similar to the Fredericksburg sequence in the northern part of the Central Texas area, with a relatively thick argillaceous section (Walnut and Comanche Peak Formations) and a thin

section of hard, rudist limestone (Edwards Formation) (Pl. III). The Walnut Formation is about 10 to 20 feet thick and consists of gray clay and argillaceous limestone with fossil oysters. The Comanche Peak Formation is 50 to 80 feet of argillaceous, thin- to thick-bedded to nodular limestone interbedded with marl. The Edwards Formation is thick-bedded, fine- to coarse-grained, rudist and shell-fragment limestones; rudist molds are common. Thickness of the Edwards Forma-

tion ranges from a thin layer to 35 feet and is about 25 feet in most of the area. Northward beneath the High Plains the Lower Cretaceous sequence grades laterally to a predominantly arenaceous facies.

Lower Cretaceous limestones of the southern High Plains are quarried locally for base material and aggregate. Cretaceous rocks of the area have been described by Brand (1953).

ROCKS OF ECONOMIC IMPORTANCE

Limestone.—Lower Cretaceous limestones (Edwards and associated formations) include a variety of types ranging from soft, argillaceous, nodular limestone relatively high in clay-size impurities to hard massive limestone generally high in calcium carbonate. Typically, the Edwards and Devils River Formations are light buff-gray, fine- to medium-grained, medium- to thick-bedded limestones containing shells of rudists, other mollusks, and miliolid foraminifers. Limestones are commonly recrystallized; coarsely crystalline (sparry) calcite replaces original grains and fossil detritus. Nodules of chert are common in the Edwards and Devils River Formations and are present in other Lower Cretaceous hard limestones. Discontinuous beds and large masses of chert are less common than nodular chert. Some sections are free of nodular chert; other sections consist of as much as 10 to 15 percent chert.^{1/}

Reefs, composed of masses of rudists and other fossil organisms (fig. 5), are common in the Central Texas area of the Edwards Formation and locally in the Callahan Divide and Edwards Plateau. According to Nelson (1959), who has described the Edwards Formation in parts of Central Texas, biohermal reefs (mound-like, nonbedded structures) in the Edwards range from 9 to 55 feet in thickness; biostromal reefs (bedded structures, not mound-like) range from 1 to 45 feet (fig. 5). Individual bioherms are circular to elongate in plan and are as much as 50 feet in diameter. Many individual bioherms probably are parts of larger reef systems. Flank beds dip away from biohermal reef cores at angles up to 35 degrees.

Hard, thick-bedded and massive limestones of the Edwards and Devils River Formations are exceptionally pure and suitable for a wide variety of industrial uses (see section on Utilization and Specifications, p. 22). Acid neutralization values (ANV), a measure of total carbonate, average about 99, and about 95 percent of the samples have ANV values exceeding 95 (fig. 7). Average values for other Lower Cretaceous carbonate rocks are 96 for Glen Rose limestones and 95 for the soft, nodular limestones of the Comanche Peak and Goodland Formations (fig. 7). Average calcium carbonate content of high-calcium (95 percent CaCO_3 , or greater) Lower Cretaceous limestones is about 98 percent (fig. 8); approximately 45 percent of all limestones analyzed from the Edwards Formation

contain 97 percent or more calcium carbonate. Magnesium carbonate occurs in most Lower Cretaceous limestones; only about 7 percent of 553 samples analysed contained no magnesium carbonate detectible by flame photometry. However, the amount of magnesium carbonate present generally is small; about 40 percent of the samples contain less than 1 percent, and about 70 percent contain less than 3 percent (fig. 9). About 20 percent of 553 samples analysed from the Edwards Formation contain magnesium carbonate in an amount sufficient to be classed as dolomite (greater than 23 percent MgCO_3). Amount of magnesium carbonate in limestones of the Comanche Peak and Goodland Formations generally is less than 1 percent; magnesium carbonate content of Glen Rose limestones is similar to that in the Edwards. Analyses of non-carbonate impurities include silica, iron oxides, and alumina (table 1 and fig. 10).

TABLE 1. Noncarbonate composition of Lower Cretaceous limestones and dolomites (based on 87 analyses).

High-purity rocks (mostly Edwards Formation)				
	Limestone		Dolomite	
	Range	Average	Range	Average
Silica	0.29-1.60	0.81	0.18-3.08	0.97
Iron oxides	0.03-0.56	0.15	0.01-0.29	0.15
Alumina	0.10-0.64	0.36	0.01-1.07	0.50
Water	0.00-0.29	0.13	0.00-0.42	0.16

Low-purity rocks (Goodland, Comanche Peak, Glen Rose Formations)		
	Range	Average
Silica	1.99 - 5.07	3.39
Iron oxides	0.15 - 0.61	0.35
Alumina	0.55 - 1.46	0.90
Water	0.14 - 0.40	0.22

Variation in physical properties of Lower Cretaceous limestones coincides with variation in chemical quality. Limestones with high calcium carbonate content (e.g., Edwards Formation) generally are hard, tough, and durable, whereas relatively low-purity limestones (Comanche Peak and Goodland Formations) generally are soft and nodular. Limestones of the Glen Rose Formation generally are of intermediate hardness and are commonly interbedded with soft clay and marl.

^{1/}All analyses cited in this report are exclusive of free chert (SiO_2). Abundance and kind of chert are indicated in diagrammatic rock sections (see Results of Tests, p. 41).

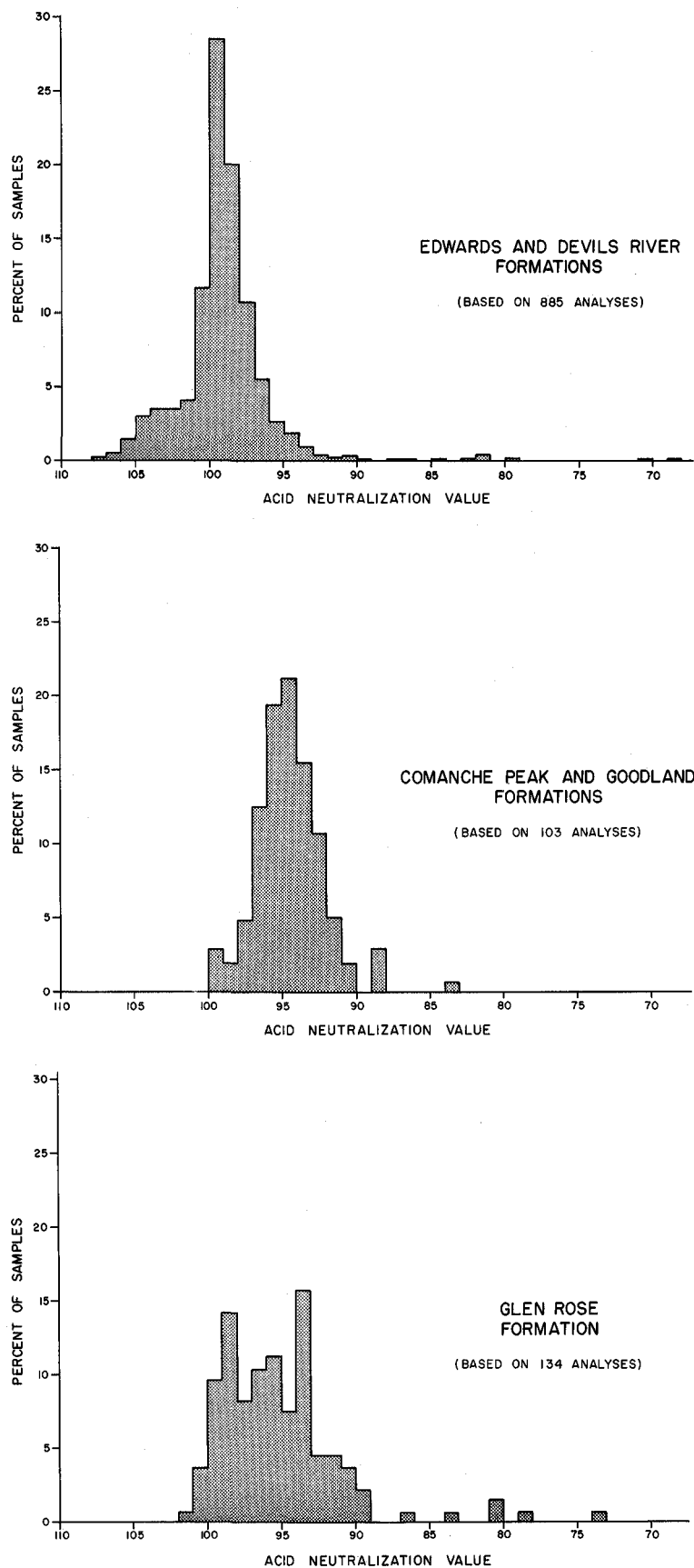


FIG. 7. Acid neutralization values (ANV) of Lower Cretaceous limestones and dolomites.

Limestones of the Edwards and Devils River Formations have wearing coefficient, hardness, toughness, and compressive strength sufficient for most aggregate and constructional uses, though only locally are these limestones sufficiently dense for

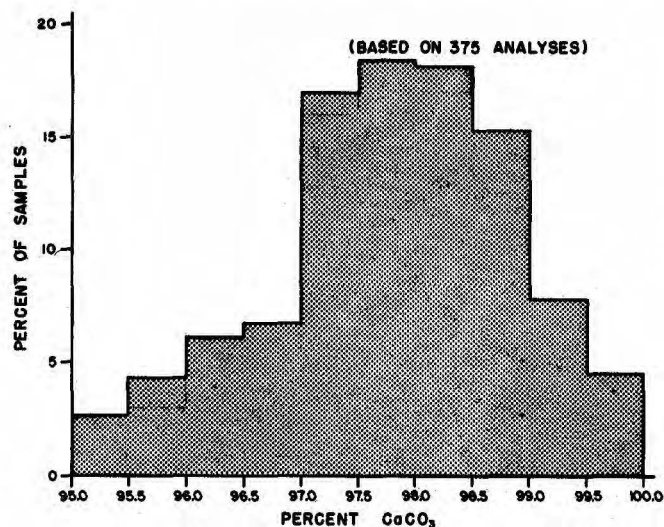


FIG. 8. Calcium carbonate content of high-calcium (95 percent or more calcium carbonate) Lower Cretaceous limestones.

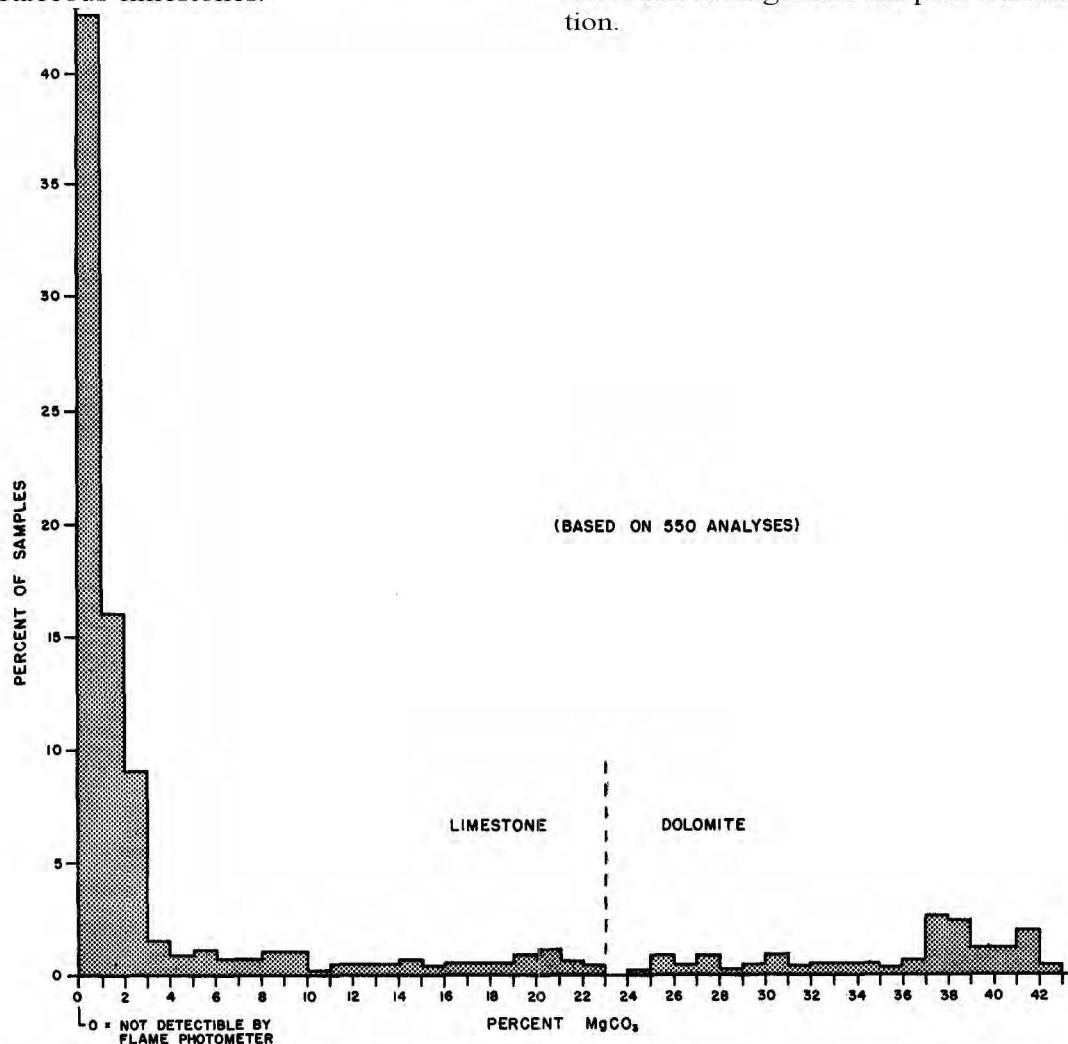


FIG. 9. Magnesium carbonate content of Lower Cretaceous limestones and dolomites.

use as riprap. The softer limestones of other Lower Cretaceous units mostly are suitable only as base material (see section on Utilization and Specifications, p. 22).

Dolomite.—Dolomite occurs extensively in the Edwards Formation, chiefly in Central Texas, along the Callahan Divide, and in the northeastern part of the Edwards Plateau. It occurs locally in the Glen Rose Formation of the eastern Edwards Plateau and along the Balcones Escarpment but is rare in other Lower Cretaceous units. Principal, high-magnesium dolomite deposits are in the Edwards Formation of Brown, Comanche, Lampasas, Mills, and Williamson counties where 25 to 60 percent of the formation consists of rocks containing more than 23 percent magnesium carbonate (Pl. IV).

Dolomite in the Edwards Formation is buff gray to medium brown; texture varies from earthy to crystalline. The rock is soft, porous, and generally consists of a mass of weakly cemented euhedral crystals (fig. 3e). The dolomite is in discrete beds, many laterally persistent, interbedded with limestone, or in irregular local deposits involving wholesale replacement of bedded and massive limestone. Some dolomite in the Edwards Formation appears to be primary; some apparently is a result of diagenetic and post-lithification alteration.

Magnesium carbonate in Lower Cretaceous dolomites varies from an arbitrary minimum of 23 percent to a maximum of 43 percent; average content is about 37 percent (fig. 8). Noncarbonate impurities, exclusive of nodular and bedded chert, average about 1.6 percent, comparable to the noncarbonate composition of Edwards limestones (table 1 and fig. 9). Common impurities include silica as sand-, silt-, and clay-size free quartz, alumina largely

as clay minerals, and iron oxides. Nodular and bedded chert (SiO_2), in amounts up to 20 percent, is commonly associated with dolomite. Most dolomite deposits are highly variable in quality and occurrence.

Pulverulent limestone.—Pulverulent limestone is soft, incoherent or poorly consolidated, light-colored, chalky or earthy textured limestone consisting mainly of microscopic rounded grains of calcite with minor impurities such as clay, iron oxide, and quartz. Calcium carbonate content generally is greater than 90 percent. Pulverulent limestone apparently forms by secondary precipitation of calcium carbonate after solution of the original calcium carbonate, perhaps by ground water.

Pulverulent limestone is present in the Edwards Formation in many parts of the State but is most abundant in the Central Texas area. Principal deposits are in the extensively dissected Lampasas Cut Plain in Bell, Coryell, Mills, and Williamson counties. Typical occurrence is in 1- to 3-foot, locally up to 15-foot, beds in the lowermost part of the Edwards Formation immediately above the Comanche Peak Formation. The relatively impermeable, argillaceous limestones of the Comanche Peak apparently provide a barrier to ground-water movement which results in solution and secondary precipitation of calcium carbonate in the lower part of the overlying Edwards Formation. Much of the pulverulent limestone may have resulted from extensive surficial weathering as deposits commonly thicken from subcrop toward outcrop. Pulverulent limestone also occurs locally at intervals higher in the Edwards Formation, though in these cases it is commonly associated with local structures or highly weathered and altered sections. In outliers or along escarpments, limestone rubble from the Edwards Formation litters the lower slopes formed by softer limestones and commonly covers the pulverulent limestone. Exploration is best conducted by drilling along the outcrop margin and near the contact of the Edwards and Comanche Peak Formations. Outliers capped with only a thin section of Edwards would have a minimum amount of overburden and are likely to be weathered deeper than outliers capped by thick sections of Edwards limestones.

Pulverulent limestone has been mined from shallow, open pits near Florence, Williamson County, for many years. The product has been marketed as a soft abrasive for use in polishing grains, especially rice; currently, it is also marketed as a mineral food (calcium source) or stock-feed additive. For the above uses pulverulent limestone should be uniform in grain size and composition and free from grit. Content of iron oxide in pulverulent limestones of the Edwards Formation is generally less than 0.5 percent but is too high for use as a whiting or paint pigment and filler without beneficiation. Other impurities

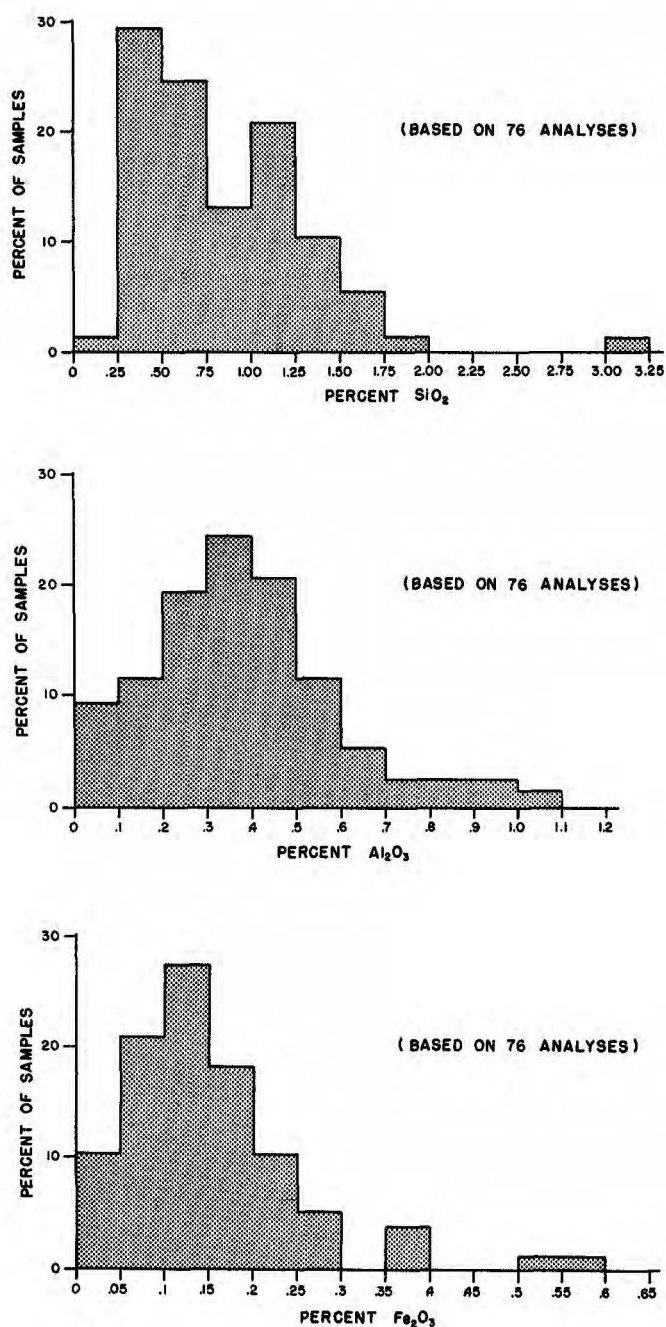


FIG. 10. Noncarbonate impurities in high-calcium limestones and high-magnesium dolomites in Lower Cretaceous rocks.

which locally make up as much as 10 percent of the total composition of pulverulent limestone are chiefly clay minerals and fine-grained quartz. Special properties of pulverulent limestone which make it useful as a mineral raw material are very small grain size, softness, incoherence, and relatively pure chemical composition in the natural state.

Gypsum.—Local deposits of gypsum are in the middle part of the Edwards Formation over much of the Edwards Plateau. Regionally, solution has removed most of the once extensive evaporite, and the former extent of this deposit commonly is indicated only by collapse structures, brecciated limestone, and secondary calcite. Deposits of gypsum in Gillespie and Menard counties were described by Barnes (1944). He reported gypsum up to 35 feet thick, occurring about 120 to 140 feet above the base of the Edwards Formation. Analyses reported by Barnes of 13 samples of gypsum from Gillespie and Menard counties ranged from about 32 to 33 percent calcium oxide, 44 to 46 percent sulfate, with 0.2 percent to a trace of insoluble materials. Calculated composition of gypsum ranged from 95 to 100 percent and of calcite, from 0 to 4 percent. Other solution collapse intervals are in the middle of the Devils River Formation of the southern Edwards Plateau and in the McKnight Formation along the southern edge of the Edwards Plateau and in the subsurface Maverick Basin.

Since 1932 gypsum from the Edwards Formation has been mined intermittently and in small volume. Production is marketed largely as a portland cement additive. Mining is complicated by solution channels, caverns, collapse structures, and the resulting erratic occurrence of the remaining gypsum.

Field characteristics.—In the evaluation of

limestone and dolomite deposits several lithologic and stratigraphic characters are significant and should be investigated in the field. These include: contamination due to bedded, nodular, and disseminated chert; lateral and vertical variation in individual beds; displacement and contamination due to faults and other structural disturbances; ground-water conditions; solution effects; and secondary mineralization. Problems resulting from these factors can be avoided by careful, systematic study of prospective sites, both on the surface and by drilling.

Chert, as nodules (generally 1 to 6 inches across), beds, and irregular masses, is common in limestone of the Edwards Formation (see rock descriptions in section on Results of Tests, p. 41). A few measured sections in the Edwards Formation contain little or no chert; these chert-free sections seem to follow no regional distribution pattern, and, accordingly, chert in some form should be anticipated in most operations. Faults and other minor structural displacements are common along the Balcones Escarpment but are rare elsewhere. Ground water moves with relative ease along faults and fractures and commonly results in solution of limestone and deposition of secondary minerals, mostly calcite. High local porosity of the limestone in the Edwards Formation causes water problems in quarries operating below the water table. Impurities along fault zones pose problems in quarries where consistent, high-grade and high-purity product is required. On the other hand, in some places, secondary cementation along faults has produced a more dense rock suitable for riprap. Locally along the Balcones Fault Zone the Edwards Formation is extensively dolomitized; abrupt lateral variations in the extent of dolomite deposits are common.

RESERVES

Tonnages of limestone and dolomite in the Edwards and associated formations (tables 2 and 3) were calculated for each county from total area of outcrop (map units, Pl. I) and average thicknesses of these formations. Mapped units (Pl. I) were considered as minable units, though these units vary in thickness from as little as 10 feet to as much as 700 feet. Overburden is negligible in most of the outcrop area and was not considered in estimating reserves. However, dolomite and some high-calcium limestone are confined to certain beds within the mapped units so that thickness of overburden for these deposits depends on their stratigraphic position within a given unit. Tonnages of dolomite and high-calcium limestone are reported (tables 2 and 3) without regard to overburden. Percent of limestone, high-calcium limestone, dolomite, and high-magnesium dolomite were determined from chemical analyses of measured, sampled sections (see Results of Tests, p. 41) taken as representative of entire units. An average density of 140 pounds per cubic foot for limestone and 105 pounds per cubic foot for dolomite was used in the calculations. Although many dolomites have a higher density than limestone, dolomite in the Edwards and associated formations generally is porous and has a lower bulk density than limestone.

Limestone Reserves

Total tonnage of surface limestone in the Edwards and associated formations (map units, Pl. I) is approximately 8.5 trillion short tons (table 2). About 8 trillion short tons of surface limestone is in the Edwards Plateau, of which only about 5.7 percent is located within 5 airline miles of railroads. About 270 billion short tons (3.2 percent of the total tonnage) of surface limestone are in the Edwards Formation in the Central Texas and southeastern Balcones Escarpment areas. About 55 percent of this total is within 5 airline miles of railroads. About 20 billion short tons of Edwards limestone crops out along the southern margin of the High Plains; about 5 percent of this is generally accessible by rail. About 200 billion short tons of Edwards limestone crops out in the Abilene-San Angelo area along the Callahan Divide and the northern border of the Edwards Plateau; about 30 percent of this tonnage is within 5 airline miles of railroads.

Reserves within principal market areas.—The bulk of current limestone production and consumption in Texas is in 8 principal market areas (fig. 11): Houston area, Corpus Christi area, San Antonio area, Austin area, Waco area, Fort Worth-Dallas area, Abilene area, and Midland-Odessa area.

About 500 billion tons (about 6 percent of the total tonnage) of Lower Cretaceous surface limestone (Edwards and associated formations) in Texas is within economic hauling distance of these markets.^{2/} Nearly 40 percent of this amount is accessible to rail transport under existing conditions (fig. 11). The latter amount is approximately 6 thousand times the total current annual production of limestone in Texas.

Dolomite Reserves

Total tonnage of dolomite in the Edwards and associated formations is approximately 460 billion short tons (table 3), or about 1/20 of total limestone and dolomite tonnage. Most of the dolomite is in the Edwards Formation in the Edwards Plateau. Only a small part is accessible by rail. In this area thick sections of limestone generally overlie the dolomite, and only a small percent of the total tonnage of dolomite can be quarried economically. Approximately 8 billion short tons of dolomite, about 2 percent of the total tonnage, are in the Central Texas area; about 40 percent of this dolomite is within 5 airline miles of railroads. Sections of the Edwards Formation in this area are relatively thin, and most dolomite deposits are near the surface. Dolomite resources in the Callahan Divide area amount to about 2 billion short tons, of which about 40 percent is accessible by rail; as in the Central Texas area, overburden generally is thin.

^{2/}

The following formula was used to calculate competitive hauling distances:

$$H = \frac{C - V}{F}$$

H = hauling distance

C = delivered cost in market area

V = product value, f. o. b. quarry, constant at \$1.00 per ton

F = rail freight rate, constant at \$1.50 per ton per 100 miles

TABLE 2. Limestone reserves in Edwards and associated formations (mapped units, Pl. I) in Texas; tonnage figures in billion short tons.

County	Total limestone (tonnage)	Limestone within 5 airline miles of railroad	High-calcium limestone (97% or more CaCO ₃)	High-calcium lime- stone within 5 air- line miles of rail- road	High-calcium limestone, % of total tonnage
Bandera	167.70	---	32.88	---	19.6
Bell	9.84	4.10	3.28	1.37	32.8
Bexar	78.06	31.22	41.37	16.55	53.8
Blanco	5.85	---	---	---	---
Borden	0.23	0.04	---	---	---
Bosque	5.94	4.19	4.81	3.40	81.0
Brown	0.16	---	---	---	---
Callahan	0.73	---	0.59	---	80.6
Coke	14.44	0.72	4.29	0.21	29.7
Coleman	1.09	0.44	1.09	0.44	100.0
Comal	87.01	66.93	41.86	32.20	48.1
Comanche	0.59	0.18	0.35	0.11	59.3
Concho	42.93	15.61	N. D.	N. D.	N. D.
Coryell	13.02	5.39	7.07	2.93	54.3
Dawson	0.12	---	N. D.	---	N. D.
Ector	0.49	0.33	---	---	---
Edwards	1870.00	---	749.40	---	40.1
Erath	0.49	---	0.41	---	83.7
Garza	0.20	0.12	N. D.	N. D.	N. D.
Gillespie	67.13	---	---	---	---
Glasscock	54.64	---	N. D.	---	N. D.
Hamilton	3.68	---	2.92	---	79.3
Hays	51.91	25.95	30.87	15.44	59.5
Hill	0.70	0.66	N. D.	N. D.	N. D.
Hood	0.08	0.08	0.06	0.06	75.0
Howard	1.37	0.31	---	---	---
Irion	161.00	48.30	N. D.	N. D.	N. D.
Johnson	1.12	0.39	0.64	0.21	54.7
Kendall	31.22	7.42	N. D.	N. D.	N. D.
Kerr	507.40	14.05	177.70	4.92	35.2
Kimble	346.60	---	60.89	---	17.8
Kinney	515.20	---	448.30	---	87.0
Lampasas	0.87	0.43	0.16	0.08	18.3
Lynn	0.12	---	N. D.	---	N. D.
Mason	5.85	---	N. D.	---	N. D.
McCulloch	5.46	1.56	N. D.	N. D.	N. D.
McLennan	2.10	1.26	0.35	0.21	16.7
Medina	163.90	---	119.70	---	73.0
Menard	273.20	54.64	N. D.	N. D.	N. D.
Mills	2.05	1.03	0.96	0.48	46.8

Table 2 (continued).

County	Total limestone (tonnage)	Limestone within 5 airline miles of railroad	High-calcium limestone (97% or more CaCO ₃)	High-calcium lime- stone within 5 air- line miles of rail- road	High-calcium limestone, % of total tonnage
Nolan	43.21	23.20	24.24	13.02	56.1
Real	521.00	---	228.30	---	43.8
Runnels	1.45	0.91	0.34	0.21	23.4
San Saba	0.55	---	N. D.	---	N. D.
Schleicher	790.30	105.40	N. D.	N. D.	N. D.
Scurry	0.12	0.08	N. D.	N. D.	N. D.
Somervell	0.41	---	0.41	---	100.0
Sterling	78.06	---	N. D.	N. D.	N. D.
Sutton	1013.00	97.85	506.50	48.90	50.0
Taylor	13.70	4.26	11.06	3.44	80.7
Tom Green	68.30	8.78	N. D.	N. D.	N. D.
Travis	5.85	4.88	2.46	2.05	42.1
Uvalde	302.50	14.64	145.20	7.03	48.0
Val Verde	1124.00	93.70	843.00	70.25	75.0
Williamson	7.30	3.98	4.94	2.69	67.7
TOTAL	8464.24	643.03 (7.5% of total)	3496.40 (41.3% of total)	226.20 (6.5% of total high-calcium limestone)	

---, None

N. D., Not determined

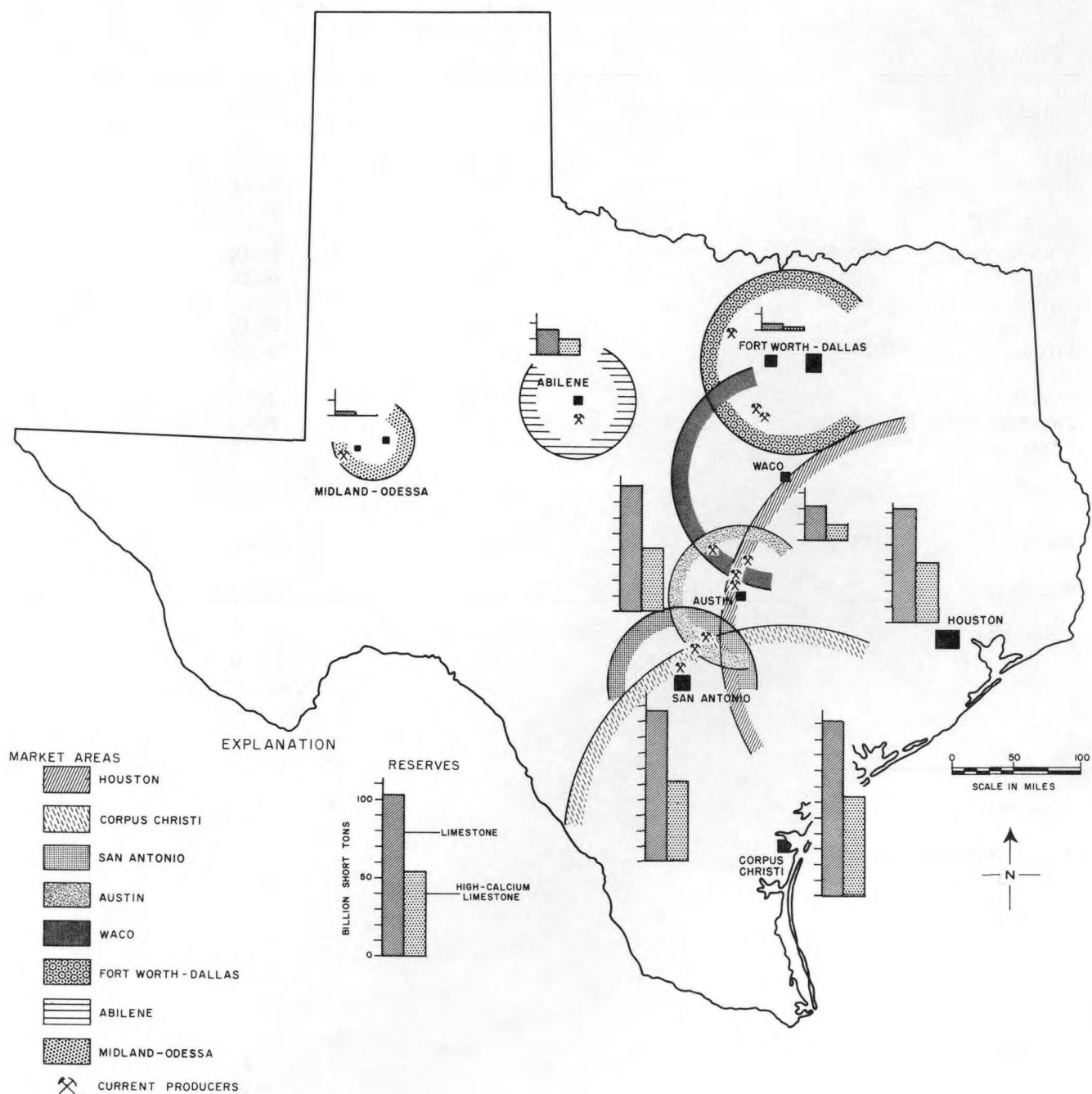


FIG. 11. Limestone and high-calcium limestone reserves in Edwards Formation (accessible within 5 airline miles of railroads) available to principal market areas. Market areas defined by limits of existing competitive hauling distances (see text for details).

TABLE 3. Dolomite reserves in Edwards and associated formations
(mapped units, Pl. I) in Texas; tonnage in billion short tons.

County	Total dolomite (>10% MgO)	Percent of total limestone and dolomite reserves	Dolomite within 5 airline miles of railroad	High-magnesium dolomite (>16% MgO)	High-magnesium dolo- mite within 5 airline miles of railroad
Bell	1.41	8.4	0.59	1.41	0.59
Brown	0.32	67.4	---	0.22	---
Coke	12.59	46.6	0.63	9.66	0.48
Comal	1.34	15.1	1.03	---	---
Comanche	0.44	42.9	0.13	0.38	0.11
Coryell	0.85	6.1	0.35	0.64	0.26
Edwards	207.80	10.0	---	64.40	---
Gillespie	66.74	49.9	---	31.61	---
Hamilton	0.57	13.4	---	0.57	---
Hays	12.29	19.1	6.15	---	---
Kimble	91.33	20.9	---	---	---
Lampasas	0.23	21.3	0.17	0.20	0.10
Mills	1.54	42.9	0.77	1.23	0.61
Nolan	7.11	14.1	3.82	4.74	2.55
Real	48.30	8.5	---	31.45	---
Runnels	0.08	5.3	0.05	0.08	0.05
Taylor	2.90	17.5	0.90	2.90	0.90
Williamson	2.58	26.1	1.41	0.81	0.44
TOTAL	458.42	5.1	15.95 (3.5% of total dolomite)	150.29 (32.8% of total dolomite)	6.09 (4.1% of total high-magnesium dolomite)

---, None

UTILIZATION AND SPECIFICATIONS

Limestone and dolomite are crushed for use as concrete aggregate, roadstone, base material, railroad ballast, and other constructional uses; fluxing agent in the smelting and refining of metals; soil conditioner and fertilizer; source of lime, chemical and industrial process raw material; and mineral fillers and pigments. Limestone is the basic raw material for portland cement; dolomite is a source of high-grade refractories. Limestone also is cut for use as dimension building stone. For certain uses physical properties are most important, for other uses chemical properties are determining factors, and for some special uses both physical and chemical properties are critical. Limestone and dolomite that will meet chemical specifications for most uses are less common than those that have suitable physical properties, and, accordingly, the high-purity rocks command a higher unit price. Lower Cretaceous limestones and dolomites, especially deposits in the Edwards Formation, are suitable for most uses, though materials meeting highly exacting specifications are localized (table 4).

Cement.—Cements produced from naturally occurring materials include hydraulic cement, portland, masonry, and pozzolan cement. Portland cement is produced by calcining to incipient fusion a finely ground mixture of lime, silica, alumina, and iron oxides, and grinding the resulting clinker; a small amount of gypsum is added to the finished product. Natural and hydraulic cements are produced by low-temperature calcination of naturally occurring materials containing approximately the required proportions of lime, silica, alumina, and iron oxides. Slag-lime or pozzolan cement is made by mixing powdered slaked lime with such materials as volcanic ash, calcined clay, or blast-furnace slag. Portland blast-furnace slag is slag mixed with portland clinker rather than lime. Masonry cements are made by grinding portland cement clinker or finished portland cement with limestone and an air-entrained plasticizer to greater fineness than portland cement. These cements have strong hydraulic properties, high plasticity, and high water retention. Natural masonry cement utilizes natural cement rock ground with a small quantity of portland cement. Special cements include oil-well cement, white cement, and hydroplastic, plastic, and waterproofing cements.

Portland cement is the cement most used and manufactured; a more uniform and dependable product generally can be made from an artificial mixture of materials than from natural cement rock.

In the production of cement from other than cement rock, alumina and silica are obtained by

addition of an argillaceous component, generally clay or shale. Content of aluminum oxide in finished portland cement should not exceed 6 to 7.5 percent, depending on type of portland manufactured. Minimum content of silica is 21 percent. Clay or shale suitable for use in manufacture of portland cement contains between 55 and 65 percent silica; aluminum and iron oxides should average between one-third and one-half the total amount of silica. Magnesium content of all components must be low, generally less than 3 percent.

Lower Cretaceous limestones (Edwards and associated formations) generally are high in calcium carbonate and low in alumina and silica; the argillaceous, aluminous, and ferruginous components must be added. Four cement producers, at Maryneal (Nolan County), Penwell (Ector County), Fort Worth (Tarrant County), and El Paso (El Paso County), currently utilize Lower Cretaceous limestones. At these operations high-purity limestone is quarried and mixed with impure or low-lime limestones and clay, obtained either from adjacent beds in the same quarry or from separate pits in adjoining areas.

Lime.—When limestone and dolomite are heated to 1000°C to 1100°C they yield carbon dioxide gas and an oxide—calcium oxide (calcium lime) from limestone and calcium oxide plus magnesium oxide (magnesium lime) from dolomite. Calcining or burning is accomplished in either vertical stationary kilns or in inclined rotary kilns. Purity of the lime is controlled largely by the quality of the raw material and to a lesser extent by the process of manufacturing. Most specifications require 90 percent available lime, so that generally a raw material with less than 4 percent noncarbonate impurities is suitable. Calcium carbonate content should be about 96 percent or greater for high-calcium lime; raw materials for magnesium or dolomitic lime should contain about 20 to 30 percent magnesium carbonate.

The calcined kiln product, known as quicklime, has a strong affinity for carbon dioxide and water. Quicklime is a marketable product but must be protected from moisture in storage and in transit. Quicklime may be hydrated by addition of proper amounts of water to form hydrated lime or calcium hydroxide, which is relatively stable under atmospheric conditions.

High-calcium lime currently is produced from limestones of the Edwards Formation at New Braunfels (Comal County), McNeil (Travis County), Round Rock (Williamson County), Blum (Hill County), and Cleburne (Johnson County) and from limestone of the Whitestone Lentil (Walnut Forma-

TABLE 4. Specifications and availability of Lower Cretaceous limestone and dolomite in Texas for principal consuming industries.

Use	Specifications		Availability from Lower Cretaceous rocks	Current production and number of plants
	Chemical	Physical		
Portland cement	MgO, maximum 3%, preferably <2%; total alkalis, maximum 0.5%; CaCO ₃ , minimum 75%, depending on availability of other raw materials	Should crush and pulverize easily	Generally, noncalcareous components must be added	Yes (4)
Natural cement and hydraulic lime	Clayey materials 13% to 35%, of which 10% to 22% should be SiO ₂ ; Al ₂ O ₃ and Fe ₂ O ₃ , 4% to 16%; remainder CaCO ₃ and MgCO ₃	Should crush and pulverize easily	Generally, noncalcareous components must be added	No
High-calcium lime	CaCO ₃ , minimum 96%, preferably >97%	In some processes rock should not decrepitate during calcining; 6" to 10" sizes for vertical kilns, 1/2" to 1-1/2" for rotary kilns	Widespread, especially in Edwards Formation	Yes (5)
Magnesium lime	MgO, 10% to 15%, preferably 11% to 12%	Same as high-calcium lime	Largely in Central Texas area	Yes (1 plant planned)
Fluxstone (blast furnace)	CaCO ₃ and MgCO ₃ , >90%; SiO ₂ , <5%; Al ₂ O ₃ , <2%; MgO, <4% to 15% (variable); P ₂ O ₅ , maximum trace	Particle size, 1/2" to 4"; rock should not decrepitate during calcining	Widespread	Yes (4)
Fluxstone (open hearth)	CaCO ₃ , >98%; SiO ₂ , <1%; Al ₂ O ₃ , <1.5%; P and S, no more than trace	Particle size, 2" to 12", generally 4" to 8"; in some processes should hold lump form until consumed in melt	Widespread in Edwards Formation	Yes
Refractory dolomite (deadburned)	MgO, minimum 18%; SiO ₂ , <1%; Fe ₂ O ₃ , <1%; Al ₂ O ₃ , <1% (lower grades locally accepted but in no case should SiO ₂ exceed 2.5%)	Particle size, approximately 5/8"	Local in Edwards Formation in Central Texas area	Yes (1)

Table 4 (continued).

Sugar beet refining	SiO ₂ , maximum 1%; MgO, maximum 4%; Fe ₂ O ₃ , <0.5%. No impurities that will give taste	Particle size, 2" to 8"; should not decrepitate during calcining	Widespread, especially in Edwards Formation	No
Agricultural lime-stone and dolomite	Maximum CaCO ₃ and MgCO ₃ desirable, at least >85%	Particle size, -4 mesh; soft and friable	Widespread	Yes (5)
Glass	CaCO ₃ and MgCO ₃ , >98%; Fe ₂ O ₃ , <0.05%, preferably <0.02% (lower grades locally used)	Particle size, -16 mesh	Local in Edwards Formation	Yes (1)
Calcium carbide and calcium cyanamide	CaCO ₃ , >98%; MgO, <0.5%; Al ₂ O ₃ , Fe ₂ O ₃ , <0.5%; SiO ₂ , <1.2%; P, <1.2%; S, no more than trace	Rock must hold lump form during calcining	Widespread in Edwards Formation	No
Rock wool	Impure raw material, CaCO ₃ , 40% to 65%; remainder SiO ₂ and Al ₂ O ₃ , iron sulfide should be low	Particle size, 2" to 5"	Widespread	No
Paper (sulfite process - tower system)	CaCO ₃ , <95%; MgO, <2.5%; SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ , <2.5%	Particle size, 8" to 14"; density, 150 to 180 pounds per cubic foot	Widespread in Edwards Formation	Not directly, except as source of quick-lime
Paint and whiting	CaCO ₃ , >96%; MgO, generally <1%; Fe ₂ O ₃ , <0.25%; SiO ₂ , <2%; SO ₃ , <0.1%	Degree of whiteness is main controlling characteristic	Local in Edwards Formation	Yes (1)
Miscellaneous ground fillers	CaCO ₃ , >96%; uniform distribution of impurities	Should crush and pulverize easily; particle size distribution specified, depending on use	Widespread in Edwards Formation	Yes (5)

Table 4 (continued).

Mineral foods	CaCO_3 , >95%; fluorine compounds very low; MgCO_3 , low	Particle size, -200 mesh, except poultry grit, -2 to +10 mesh	Widespread	Yes (4)
Crushed stone (aggregate, ballast, base materials, etc.)	Low alkalis, low surface organic matter, very low opaline silica for concrete aggregate	Clean, strong, durable, tough, low porosity; particle size, variable but specified	Widespread, except for riprap materials	Yes (15 major commercial plants)
Dimension stone	Low in mineral grains or impurities which result in stains and streaks on weathering	Free working (split with approximately equal ease in all directions); durable, tough, strong; color and texture variable	Widespread	Yes (5)
Stone sand	Same as aggregate where used in concrete	Clean, durable, free of flaky particles; uniform particle size distribution	Widespread	Yes (2)
Stone chips (roofing granules, terrazzo, exposed aggregate, etc.)	Same as aggregate where used in concrete	Clean, free of dust and soft particles; pleasing appearance; particle size specified	Widespread	Yes
Filter stone	Generally none, depends on performance	Clean, free of dust; particle size range within 1" between minimum and maximum	Widespread	No
Alkalies	CaCO_3 , >98%; SiO_2 , <1%	Particle size, 1" to 6"	Widespread in Edwards Formation	Yes (2)

tion) at Cedar Park (Williamson County). Manufacture of magnesium lime from dolomite of the Edwards Formation west of Round Rock (Williamson County) is planned. Lime production from Lower Cretaceous limestones accounts for about half the total lime production of the State; the remainder is manufactured largely from oyster shell obtained from shallow bays along the Texas Gulf Coast.

Agricultural limestone.—Limestone and dolomite, either in the raw state (aglime or agstone) or burned to lime, are used as soil conditioners and fertilizers to replenish calcium and magnesium cropped or leached from soils, correct soil acidity, improve physical and microbiological conditions in the soil, and increase efficiency of other fertilizers. Raw, ground limestone and dolomite (aglime), obtained commonly as a by-product in crushed stone operations, currently are used much more extensively than lime. Aglime reacts more slowly and requires greater unit volume than lime but is considerably cheaper and easier to handle.

Specifications for agricultural limestone are variable but commonly are based on capacity of the limestone to correct acidity, described as calcium carbonate equivalent (c. c. e.) or acid neutralizing value (ANV). The c. c. e. for pure calcite is 100.0 and for pure dolomite (theoretical) is 108.6. Minimum requirements commonly are specified at 80 to 90 ANV or approximately 85 percent calcium carbonate. Fine grain size is important as it is a significant factor in rate of solubility. Typical size specifications are 90 percent passing 8 mesh and up to 20 percent passing 100 mesh. Trace elements such as Mn, Cu, Zn, B, Bo, and Mo are important for some purposes in agricultural limestone. Generally, the higher the content of calcium carbonate or magnesium carbonate (in the case of dolomite), the more suitable a stone for agricultural purposes.

Agricultural limestone is produced from the Edwards Formation at Beckmann (Bexar County), Ogden (Comal County), McNeil (Travis County), Georgetown (Williamson County), and Cleburne (Johnson County). Production is exclusively as a by-product, utilizing fines from crushing operations; production of agricultural limestone generally amounts to less than 10 percent of total volume from any one operation.

Fluxstone.—Limestone is used as a fluxing agent in the smelting of metals, especially those smelted in blast furnaces. Limestone or other calcareous materials supply the basic calcium oxide which combines with undesirable acid constituents in the ore and fuel to form a slag separable from the molten metal. Main requirements are that the fluxstone be fine grained, have uniform particle size distribution, have hardness sufficient to allow crushing to uniform size, be easily calcined, and be low in acid constituents, such as silica, alumina, sulfur, and phosphorus. Maximum silica

content tolerated is 5 percent, though 1.5 to 3.0 percent generally is specified; fluxstone used in open hearths should contain less than 2.0 percent silica. Magnesium oxide is not critical in a blast furnace fluxstone but should be less than 5 percent for use in open hearths. Fluxstone used in either open hearths or blast furnaces should contain no more than a trace (0.005 to 0.006) of phosphorus pentoxide.

Approximately 40 percent of the fluxstone produced in Texas is from the Edwards Formation. Current production is at Ogden (Comal County), McNeil (Travis County), Georgetown (Williamson County), and El Paso (El Paso County).

Crushed stone.—For use as aggregate or for other physical purposes, limestone and dolomite should be durable, sound, nonporous, and free of such impurities as chert, organic matter, and pyrite. Relative ease in crushing and widespread occurrence account for the extensive use of limestone as a crushed stone. In Texas, limestone is obtained widely from Lower Cretaceous rocks, especially the Edwards Formation, for use as concrete aggregate, base material, roadstone, riprap, and railroad ballast. Lower Cretaceous limestones account for about 40 percent of the total State production of crushed limestone. Major commercial operations exist in 10 counties, with numerous small operations and noncommercial operations in several other counties. Lower Cretaceous dolomites and argillaceous, nodular limestones generally are too soft or porous for constructional uses, except locally as base materials.

Chemical and industrial process stone.—Limestone and dolomite are used directly and indirectly as lime in several important chemical and industrial processes. These include processing of paper, pulp, and sugar and the manufacture of glass, caustics, alkalies, calcium carbide, and calcium cyanamide. Limestone for chemical and industrial uses must be high purity with calcium carbonate content commonly specified at 98 percent or greater. Lime used generally must contain calcium oxide in excess of 96 percent. Such impurities as alumina, iron oxides, silica, sulfur, and phosphorus must be not only very low but uniform in distribution.

Among Lower Cretaceous rocks, chemical- and industrial-grade limestone and dolomite are restricted largely to the Edwards Formation, with current production at Beckmann (Bexar County), Ogden (Comal County), Georgetown (Williamson County), and Cleburne (Johnson County). Lime manufactured from limestones of the Edwards Formation also is used extensively in chemical and industrial processes.

Fillers and pigments.—Finely ground limestone and dolomite are used extensively as mineral fillers, chiefly in asphalt, fertilizer, insecticide, paint, and rubber, as well as a variety of other products. Specifications depend on use. Lime-

stone or dolomite whiting used as a filler and extender in oil paints and calcimines or as a ceramic ingredient, for example, must have a good white color, be free of grit, have high chemical purity, and be ground to uniform particle size of about 50 microns. By contrast, lower grade fillers have less exacting specifications; they are used chiefly in asphalt, fertilizer, and insecticide.

Fillers, primarily fertilizer and asphalt grade, are processed from limestones of the Edwards Formation in Bexar, Comal, Johnson, and Williamson counties.

Dimension stone.—Dimension stone is quarried, cut, or broken in special shapes and sizes. Main controlling factor in use and selection of a dimension stone is its physical appearance (chiefly color and texture). Specifications chiefly concern strength, soundness, durability, and freedom from cracks and other defects. Variation in specifications depends on whether the stone is for interior or exterior use, and whether it is to be used structurally or as a facing stone.

Most Lower Cretaceous limestones are sufficiently durable and sound for use as dimension stone and they are used in many areas for such purpose. Fine-grained to shell-fragment limestone of the Edwards Formation was long quarried as dimension stone at Crawford (McLennan County). In the Cedar Park area, Williamson County, a 10-foot sequence of Lower Cretaceous limestone (Whitestone Lentil of Walnut Formation) is quarried as a dimension stone and used extensively in Texas, as

well as throughout the United States. The stone is a buff-colored, relatively soft, oolitic limestone; locally, a distinctive limestone bed with well-preserved molds of clams and other shells occurs beneath the oolitic limestone. These are marketed, respectively, as Cordova Cream and Cordova Shell. Three companies operate in the Cedar Park area, producing approximately 80 percent of the total State production of dimension limestone. More detailed description of these operations is given by Barnes (*in* Barnes, Dawson, and Parkinson, 1947, pp. 169–170; 1958, pp. 34–36).

Dolomite refractories.—Dolomite suitable for manufacture of refractories as deadburned dolomite should contain at least 18 percent magnesium oxide and generally less than 1 percent each of iron oxide, silica, and alumina. Raw materials are calcined at temperatures of about 1500°C so that all carbon dioxide is eliminated. Although the calcined material is technically a quicklime, it is burned so thoroughly that it is practically chemically inactive; addition of iron or iron oxide helps stabilize the product and prevents air slaking. The product is partly sintered depending upon content of impurities. Deadburned dolomite is used primarily for lining open-hearth steel furnaces. It is produced from the Edwards Formation by one plant west of Round Rock (Williamson County). Dolomite suitable for the manufacture of refractories occurs in the Edwards Formation throughout Central Texas, though most deposits are of variable size and quality.

PRODUCTION AND VALUE

Production of limestone and dolomite in Texas during 1963 amounted to approximately 31 million tons valued at about \$35 million (table 5). This is 5.6 percent of the total United States production and ranked Texas fifth among producing states. About 70 percent of the total limestone produced in Texas was used as aggregate, railroad ballast, riprap, roadstone, base material, and for other bulk constructional purposes; approximately 18 percent of the total production was used in the manufacture of portland and masonry cement (figs. 12, 13, 14). Current commercial producers of limestone and dolomite from Lower Cretaceous rocks are listed in table 6.

About 40 percent of the total value of limestone produced in Texas during 1963 was from Lower Cretaceous rocks, principally from the Edwards Formation along the Balcones Escarpment between San Antonio, Bexar County, and Georgetown, Williamson County (Pl. I). A large portion of the total State production of limestone for special uses or for uses requiring a high-purity stone is from the Edwards Formation. Rocks from this formation provided (by value) all the dolomite used in the manufacture of deadburned

dolomite, 95 percent of the limestone used in the manufacture of lime, 95 percent of the limestone used as fertilizer filler and mineral food, 60 percent of the limestone used for production of alkalies, glass, asphalt filler, and stone sand, and 40 percent of the limestone fluxstone. By contrast, a smaller percent of the limestone produced for uses not requiring chemical purity comes from Lower Cretaceous rocks (constructional crushed limestone, 35 percent; portland cement, 25 percent). About 80 percent of all dimension limestone produced in the State is quarried from Lower Cretaceous limestones in the Cedar Park area (Williamson County).

Annual production of limestone in the entire State amounted to less than 5 million tons up until 1950 but thereafter climbed rapidly to a 1963 high of about 35 million tons (fig. 15). Value of production has paralleled amount of production and now averages slightly more than \$1.00 per ton, f.o.b. plant. Delivered costs of crushed limestone during 1960 (table 7) ranged from lows of \$2.05 to \$2.10 per cubic yard in cities close to limestone-quarrying operations and up to \$4.75 per cubic yard in cities distant from quarries.

TABLE 5. Production and utilization of limestone in Texas during 1964.
(From U. S. Bureau of Mines 1964 mineral data sheets.)

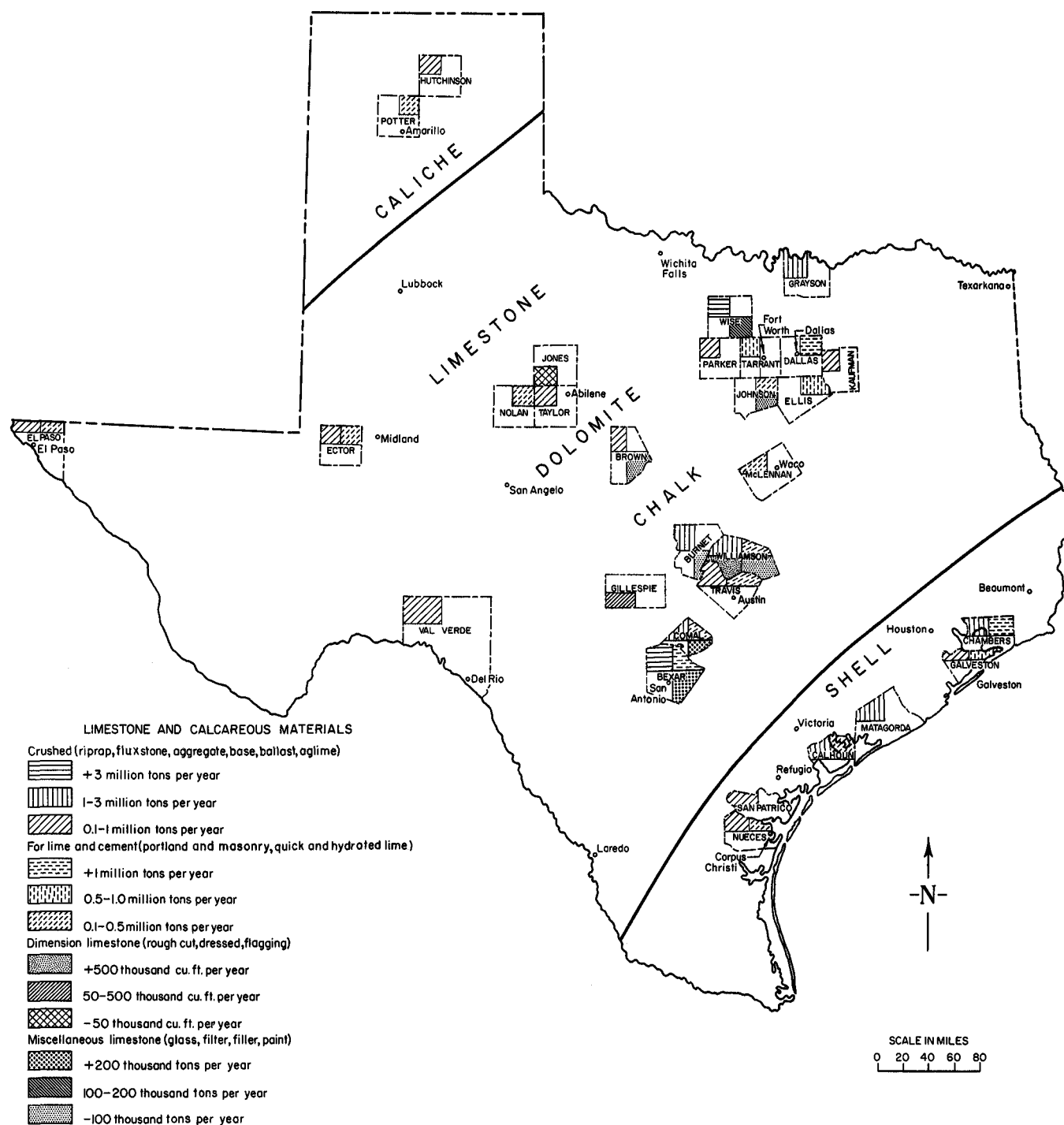
	<u>Quantity</u> (thousand short tons)	<u>Value</u> (thousand dollars)	<u>Percent (value) from</u> <u>Lower Cretaceous rocks</u>
Aggregate, ballast, base material, riprap, and allied crushed stone . . .	20,264	20,771	40
Portland and masonry cement . . .	5,330	5,813	26
Lime	1,111	1,244	100
Fluxstone	496	561	51
Agricultural limestone	296	278	51
Fertilizer filler, mineral food, poultry grit	49	446	97
Alkalies, paper, glass, paint, asphalt filler, stone sand, and other	684	1,847	57
Dimension stone	<u>16</u>	<u>457</u>	<u>100</u>
TOTAL	28,246	31,417	43

TABLE 6. Current commercial producers of limestone and dolomite from Lower Cretaceous rocks in Texas.
(Modified from Texas Mineral Producers, 1965, compiled by Roselle Girard.)

		Crushed stone (aggregate, base materials, riprap, ballast, etc.)	Portland and masonry cement	Lime	Fluxstone	Agricultural limestone	Fillers	Chemical and industrial process and miscellaneous stone	Deadburned dolomite	Dimension stone
1. Allied Material Company, San Antonio	Bexar County	●								
2. Bexar Concrete Company, San Antonio	Bexar County						●			
3. McDonough Bros., Inc., Beckmann	Bexar County	●				●		●		
4. Olmos Rock Products Corporation, San Antonio	Bexar County	●								
5. H. B. Zachry Company, San Antonio	Bexar County	●								
6. Servtex Materials Company, Ogden	Comal County	●			●	●	●	●		
7. United States Gypsum Company, New Braunfels	Comal County	●		●						
8. Permian Sand & Gravel Company, Inc., Penwell	Ector County	●								
9. Southwestern Portland Cement Company, Penwell	Ector County		●							
10. Southwestern Portland Cement Company, El Paso	El Paso County		●		●					
11. Doebbler's Quarry, Grapetown	Gillespie County									●
12. Crusher, Inc., Pottsboro	Grayson County	●								
13. S. E. Evans Mining Company, Denison	Grayson County	●								
14. Brazos Lime Company, Blum	Hill County			●						
15. Texas Lime Company, Cleburne	Johnson County	●		●		●	●	●		
16. Lone Star Cement Company, Maryneal	Nolan County		●							
17. Carruthers Cut Stone Company, Fort Worth	Tarrant County									●
18. General Portland Cement Company, Fort Worth	Tarrant County		●							
19. H. B. Zachry Company, Abilene	Taylor County	●								
20. Austin White Lime Company, McNeil	Travis County	●		●	●	●				
21. H. B. Zachry Company, Del Rio	Val Verde County	●								
22. Leander Limestone Corporation, Cedar Park	Williamson County									●
23. Round Rock White Lime Company, Round Rock	Williamson County			●						
24. San-Tex Stone Quarry, Inc., Liberty Hill	Williamson County									●
25. Superior Stone Products, Inc., Round Rock	Williamson County					●	●	●	●	
26. Texas Carbonate Company, Florence	Williamson County						●	●		
27. Texas Crushed Stone Company, Georgetown	Williamson County	●			●	●		●		
28. Texas Quarries, Inc., Cedar Park	Williamson County									●
29. White Stone & Lime Company, Leander	Williamson County			●						

TABLE 7. Range in delivered costs of crushed limestone and other aggregate materials at various market areas in Texas. Unit costs given per cubic yard (2,700 pounds). From 1960 data reported by Diamond et al. (1964). Note: Scoria (delivered cost, \$2.00-\$2.25) is the principally consumed lightweight aggregate in the El Paso area.

	Crushed limestone	Constructional sand	Constructional gravel	Expanded clay
Dallas	\$2.45 - 2.95	\$2.05 - 2.45	\$2.45 - 2.85	\$4.55 - 5.10
El Paso	2.05 - 2.70	1.65 - 2.05	2.05 - 2.35	5.95 - 6.05
Fort Worth	2.30 - 2.85	2.05 - 2.45	2.05 - 2.45	4.80 - 5.00
Houston	3.35 - 4.75	2.00 - 2.95	2.55 - 3.55	5.15 - 5.50
San Antonio	2.10 - 2.50	2.15 - 2.45	2.45 - 2.85	4.00 - 4.50
Waco	2.85 - 3.25	1.75 - 2.05	2.05 - 2.35	5.30 - 5.50



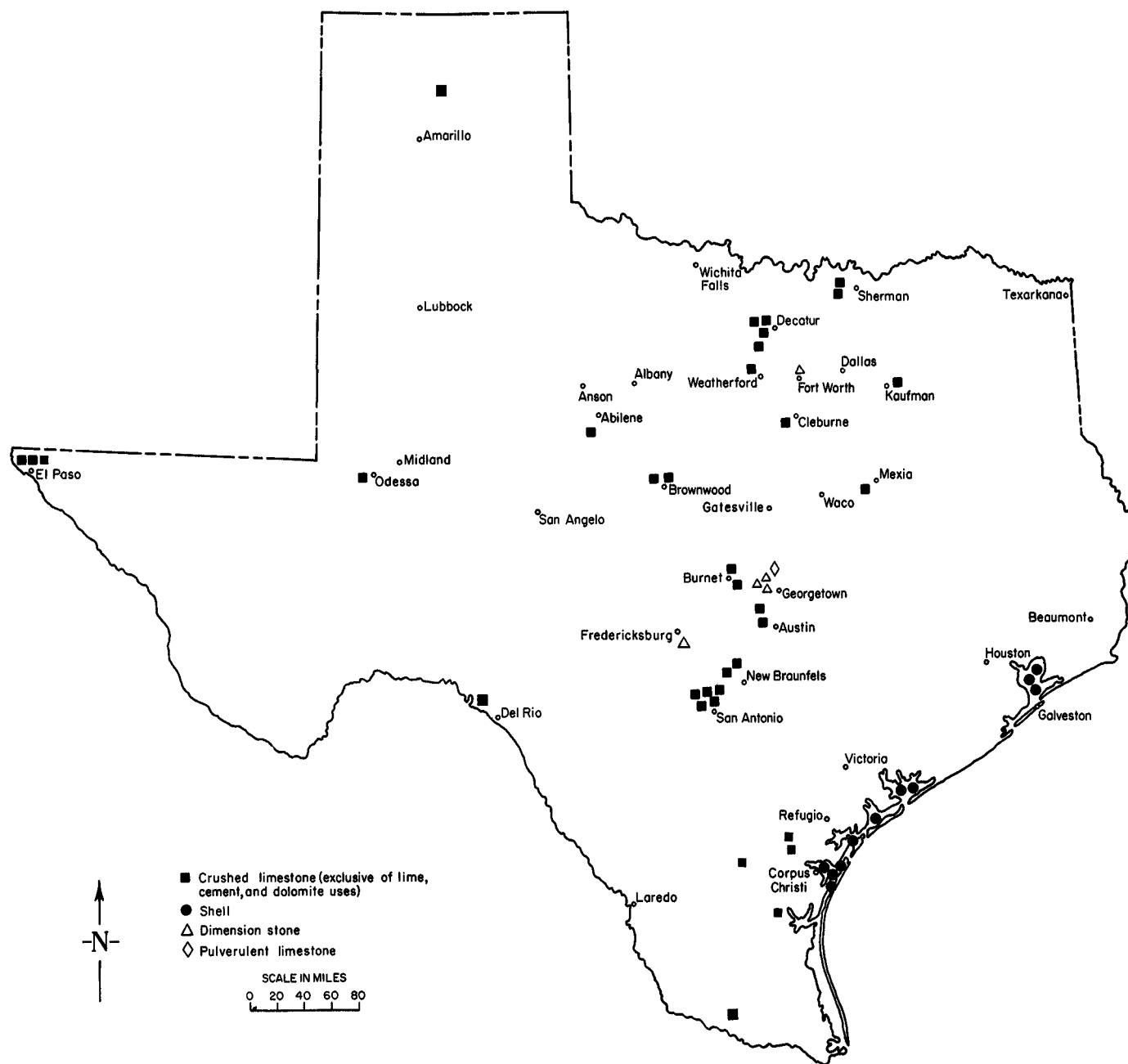


FIG. 13. Principal limestone and shell producers (exclusive of lime, cement, and dolomite) in Texas in 1964.

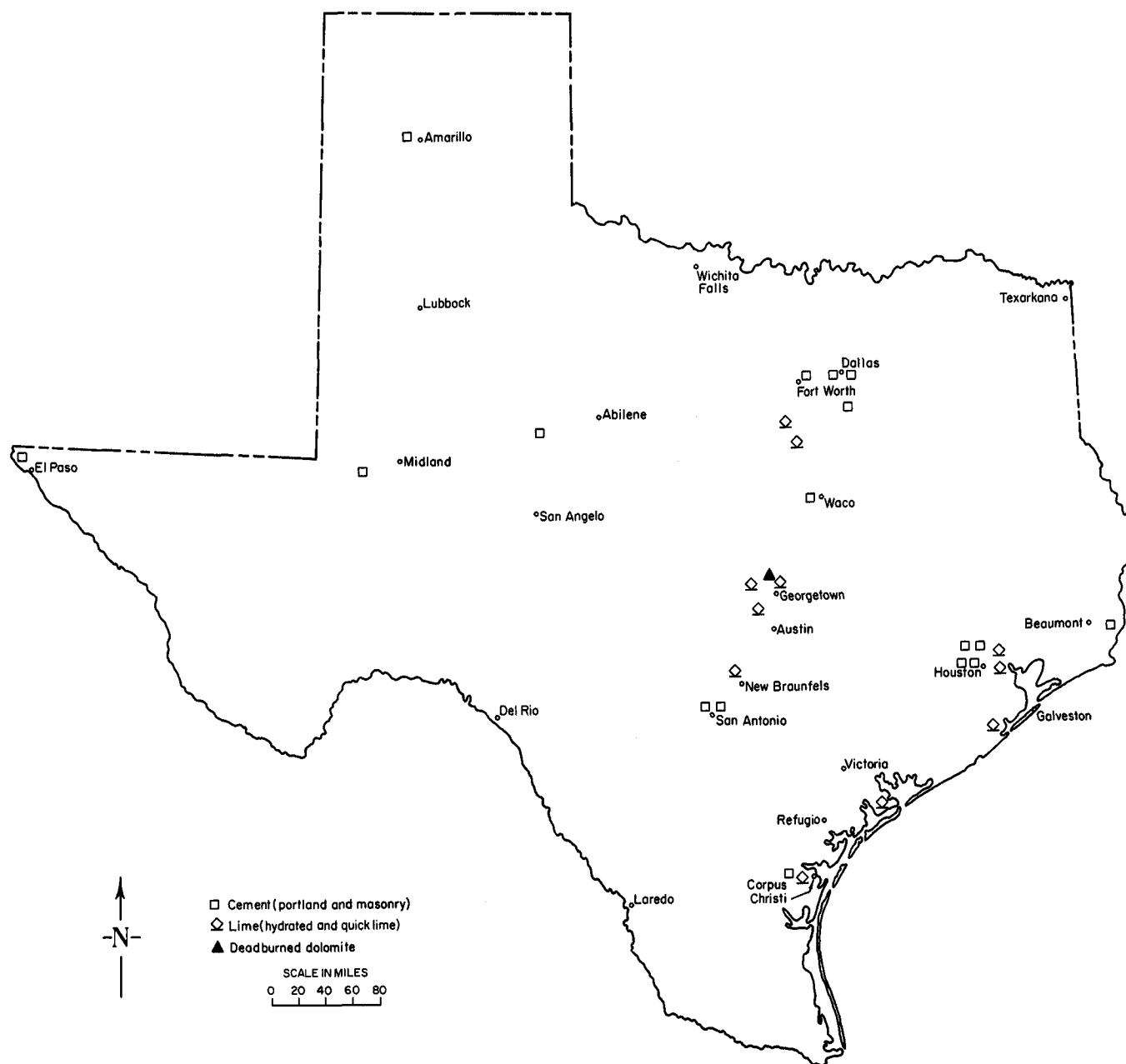


FIG. 14. Distribution of cement, lime, and deadburned dolomite plants in Texas.

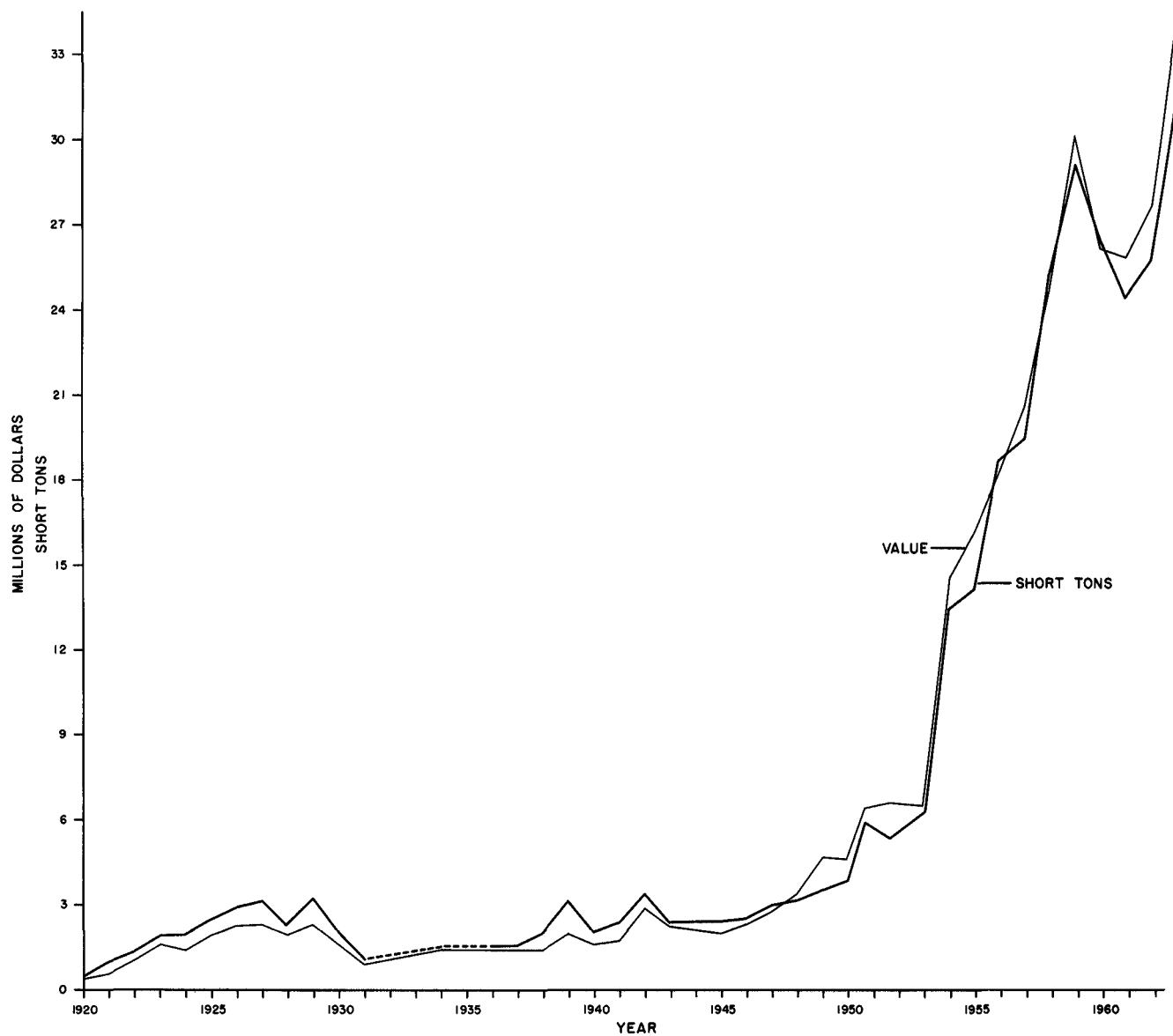


FIG. 15. Production and value of limestone in Texas, 1920–1963.

MINING AND PROCESSING

All but about 5 percent of the limestone produced in the United States is quarried and worked from open pits (fig. 16). All limestone produced in Texas is quarried. Most large operations in Texas take advantage of topography, quarrying from level benches driven into hillsides and escarpments; a few, however, quarry below local ground level. Bench spacings (or height of working face) vary from about 10 to 90 feet depending on topography, grade and attitude of rocks, and other geological and engineering considerations. In most operations blasting is necessary and generally is accomplished by drilling a line of holes a few feet back from the top of the working face and to about

the level of the quarry bench. Amount and type of blasting depend chiefly on hardness and structural attitude of the rock.

Rock is transported from quarry to processing plant or market by truck, rail, belt conveyor, or combinations of these methods. Specially designed trucks, trailers, and railroad cars are used in larger operations. Loading is done by power shovels, skip-loaders, belt conveyors, front-end loaders, and simple bulldozer-and-ramp methods. Crushing and screening operations are situated near or in the quarry.

Processing of limestone and dolomite for most uses involves only crushing and sizing (figs. 17 and



FIG. 16. Limestone quarry, Texas Crushed Stone Company, Georgetown, Williamson County, Texas. Photograph by Cader A. Shelby.

18). Other equipment is necessary in processing finely ground and special-purpose products and for manufacturing such products as lime, cement, and deadburned dolomite. Portable units, consisting of jaw crushers, hammer mills, and screens, commonly are used in small operations. If the final product is to be finely ground, ball mills, rod mills, tube mills, cone crushers, and other equipment are used. Sizing is accomplished by use of equipment such as rotating screens, vibrating screens, hot-dry or wet screens and classifiers, and air separators. Limestone and dolomite used as aggregate, ballast, base material, riprap, and the like require only crushing and sizing. For many chemical and industrial uses, such as fluxstone and in the manufacture of lime, deadburned dolomite, calcium carbide, and calcium cyanamide, limestone and dolomite are used in lump form and in some processes should maintain a lump form during calcination. Limestone processed for portland cement, masonry cement, filler, pigment, and agricultural limestone must be finely ground.

Manufacture of cement.—Processing of raw materials into finished cement consists of four stages (fig. 19):

1. Size reduction (blasting, crushing, and grinding) to obtain proper fineness and surface.

2. Blending and homogenization of the raw mix to obtain desired composition and uniformity.
3. Calcination (liberation of carbon dioxide) and burning (pyro-processing),
4. Fine pulverization of kiln product (clinker with addition of gypsum).

Commonly, a primary crusher (gyratory, roll, or jaw) is used to reduce rock from shovel size to about 6 to 10 inches, with a secondary crusher (gyratory or hammer mill) used to reduce the rock to sizes of 2 to 2.5 inches. Either of two processes, wet or dry, is used in grinding. In the dry process, materials are dried to less than 1 percent moisture and ground to a fine powder in roller, ball, and tube mills. Dry-process mills may be operated in conjunction with air separators which return a coarse fraction for further grinding. The final grind is stored in silos from which appropriate materials are blended to provide the kiln feed or raw meal. In the wet process, materials are ground in similar mills with addition of water to produce a slurry. Water or clay slip is added at the feed end of the initial grinder together with roughly proportional amounts of other components. Vibrating screens, rake classifiers, hydroseparators, and thickeners are used in conjunction with the mills;

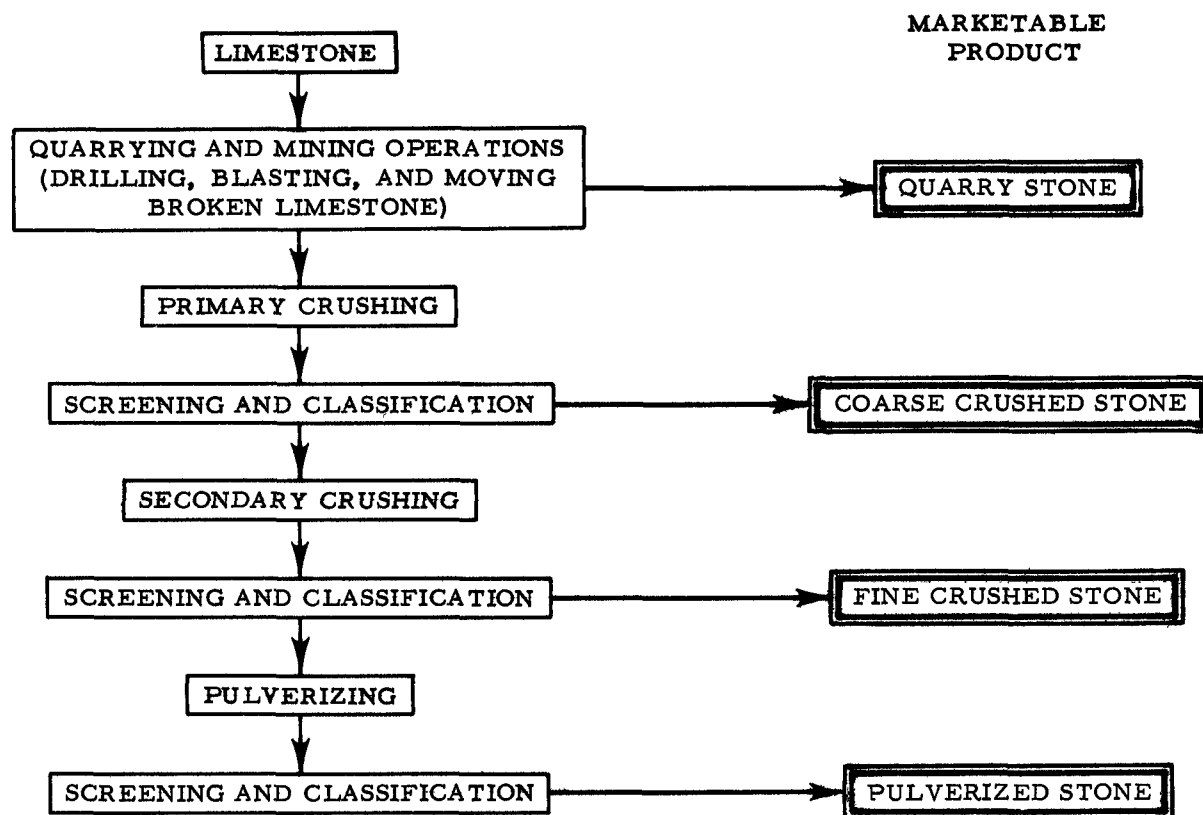


FIG. 17. Generalized flowsheet for production of crushed stone.



FIG. 18. Limestone processing plant, Servtex Materials Company, Ogden, Comal County, Texas. Photograph by Cader A. Shelby.

oversize material is returned for further grinding. The finished slurry is pumped to basins for mixing and storage.

The raw meal is fed into the upper end of a large, slightly inclined, rotary kiln rotating at a speed of 50 to 90 rph. In a few hours the feed moves by gravity through the kiln and leaves the discharge end as a glassy clinker of silicates and aluminates. Wet-process kilns are larger than dry-process kilns as a portion of the kiln is used for evaporation of the slurry water.

Finished cement is produced by finely grinding the clinker and adding 4 to 6 percent gypsum. Cement is pumped pneumatically from finish mills to silos and stored.

Manufacture of lime (fig. 20).—Manufacture of lime products involves limestone preparation, calcination, and hydration (except for quicklime). Two types of kilns—vertical or shaft type and rotary

type—are used in Texas lime manufacture (fig. 21). Limestone for the vertical kiln should be in 6- to 8-inch pieces and must hold its lump shape during calcining to allow circulation of the hot gases in the kiln. Generally, the more crystalline and coarse-grained limestones are not suitable for use in this type of kiln. The rotary kiln requires higher fuel consumption but is designed to handle smaller pieces (1/4 inch to 2-1/2 inches) as well as more coarse-grained limestone.

Principal process in calcination is the dissociation of carbon dioxide from the limestone, yielding a metallic oxide—calcium oxide from high-calcium limestone and calcium-magnesium oxide from dolomitic limestone. For calcitic and moderately dolomitic limestones principal dissociation of carbon dioxide is between 900°C and 1000°C; a kiln temperature of about 1200°C is maintained to assure complete dissociation. Time

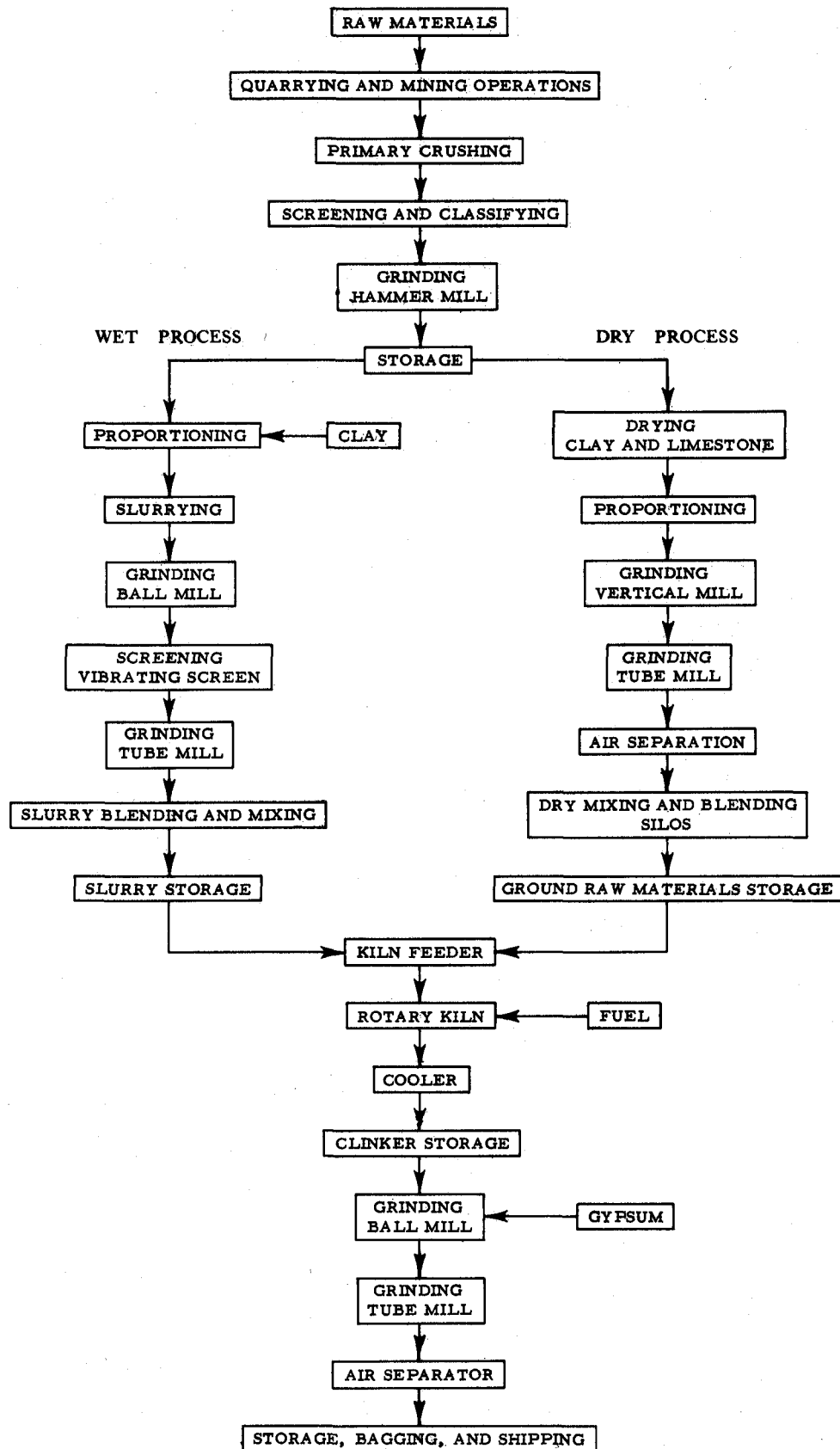


FIG. 19. Generalized flowsheet for production of portland cement.

required to convert limestone to lime depends on the type of kiln used and particle size of the charge but generally is only a few hours. The dissociation reaction is reversible so that carbon dioxide must be drawn from the kiln as soon as it is liberated.

The kiln product is quicklime and because of affinity for water and carbon dioxide, it requires special handling. Quicklime is marketed in lump and pebble sizes (up to 8 inches) or ground and pulverized. Most of the lime produced from Lower Cretaceous limestones in Texas, however, is marketed as hydrated or slaked lime, a more stable product that does not require special handling. Quicklime is crushed to minus 1-inch size, placed in shallow, closed pans, and converted to hydrated lime by addition of water. As water is added, the pan is rotated and the bottom continuously scraped until evolution of steam (caused by the heat of hydration) stops and the contents become light and dry. A ratio by weight of lime to water of about 3 to 1 is sufficient to produce hydrated lime of proper consistency; overslaking causes the lime

to be sticky and wet. Calcitic lime generally slakes faster than dolomitic lime. Following hydration, the lime product generally is fed to a pulverizer or tube mill equipped with an air separator. Hydrated lime is generally marketed as (1) standard hydrate, where 95 percent is -200 mesh, and (2) superfine or spray hydrate, with 98 percent -325 mesh.

Manufacture of deadburned dolomite.—Deadburned or doubly calcined dolomite is produced by prolonged calcination at temperatures of about 1650°C, well above the dissociation temperature of pure dolomite (825°C to 945°C). Calcination is generally accomplished in a rotary kiln, though a small amount of deadburned dolomite is manufactured by sintering. Kiln charge consists of 3/8-inch pieces of high-magnesium dolomite mixed with 5 to 10 percent iron ore, mill scale, or other iron ingredient. The kiln product is generally treated with a light oil to retard slaking and reduce dust.

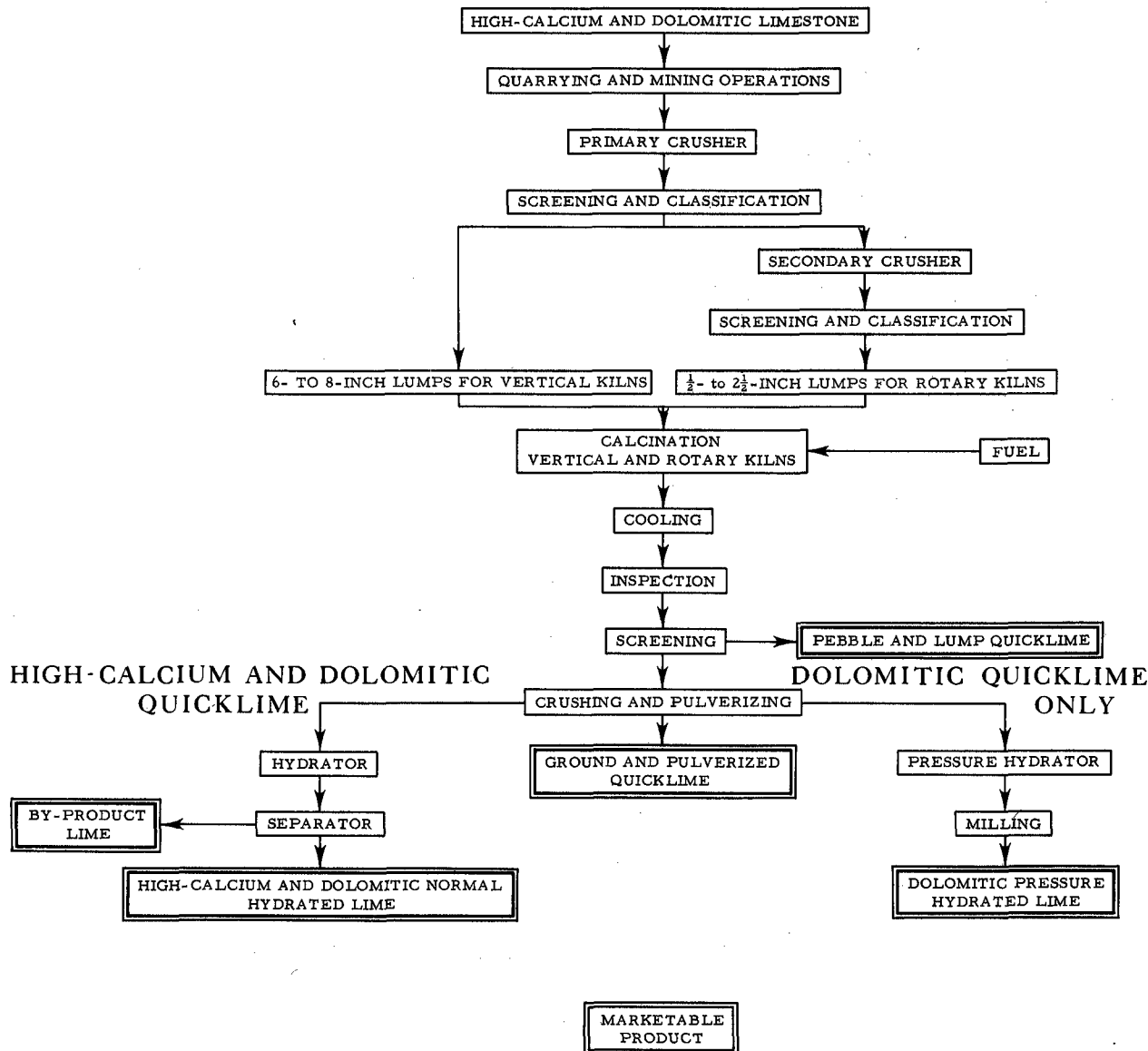


FIG. 20. Generalized flowsheet for production of lime.

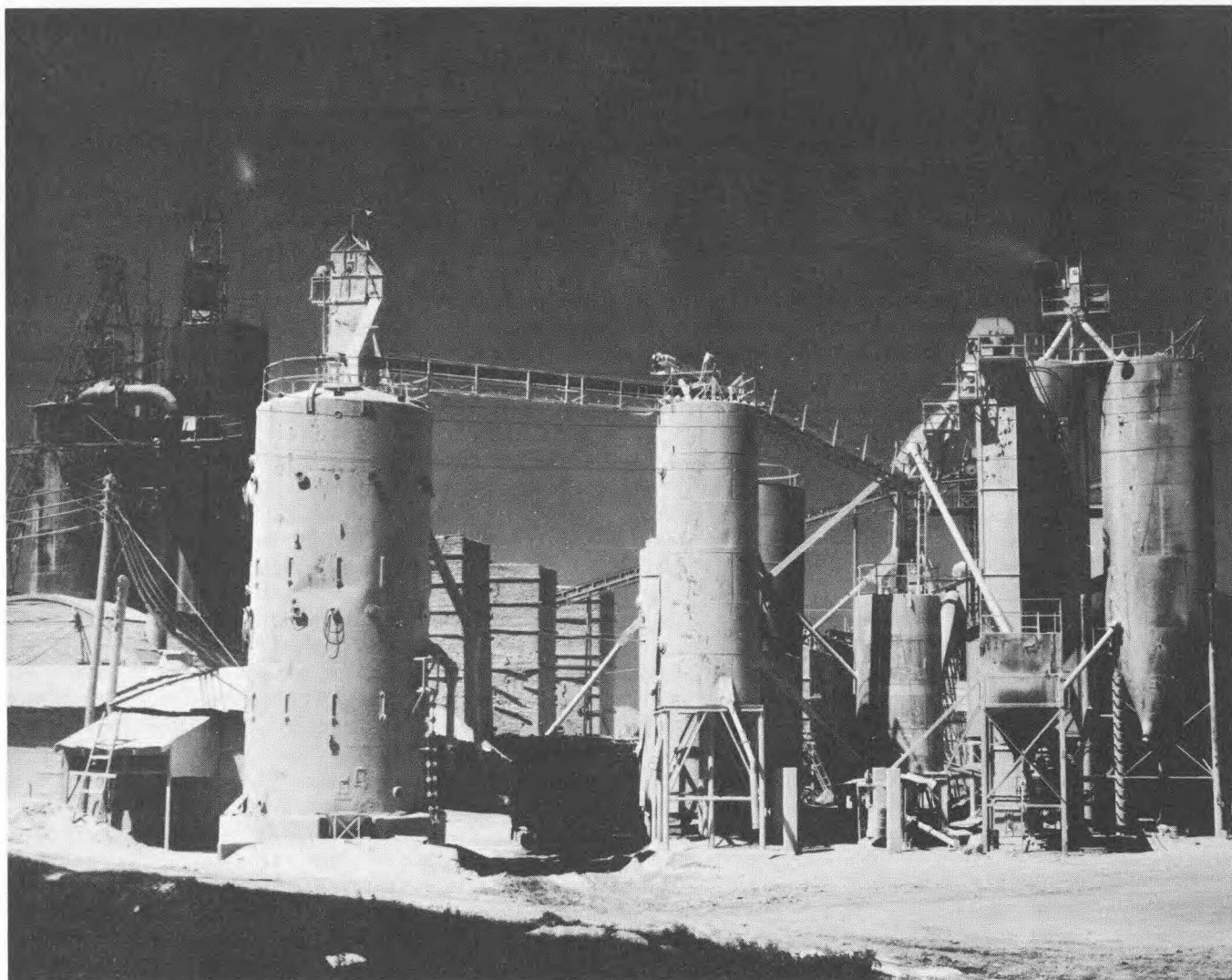


FIG. 21. Vertical, stationary kilns used in manufacture of lime, Round Rock White Lime Company, Round Rock, Williamson County, Texas. Photograph by Cader A. Shelby.

ECONOMIC CONSIDERATIONS

Limestone and, to a lesser extent, dolomite of grades suitable for most constructional, industrial, and chemical uses are abundant and readily available from Lower Cretaceous rocks of Texas. These materials are bulky, low-value commodities, and location of deposits in relation to suitable transportation facilities and markets is critical (table 7).

Approximately 30 percent of the limestone marketed in Texas as crushed or broken stone is shipped from plants to points of consumption by rail; the remainder is transported by truck. Truck hauls generally are limited to a radius of about 50 miles of the plant or quarry site; rail transport is utilized for longer hauls. Approximately 60 percent, or about 5 million tons, of the crushed limestone quarried annually from Lower Cretaceous rocks along the Balcones Escarpment of Central Texas is transported by rail, chiefly to Gulf Coast markets; the remainder is hauled by truck mostly to local metropolitan markets (San Antonio, Austin, and Fort Worth). In other parts of the State, transport is generally by truck with hauls relatively short. Freight rates for rail transport of crushed limestone are negotiated and hence variable but average approximately \$1.40 to \$1.50 per ton for 100 miles; \$2.10 for 200 miles; \$2.40 for 300 miles; and \$3.00 for 500-mile hauls. Cost of truck transportation averages about \$0.05 per ton per mile.

A significant factor in the future of the Central Texas limestone industry is the future of the oyster shell industry along the Texas Gulf Coast. Currently, shell dredged from coastal bays and limestone from Lower Cretaceous rocks along the Balcones Escarpment are the principal sources of chemical-grade or high-purity calcareous raw

materials for the Texas coast and are significant sources of aggregate and other constructional stone. Total consumption from these two sources along the Texas Gulf Coast during 1963 was about 16 million tons with Lower Cretaceous limestones supplying about 35 percent of the total. As reserves of shell in coastal bays are depleted, or as production is restricted because of conservation measures, the Gulf Coast market will depend more and more on Central Texas limestone, especially for high-purity calcareous raw materials. Although Central Texas limestone is situated 150 to 200 miles from the Texas Gulf Coast market, it is the most readily available substitute for shell as a high-purity calcareous raw material. The coastal market currently supplied by shell, but not requiring high-purity raw materials (e.g., aggregate), can probably be met in part by local sources of hard rock on the Coastal Plain or by manufacture of artificial aggregates, though the bulk of these materials probably will come ultimately from Central Texas limestones. Calcareous raw materials for the manufacture of portland cement along the Texas Gulf Coast (1963 consumption of about 3 million tons), now largely shell, could be replaced by relatively low-purity calcareous raw materials from Central Texas (chalk and argillaceous limestone of the Austin Chalk). This would involve a haul to coastal markets similar to that for Central Texas high-purity limestone. Portland cement probably could be produced more cheaply by hauling high-purity limestone to the coast and mixing it with coastal clay, than by hauling low-purity calcareous materials to the coast.

RESULTS OF TESTS

Chemical analyses are reported for approximately 1,000 samples of Lower Cretaceous limestones and dolomites, from 246 localities in 49 Texas counties. Acid neutralization values are reported for all samples; calcium and magnesium, expressed as carbonates and oxides, are reported for samples with ANV of 97 or greater. A dash (—) indicates that an analysis was not made; 0.0 indicates that the element was not detected. Content of alumina, iron oxides, silica, moisture, and percent of ignition loss are given for selected, representative, high-calcium and high-magnesium samples. Analysed samples are indicated by Mineral Studies Laboratory number (e.g., 62105). Analyses are referred to measured stratigraphic sections, which are presented diagrammatically with brief rock descriptions. Bedded and nodular chert were excluded from all chemical analyses; abundance and distribution of chert are shown on diagrammatic rock sections. Key to symbols used in diagrammatic sections is given in figure 22. Measured sections are designated by county name and locality number (e.g., BEXAR—4). Each section includes a brief locality description and a locality map; localities are also included on the geologic maps (Pls. I and II). Distances in locality descriptions are straight-line distances unless

stated otherwise. Measured sections and chemical analyses are reported alphabetically by county and numerically within each county.

Several terms used in the rock descriptions are defined below.

Grain size:

- aphanitic—individual grains not visible with a 10-power lens
- fine-grained—individual grains visible with a lens but smaller than 1 mm
- medium-grained—individual grains from 1 mm to 5 mm
- coarse-grained—individual grains larger than 5 mm

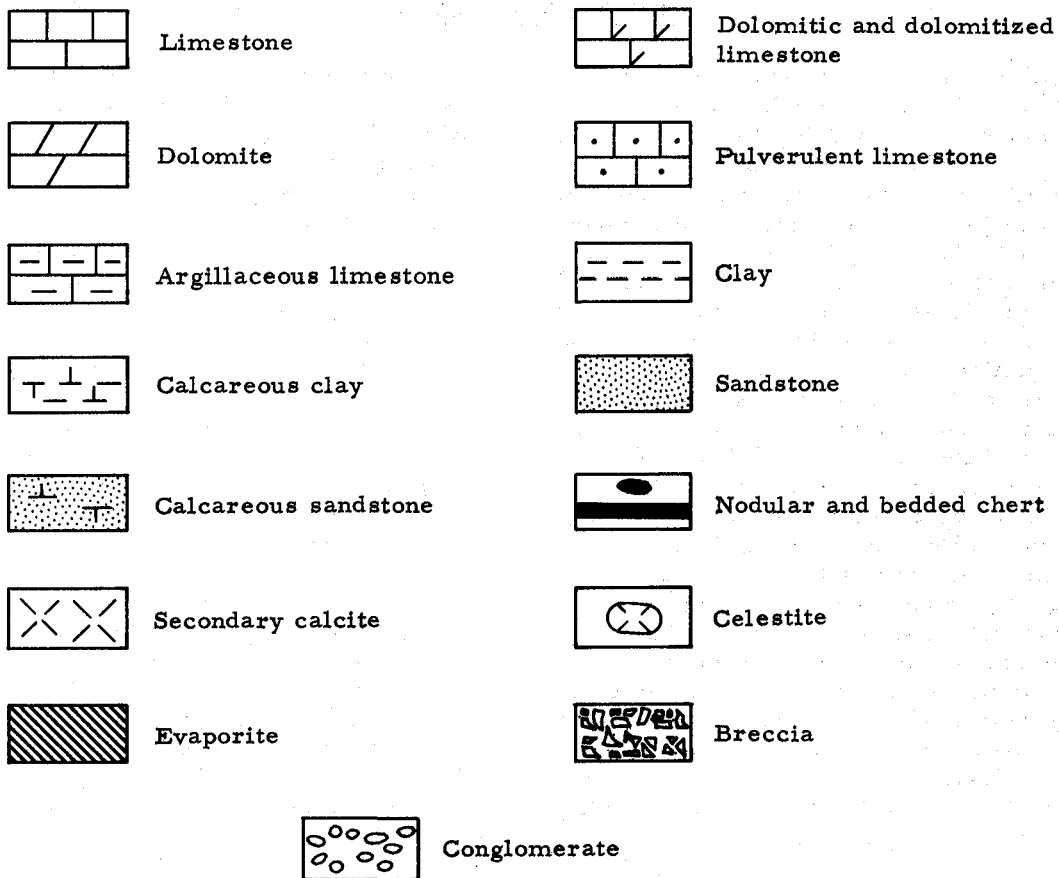
Bedding:

- thin-bedded—individual beds less than 3 inches thick
- medium-bedded—individual beds 3 inches to 8 inches thick
- thick-bedded—individual beds more than 8 inches thick

Other terms:

- dolomitic—MgO content between 1% and 5%
- dolomitized—MgO content more than 5% and less than 11%
- dolomite—MgO content 11% or more

LITHOLOGY



BEDDING



OTHER FEATURES

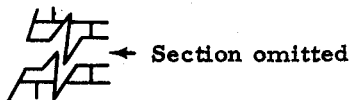
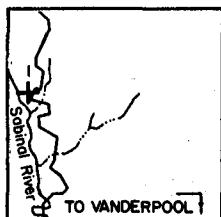


FIG. 22. Key to symbols used in diagrammatic rock sections and Plate III.



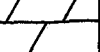
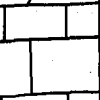
BANDERA--1. Road cuts on west side of gravel road, 7 miles north of Vanderpool.

Edwards Formation (lower unit)

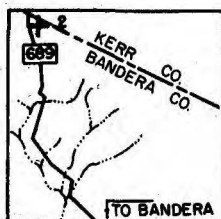
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61547	100.8	96.4	3.2	54.1	1.5		50	Limestone, aphanitic to coarse grained, medium to thick bedded, hard; upper part dolomitic; nodular chert at base and near middle
61546	100.8							
61545	97.1	96.6	1.3	54.2	0.6			
61544	99.5							
61543	100.0	76.6	20.5	43.0	9.8		3	Dolomite, fine to coarse grained; abundant rudists; secondary calcite
61542	104.8						10	Limestone, dolomitized, fine to coarse grained, partly crystalline, thick bedded; abundant nodular chert
							7	Dolomite, fine grained, thick bedded; abundant molds of fossils; nodular chert in upper part
61541	100.2	91.3	8.1	51.2	3.9			25
61540	101.8							

(CONTINUES)

61539	101.4	91.1	7.3	51.1	3.5
61538	101.0				

	5	Dolomite, fine grained, thick bedded
	18	Limestone, aphanitic to medium grained, thick bedded, hard

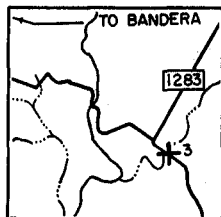
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61545	0.20	43.74	54.20	0.62	0.31	0.33	0.03
61544							
61543	0.18	45.08	43.00	9.80	0.70	0.44	0.14
61542							



BANDERA--2. Slope on east side of Ranch Road 689 at Bandera Pass, 9.5 miles north of Bandera.

Edwards Formation (lower unit)

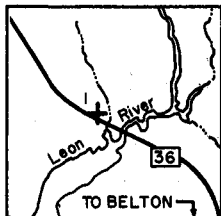
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61554	100.1	98.5	1.3	55.3	0.6		6	Limestone, fine to medium grained, medium bedded, hard; small fossils	
61553	100.1						97.4	1.9	54.6
61552	99.9								
61551	99.5								
61550	93.5	-	-	-	-			15	Limestone, fine to coarse grained, partly crystalline, medium to thick bedded, hard
61549	94.4	-	-	-	-				
61548	91.0	-	-	-	-				
		(Not sampled)					(Rubble slope)		



BANDERA--3. Creek bank and road cut on Farm Road 1283, on west side of bridge over Red Bluff Creek, 7.5 miles east-southeast of Bandera.

Glen Rose Formation

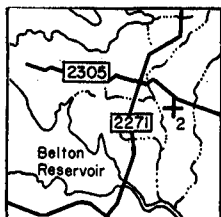
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61562	94.8	-	-	-	-		7	Limestone, fine to coarse grained, thin to thick bedded; abundant fossils
61561	99.3	96.7	1.8	54.3	0.9		20	Limestone, fine to coarse grained, thick bedded; abundant fossils, abundant rudists in upper part
61560	98.3							
61559	96.1	-	-	-	-		10	Limestone, dolomitic, fine grained, medium to thick bedded; nodular weathering in upper part
61558	99.5	96.9	2.2	54.4	1.1			
61557	100.0	96.6	2.6	54.2	1.2		20	Limestone, dolomitic, fine to coarse grained, massive; abundant rudists
61556	99.4							
61555	99.1	97.2	1.6	54.6	0.8		Creek	4



BELL--1. Road cut, State Highway 36, west side of Leon River, 12.0 miles north of Belton.

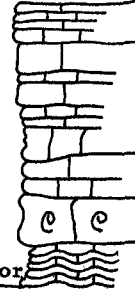
Edwards and Comanche Peak Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61245	98.9							(Edwards Formation)
61244	99.1	98.4	0.5	55.2	0.2		28.0	Limestone, thick bedded, hard, coarse grained, abundant rudists, chert float
61243	96.6	-	-	-	-			
61242	94.7	-	-	-	-		2.0	Limestone, hard, fine grained, medium bedded
		(Not sampled)					20.0	(Comanche Peak Formation) Limestone, gray, soft, nodular, fine grained, weathered
							46.0	Covered and filled interval
61241	96.8	-	-	-	-		8.0	Limestone, soft to hard in upper part, fine grained, medium to thick bedded
		(Not sampled)					2.0	Limestone, soft, nodular
61240	95.4	-	-	-	-		14.0	Limestone, soft, fine grained, thick bedded



BELL--2. Quarry, south side of Farm Road 2271, 4.6 miles north of Belton.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61248	98.7	97.9	0.6	54.9	0.3		3.0	Limestone, gray, fine grained, thin bedded
61247	98.5						8.0	Limestone, brown, thin to thick bedded
61246	97.9	97.6	0.3	54.6	0.1		3.0	Limestone, fine grained, medium bedded
							3.0	Limestone, massive, coarse grained, fossil fragments
							2.5	Limestone, fine grained, thin bedded, partly nodular
		(Not sampled)				Quarry floor		

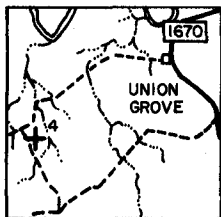
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO_2	% Al_2O_3	% Fe_2O_3
61246	0.04	42.95	54.60	0.14	1.45	0.28	0.07

BELL--3. Road cut, north side of U. S. Highway 190, 5.5 miles west of Belton.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61253	101.6	60.3	35.9	33.8	17.2		3.0	Limestone, dolomitic, white, fine to medium grained, medium bedded	
61252	104.2						12.0	Dolomite, pulverulent, locally case-hardened, lenses of nodular limestone, cherty in lower part	
61251	103.3						10.0	Dolomite, fine to medium grained, thick bedded, some nodular chert	
61250	95.9	-	-	-	-		11.0	Limestone, dolomitic, coarse grained to fine grained in upper part, shell detritus	
		(Not sampled)					3.0	Covered interval	
61249	94.1	-	-	-	-		3.0	Limestone, hard, filled tubular burrows	
		(Not sampled)					4.0	Limestone, fine grained, thin bedded	
								Limestone, nodular (Comanche Peak Formation)	

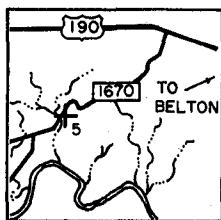
[illegible]



BELL--4. Road cut, northeast side of gravel road, 2.2 miles southwest of Union Grove and 6.4 miles west-northwest of Salado.

Edwards Formation

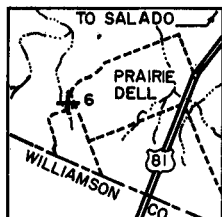
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61262	100.0	92.6	5.8	51.9	2.8		10.0	Limestone, dolomitic, fine to medium grained, medium to thick bedded, upper part weathered
		(Not sampled)					2.0	Limestone, brown, nodular, weathered
61261	90.0	-	-	-	-		3.0	Limestone, pulverulent
		(Not sampled)						Limestone, nodular, gray (Comanche Peak Formation)



BELL--5. Road cut, east side of Farm Road 1670, 4.0 miles southwest of Belton.

Edwards Formation

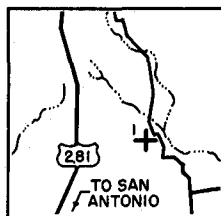
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61258	101.5	86.3	12.0	48.5	5.7		22.0	Limestone, dolomitized, aphanitic to coarse grained, medium to thick bedded, nodular chert in lower part
61257	100.0							
61256	97.3	77.1	16.7	43.3	8.0		8.0	Limestone, dolomitized, aphanitic to coarse grained, medium bedded
		(Not sampled)						Limestone, nodular, gray (Comanche Peak Formation)



BELL--6. Quarry, northwest side of T-junction of two gravel roads, 6.2 miles south-southwest of Salado.

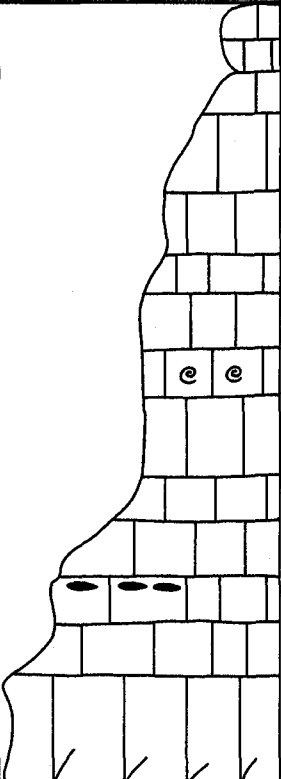
Edwards Formation

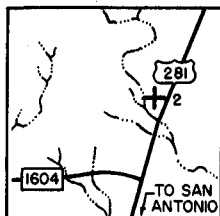
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61260	99.2	97.2	0.9	54.5	0.4		8.0	Limestone, fine to coarse grained, thick bedded
		(Not sampled)					2.4	Limestone, gray, hard, fine to coarse grained, thin bedded, nodular chert
61259	97.4	97.2	0.9	54.5	0.4		2.0	Limestone, gray, hard, aphanitic to fine grained
							3.0	Limestone, soft, weathered, large chert masses in quarry floor



BEXAR--1. Stream exposure, branch of Long Creek at Bulverde Road, 1 mile (airline distance) and 4 miles (by road) east of U. S. Highway 281.

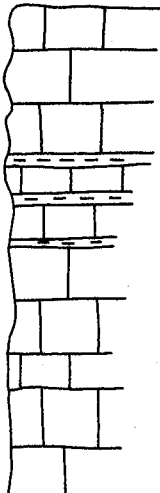
Edwards Formation

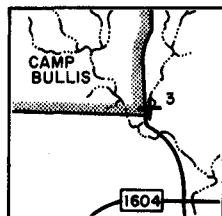
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61439	99.4	99.2	0.4	55.7	0.2		55	Limestone, light gray to light buff gray, mostly fine to medium grained, partly crystalline, medium to thick bedded; few rudists in middle part; few chert nodules in lower part; lower few feet dolomitic
61438	100.0							
61437	100.0	98.7	0.9	55.4	0.4			
61436	99.6							
61435	100.0	98.9	0.2	55.5	0.1			
61434	98.2							
61433	100.4	97.1	2.8	54.5	1.3			



BEXAR--2. Quarry, west side of U. S. Highway 281, north of Mud Creek, 7.5 miles north-northeast of intersection of U. S. Highway 281 and Interstate Highway 410.

Edwards Formation

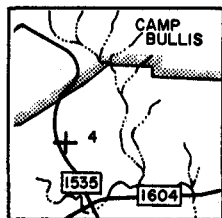
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61441	99.2	-	-	-	-		35	Limestone, light to medium gray, hard, crystalline, aphanitic to fine grained; medium to thick bedded; abundant replacement calcite and residual clay; no chert
61440	99.0	-	-	-	-			



BEXAR--3. Road cut, east side of north-south, paved secondary road, at southeast corner of Leon Springs Military Reservation, 7.5 miles north-northwest of intersection of U. S. Highway 281 and Interstate Highway 410.

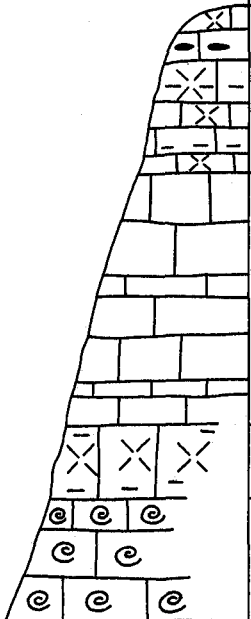
Edwards Formation

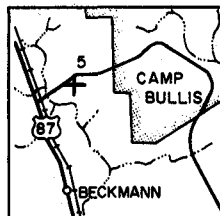
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61444	98.5	97.9	0.5	54.9	0.2		12	Limestone, gray, hard, aphanitic to coarse grained, partly crystalline, medium to thick bedded; common replacement calcite and residual clay; brecciated in upper part
61443	94.7	-	-	-	-		8	Limestone, highly altered, brecciated and mixed with red brown clay
61442	96.4	-	-	-	-		12	Limestone, gray, hard, aphanitic to coarse grained, partly crystalline, medium to thick bedded, brecciated in middle



BEXAR--4. Road cut, Farm Road 1535, 7 miles north-northwest of intersection of Farm Road 1535 and Interstate Highway 410.

Edwards Formation

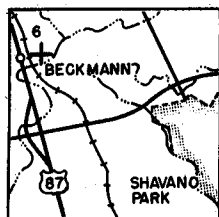
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								
61448	99.3	98.9	0.3	55.5	0.1		12	Limestone, thin to thick bedded; altered, abundant secondary calcite; residual red brown clay along bedding planes and fractures, chert nodules near top
61447	100.0	98.9	0.8	55.5	0.4		18	Limestone, gray, aphanitic to coarse grained, partly crystalline, hard, thin to thick bedded; some coarse crystalline, secondary calcite
61446	99.7							
	(Not sampled)						5	Limestone, altered, with abundant secondary calcite and residual red brown clay
61445	97.3	97.0	0.3	54.4	0.1	9	Limestone, light gray, hard, thick bedded; abundant rudists	



BEXAR--5. Road cut, south side of paved, secondary road from U. S. Highway 87 to Camp Bullis, 2 miles north of Beckmann.

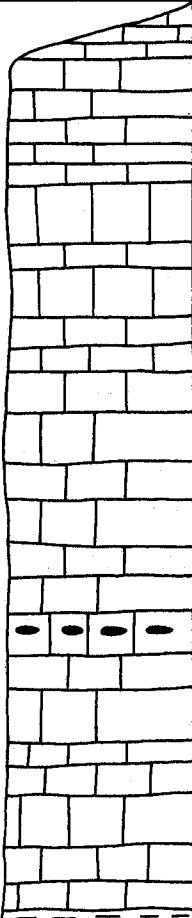
Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61452	93.7	-	-	-	-		2	Limestone, buff gray, hard
61451	93.5	-	-	-	-		6	Limestone, gray to tan, thin to medium bedded, aphanitic to fine grained; locally nodular
61450	92.9	-	-	-	-		6	Limestone, thick bedded, nodular
							8	Limestone, thin to medium bedded, nodular
							6	Limestone, gray buff, thick bedded, nodular
61449	93.4	-	-	-	-		10	Limestone, gray, soft, nodular, interbedded with calcareous clay; abundant fossils

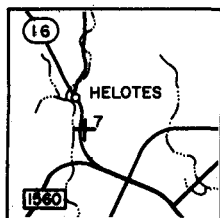


BEXAR--6. Quarry of McDonough Brothers, Inc., east pit, east side of U. S. Highway 87 at Beckmann.

Edwards Formation

Lab. Number	Neutral-ization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thick-ness Feet	Rock Description
61463	98.7	98.4	0.3	55.2	0.1		4	Limestone, buff, medium bedded (Slope above quarry face)
61462	95.2	-	-	-	-		15	Limestone, buff to light brown, aphanitic to fine grained, thin to thick bedded
61461	93.6	-	-	-	-		46	Limestone, light gray to buff, aphanitic to fine grained, partly crystalline, thin to thick (mostly medium) bedded; 1-foot bed of nodular chert near middle
61460	99.2	99.0	0.3	55.6	0.1			
61459	99.4							
61458	98.7	98.3	0.8	55.2	0.4			
61457	99.8							

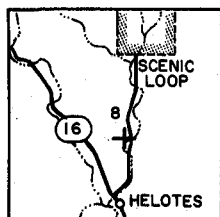
(CONTINUES)



BEXAR--7. Road cut, east side of State Highway 16, 0.3 mile south of Helotes.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61466	99.4	-	-	-	-		20	Limestone, gray, aphanitic to fine grained, partly crystalline, hard; nodular at top, with secondary calcite
61465	99.2	-	-	-	-			
61464	98.3	-	-	-	-		14	Limestone, gray, aphanitic to fine grained, partly crystalline, hard, thin to thick bedded; locally nodular filled burrows

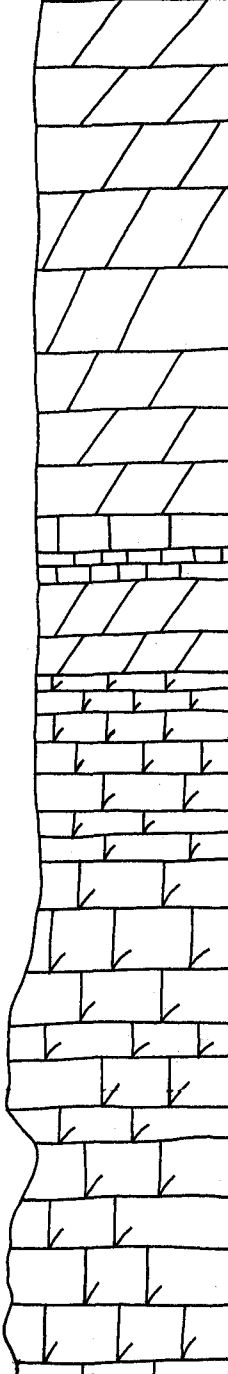


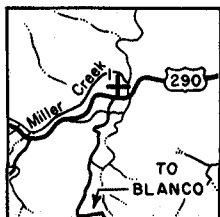
BEXAR--8. Steep bluff, west side of Helotes Creek, 0.8 mile north of Helotes.

Edwards and Glen Rose Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61484	98.7	98.6	0.1	55.3	0.0		38	(Edwards Formation)
61483	96.1	-	-	-	-			Limestone, light gray, fine crystalline, medium to thick bedded, alternating with covered intervals; unit forms gentle slope
61482	95.4	-	-	-	-			
61481	96.2	-	-	-	-			
61480	96.9	-	-	-	-		18	Limestone, light gray, hard, thick bedded, fine to medium grained, poorly exposed
61479	96.1	-	-	-	-			
61478	82.7	-	-	-	-		11	Limestone, light gray to yellow brown, fine to medium grained; partly crystalline, thick bedded
61477	87.5	-	-	-	-		6	Limestone, light gray to buff, hard, thick bedded; fine grained
		(Not sampled)					10	(Glen Rose Formation) Covered interval
							2	Limestone, coarse crystalline, massive; secondary calcite
61476	96.5	-	-	-	-		7	Limestone, light gray, soft

(CONTINUES)

61475	97.5	59.3	32.0	33.3	15.3		37	Dolomite, light brown, thick bedded; common molds of <u>Orbitolina</u>
61474	98.0	64.8	27.4	36.7	13.1			
61473	96.8							
61472	97.9	64.5	27.8	36.2	13.3			Limestone, hard, fine grained, abundant <u>Orbitolina</u>
61471	94.5	-	-	-	-	2		Limestone, thin bedded, abundant <u>Orbitolina</u>
						2		
						7		Dolomite, thick bedded
61470	97.2	75.5	18.1	42.4	8.7	5		Limestone, dolomitized, thin to medium bedded
						5		Limestone, dolomitized, medium bedded
						2		
61469	96.4	-	-	-	-	6		Limestone, dolomitized, gray, aphanitic to fine grained
						6		
						20		Limestone, dolomitized, gray, fine grained, thick bedded
61468	93.0	-	-	-	-	18		Limestone, dolomitized, gray, fine grained, thick bedded, abundant <u>Orbitolina</u>
61467	97.4	86.2	9.2	48.4	4.4			



BLANCO--1. Quarry between old U. S. Highway 290 and Miller Creek,
4.5 miles east of intersection of U. S. Highways 281 and 290.

Glen Rose Formation

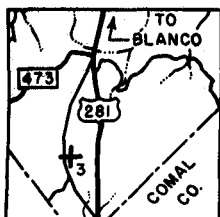
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61402	95.4	-	-	-	-		6.5	Limestone, gray to buff, fine grained, rudists
61401	97.1	96.7	0.3	54.2	0.1		8.0	Limestone, buff, medium to coarse grained; large rudist molds, casts of <i>Trigonia</i> , and abundant shell detritus
61400	91.2	-	-	-	-		4.0	Limestone, buff to buff gray, granular; dolomitized filled burrows in lower part, rudists in upper part
61399	93.6	-	-	-	-		3.5	
61398	78.0	-	-	-	-		2.0	Limestone, buff to blue gray, mottled; filled burrows
61398	78.0	-	-	-	-		4.0	Limestone, blue gray, silty, argillaceous, interbedded with shale in upper part
61397	91.0	-	-	-	-		6.0	Limestone, blue gray, fossiliferous, abundant <i>Orbitolina</i> (foraminifer)
61396	91.0	-	-	-	-	Quarry floor Creek	25.0	Limestone, light brown to blue gray, locally dolomitic and with filled burrows; finely divided fossil detritus
61396	91.0	-	-	-	-			Limestone, buff gray, argillaceous, dolomitic; crops out below quarry in bluffs of Miller Creek; forms prominent rounded ledges



BLANCO--2. Road cut and stream exposure along Farm Road 1623,
9 miles northwest of Blanco.

Edwards Formation

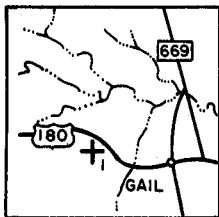
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61404	99.6	80.2	16.7	45.0	8.0		3.5	Limestone, chalky, weathered
							4.0	Limestone, dolomitic, drab gray
							5.5	Limestone, medium gray, aphanitic, hard; chert nodules
							4.5	Limestone, weathered, argillaceous; forms slope
							5.5	Limestone, light gray to buff, aphanitic to medium grained, thin bed of chert nodules
							1.5	Limestone, hard, abundant rudists
							1.0	Limestone, light gray, pulverulent
61403	101.1						7.0	Dolomite, argillaceous, drab gray, medium to thick bedded
							6.0	Limestone, yellow gray, pulverulent, poorly exposed



BLANCO--3. Road cut, old U. S. Highway 281, 0.5 mile west of new U. S. Highway 281, 10 miles south of Blanco, and 0.8 mile north of Comal County line.

Glen Rose Formation

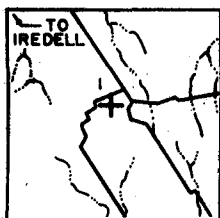
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								Limestone, light buff gray, nodular with few fossils; bedded and dolomitic in upper part
61407	93.6	-	-	-	-		5.0	Limestone, light buff, argillaceous; abundant molds of mollusks
		(Not sampled)					2.5	
							3.0	Shale, buff gray
							3.5	Limestone, blue gray, argillaceous
61406	94.3	-	-	-	-		3.0	Limestone, buff gray, argillaceous and silty, laminated
							6.0	Limestone, buff gray, fine grained; rudists common; locally dolomitic
61405	97.3	95.5	1.5	53.6	0.7		10.0	Limestone, buff gray, medium to coarse grained; abundant fossil detritus
		(Not sampled)					7.0	Limestone, blue gray, argillaceous; soft; shaly to massive



BORDEN--1. Road cut on gravel road along west side of Gail Mountain, 1 mile west of Gail.

Edwards and Comanche Peak Formations

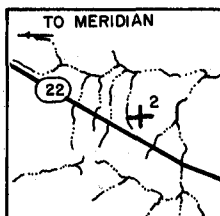
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								(Edwards Formation)
63801	93.1	-	-	-	-		8	Limestone, argillaceous, grayish yellow, fine to coarse grained, thick bedded; fossiliferous
63800	95.0	-	-	-	-		8	Limestone, mostly coarse grained, thin to thick bedded; fossiliferous, rudists common
63799	95.0	-	-	-	-		7	Limestone, argillaceous, fine to medium grained, poorly bedded
63798	96.0	-	-	-	-		10	Limestone, grayish yellow, fine to coarse grained, thick bedded; secondary calcite in upper part; rudists in lower part
63797	95.0	-	-	-	-		41	(Comanche Peak Formation) Limestone, argillaceous, fine grained, medium to thick bedded; fossiliferous
63796	92.6	-	-	-	-			
63795	96.1	-	-	-	-			
63794	92.5	-	-	-	-			
63806	91.7	-	-	-	-		8	Limestone, argillaceous, gray, nodular



BOSQUE--1. Abandoned quarry on south side of gravel road, 3.8 miles southeast of Iredell.

Edwards Formation

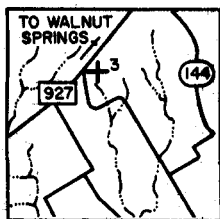
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60548	99.4	98.8	0.5	55.4	0.2		7.5	Limestone, fine to coarse grained, medium to thin bedded; abundant rudists
60547	97.7	95.2	2.1	53.4	1.0		4.5	Limestone, dolomitic, fine to medium grained, medium bedded; abundant filled burrows
60546	97.5	96.4	0.9	54.1	0.4			
60545	97.7	95.3	2.0	53.5	1.0		16	Limestone, fine to medium grained, thick bedded
	(Not sampled)						-	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)



BOSQUE--2. Abandoned quarry on north side of State Highway 22, 5.8 miles east of Meridian.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60575	99.5	99.3	0.2	55.7	0.1		6	Limestone, fine to coarse grained, massive; abundant rudists
	(Not sampled)						8	Covered slope

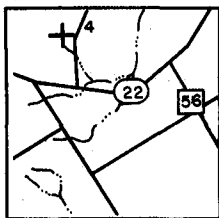


BOSQUE--3. Quarry on south side of Farm Road 927, 2 miles south-southwest of Walnut Springs.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60552	99.8	99.8	0.0	56.0	0.0		16	Limestone, fine to coarse grained, massive; abundant rudists; middle part finer grained, bedded
60551	99.6	99.6	0.0	55.9	0.0			
60550	99.1	98.8	0.3	55.4	0.1			
60549	97.4	96.9	0.2	54.4	0.1		7	Limestone, buff, fine grained, medium bedded
	(Not sampled)						-	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)

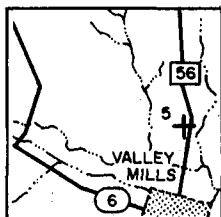
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60549	0.29	43.03	54.40	0.10	1.09	0.88	0.19



BOSQUE--4. Quarry beside gravel road, 1.8 miles west of west end of Whitney Dam.

Edwards and Comanche Peak Formations

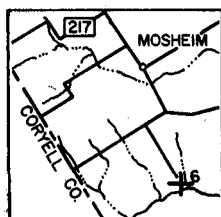
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60579	99.5	99.5	0.0	55.8	0.0		0 to 4	Limestone, fine grained, thin to medium bedded
60578	98.8	97.3	1.3	54.6	0.6		0 to 6	Limestone, fine to coarse grained, thin to thick bedded; fossil detritus; dipping beds
60577	98.5	97.7	0.7	54.8	0.3		8 to 18	Limestone, fine to coarse grained; massive; abundant rudists
60576	96.1	-	-	-	-		7	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)



BOSQUE--5. Road cut on west side of Farm Road 56, 1.4 miles north of Valley Mills.

Edwards Formation

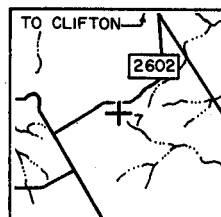
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60555	99.2	99.1	0.1	55.6	0.0		2	Limestone, fine grained, thin bedded; fossiliferous
60554	99.1	98.8	0.3	55.4	0.1		16.5	Limestone, fine to coarse grained, thick bedded; chert nodules common; rudists in lower part
60553	98.9	98.4	0.4	55.2	0.2			
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



BOSQUE--6. Road cut at end of gravel road, and bluff exposure, north side of Middle Bosque River, 8 miles southwest of Valley Mills.

Edwards Formation

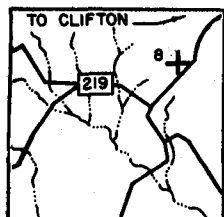
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60559	99.6	99.6	0.0	55.9	0.0		6	Limestone, fine to medium grained, thin to medium bedded
60558	99.7	99.7	0.0	56.0	0.0		24	Limestone, fine to coarse grained, partly crystalline, thick bedded; locally dolomitic; rudists common
60557	98.7	95.6	2.6	53.6	1.2			
60556	98.6	97.0	1.3	54.4	0.6			
	(Not sampled)						-	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)



BOSQUE--7. Abandoned quarry on south side of Farm Road 2602, 6 miles south of Clifton.

Edwards Formation

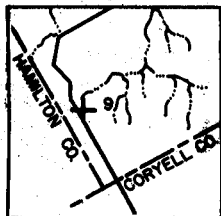
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60560	99.0	98.0	0.8	55.0	0.4		10	Limestone, fine to medium grained, medium to thick bedded; fossiliferous



BOSQUE--8. Road cut on north side of Farm Road 219, 1.7 miles southwest of Clifton.

Edwards Formation

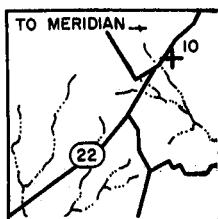
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60563	99.6	99.6	0.0	55.9	0.0		2.5	Limestone, fine grained, medium bedded
	(Not sampled)						4	Limestone, buff white, pulverulent, soft
60562	98.9	97.3	1.3	54.6	0.6		6	Limestone, gray, fine to coarse grained, thick bedded, rudists abundant
	(Not sampled)						12	Covered interval
60561	96.5	-	-	-	-		3.5	Limestone, buff gray, fine grained, massive; filled burrows common
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)
	(Not sampled)							
	(Not sampled)							



BOSQUE--9. Road cut on gravel road, 7 miles south-southeast of Cranfills Gap.

Edwards Formation

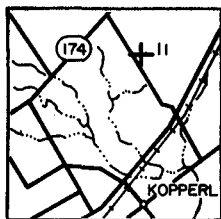
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60565	99.0	97.3	1.4	54.6	0.7		4	Limestone, fine grained, medium bedded
60564	98.2	98.0	0.2	55.0	0.1		20	Limestone, fine to coarse grained, thick bedded; nodular chert common; rudists abundant
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)



BOSQUE--10. Road cut on south side of State Highway 22, 3.5 miles southwest of Meridian.

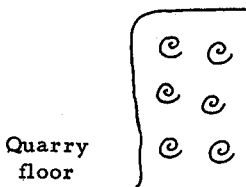
Edwards Formation

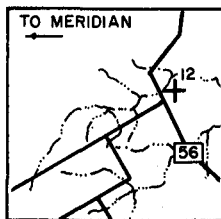
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					22	Limestone, gray, argillaceous, thin bedded; and clay, dark gray (Duck Creek and Kiamichi Formations)
60570	97.6	97.6	0.0	54.8	0.0		6	Limestone, gray to buff, fine to coarse grained, thick bedded; fossils and fossil detritus common
60569	98.8	98.7	0.1	55.4	0.0		6.5	Limestone, light buff, fine to medium grained, thin to thick bedded; fossiliferous
60568	99.4	97.7	1.4	54.8	0.7			
60567	99.7	98.4	1.1	55.2	0.5			
61891	96.8	-	-	-	-		21	Limestone, fine to coarse grained, massive to thick bedded; rudists abundant
61890	98.2	96.9	1.1	54.4	0.5			
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



BOSQUE--11. Abandoned quarry, east side of gravel road, 2 miles north of Kopperl.

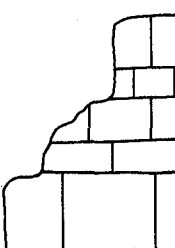
Edwards Formation

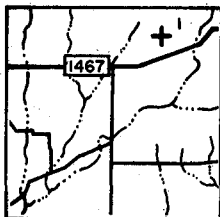
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60572	99.5	99.5	0.0	55.8	0.0	 <p>Quarry floor</p>	13	Limestone, fine to coarse grained, massive; abundant rudists



BOSQUE--12. Exposures in Long Branch and in road metal pit, east side of Farm Road 56, 11 miles east of Meridian.

Edwards Formation

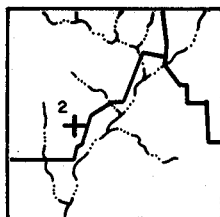
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60574	99.2	97.8	1.2	54.9	0.6		16.5	Limestone, buff to gray, fine to medium grained, partly crystalline, medium to thick bedded; fossil detritus
60573	99.0	97.6	1.2	54.8	0.6			



BROWN--1. Quarry, southwest flank of mesa, north of Farm Road 1467, 13.0 miles northeast of Brownwood.

Edwards Formation

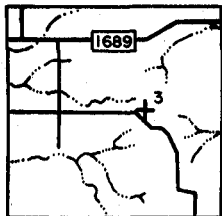
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61031	105.5	55.8	41.8	31.6	20.0		40	Dolomite, light brown, fine crystalline; thin to medium bedded; dolomitic limestone in lower part; chert nodules common in upper part
61030	102.6	70.7	26.7	39.7	12.8			
61029	104	57.8	38.2	32.4	18.3			
61028	95.7	-	-	-	-			
	(Not sampled)						45	Limestone, gray, nodular; local bed of limestone with filled burrows (Comanche Peak Formation)



BROWN--2. South nose of mesa at gap; north of secondary road, 14.0 miles north-northeast of Brownwood.

Edwards Formation

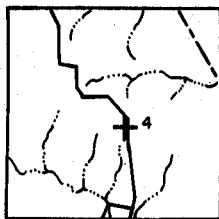
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61034	105.3	56.3	41.1	31.6	19.2		14	Dolomite, light brown, fine crystalline, thin to medium bedded; nodular chert in lower part
61033	102.1	56.5	38.2	31.7	18.3		6	Dolomite, light brown, massive; abundant rudists
61893	101.4	69.0	25.3	38.8	12.1		17	Dolomite, brown, fine crystalline, thin to medium bedded; nodular chert in upper part
61892	97.1							
		(Not sampled)					133	Limestone, gray, nodular, poorly exposed (Comanche Peak Formation)



BROWN--3. Southwest-facing nose, northeast side of secondary road approximately 18.0 miles north-northeast of Brownwood.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61037	104.5	57.1	39.7	32.1	19.0		34	Limestone, dolomitic, buff gray to brown, fine grained in lower part; limestone, dolomitized in middle; dolomite, fine crystalline in upper part; thin to thick bedded; common nodules of dark chert
61036	99.1	83.9	12.9	47.1	6.2			
61035	99.6	95.3	3.4	53.5	1.6			
		(Not sampled)					30	Limestone, gray, nodular (Comanche Peak Formation)

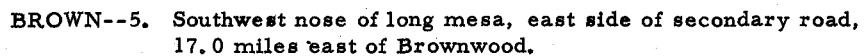


BROWN--4. Road cut, west side of secondary road at descent from mesa, 17.0 miles north-northeast of Brownwood.

Edwards Formation

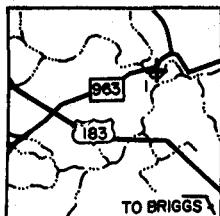
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61040	106.2	54.6	42.6	30.6	20.4		30	Dolomite, brown, fine crystalline, thin to thick bedded; chert abundant, nodular to bedded
61039	105.8	56.1	41.0	31.5	19.6			
61038	103.9	56.0	40.4	31.4	19.3			

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61040	0.09	46.96	30.60	20.40	0.46	0.36	0.17
61038	0.25	46.33	31.40	19.30	1.08	0.49	0.15



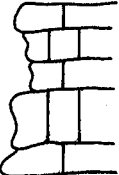
Edwards Formation

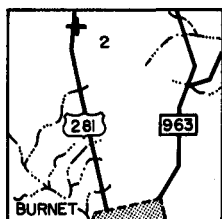
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61895	97.3	83.2	13.4	46.7	6.4		21	Limestone, dolomitized, thin to thick bedded, fine grained, partly crystalline; poorly exposed; nodular chert
61894	101.8							
61042	100.5	88.4	9.3	49.6	4.4		6	Limestone, dolomitized, brown, thin to thick bedded; abundant rudists in upper part
61041	103.4	63.2	33.6	35.5	16.1		12	Dolomite, brown, fine crystalline, thick bedded
		(Not sampled)					68	Limestone, gray, nodular, mostly covered (Comanche Peak Formation)



BURNET--1. North bank of Rocky Creek, northeast of bridge on Farm Road 963, 5.3 miles northwest of Briggs.

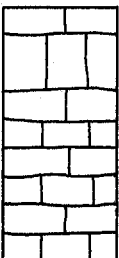
Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61266	93.3	-	-	-	-		12.0	Limestone, buff, hard, coarse grained, abundant shell detritus

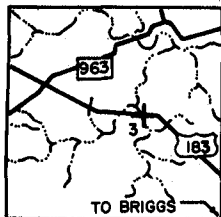


BURNET--2. Core, taken by Texas Highway Department, east side of U. S. Highway 281, 3.3 miles north of Burnet.

Walnut Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61269	98.4	98.1	0.3	55.0	0.1		18.0	Limestone, light tan to light gray, fine grained, vuggy, abundant fossils; partly leached
61268	98.2	98.2	0.0	55.1	0.0			
61267	98.4	97.5	0.6	54.7	0.3			

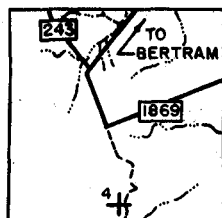
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61267	0.11	43.67	54.70	0.29	0.31	0.29	0.11



BURNET--3. Road cut, U. S. Highway 183, east of bridge over South Fork of Rocky Creek, 4.8 miles northwest of Briggs.

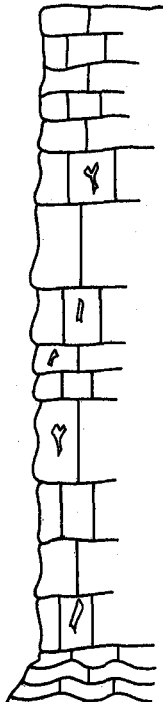
Glen Rose Formation

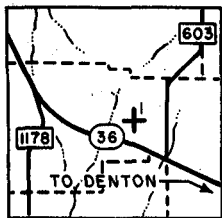
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					9.0	Limestone, tan, medium to thin bedded, interbedded with tan, fossiliferous clay
61271	96.3	-	-	-	-		14.0	Limestone, argillaceous, gray tan, fossiliferous, thick bedded
61270	93.7	-	-	-	-		10.0	Limestone, argillaceous, gray, thick bedded, interbedded with gray clay



BURNET--4. Exposure along west side of north-south gravel road, 7.3 miles south of Bertram.

Walnut Formation

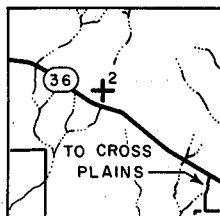
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61276	99.1	97.5	1.1	54.7	0.5		10.0	Limestone, gray, fine grained, medium to thick bedded, abundant fossils
61275	98.5						36.0	Limestone, gray-brown, hard, aphanitic to fine grained, thick bedded; weathers nodular with bedding obscured, filled, tubular burrows
61274	97.1	96.7	0.7	54.3	0.3			
61273	98.0							
61272	93.6	-	-	-	-		4.0	Limestone, gray, nodular, fine grained



CALLAHAN--1. Quarry, north side of State Highway 36, 3 miles northwest of Denton.

Edwards Formation

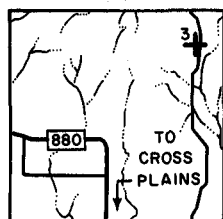
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60489	97.4	97.0	0.3	54.4	0.1		3.5	Limestone, medium gray, thick bedded; abundant rudists
60488	96.5	-	-	-	-		10.5	Limestone, buff to locally blue gray, granular, medium to thick bedded
60487	94.3	-	-	-	-		6.0	Limestone, buff gray, aphanitic to fine grained, partly crystalline; filled burrows
60486	95.9	-	-	-	-		10.0	Limestone, gray, argillaceous, nodular (Comanche Peak Formation)
		(Not sampled)						



CALLAHAN--2. Quarry, north side of State Highway 36, 9.5 miles northwest of Cross Plains.

Edwards Formation

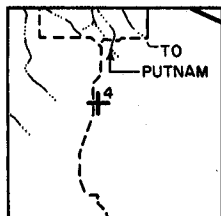
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61006	97.5	96.9	0.5	54.4	0.2		30	Limestone, gray to buff, fine to medium grained, medium to thick bedded; fossil detritus; chert float on slope
61005	97.1	95.7	1.2	53.8	0.6			
61004	95.4	-	-	-	-			
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



CALLAHAN--3. Slope on west side of north-south gravel road, east of Farm Road 880, 7.2 miles north-northeast of Cross Plains.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61898	97.8	96.8	0.8	54.4	0.4		25	Limestone, gray to buff, fine to medium grained, thin to thick bedded; fossil detritus
61897	93.6	-	-	-	-			
61896	93.7	-	-	-	-			
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



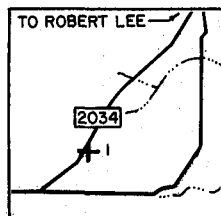
CALLAHAN--4. West nose of Spring Mesa, east side of north-south gravel road, 9 miles southwest of Putnam.

Comanche Peak and Edwards Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61902	98.6	97.5	0.3	54.7	0.1		35	(Edwards Formation)
61901	97.4							Limestone, gray to buff, fine to medium grained, thin to thick bedded; dolomitic in lower part; fossil detritus; common nodules of dark chert
61900	96.5	-	-	-	-			
61899	97.0	90.6	5.0	50.8	2.4			
61010	99.8	99.3	0.4	55.7	0.2		70	(Comanche Peak Formation)
								Limestone, gray, nodular; lower part dolomitic

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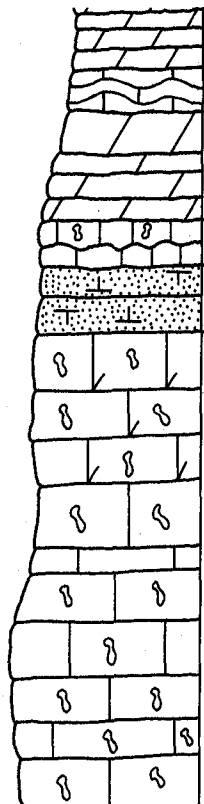
COKE--1. Road cut on east side of Farm Road 2034, 10 miles southwest of Robert Lee.

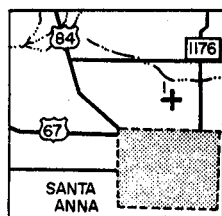
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
64321	99.0	97.0	0.2	54.4	0.1		3	Sandstone, calcareous, buff, fine grained, cross bedded
							10	Limestone, buff to gray, mostly coarse grained, thin to thick bedded; abundant rudist fragments; nodular chert at base and top
64320	98.0	68.4	28.4	38.4	13.6		10	Dolomite, buff to gray brown, fine grained, mostly crystalline, thin to thick bedded
							2	Calcite, secondary, white, hard, coarse grained
64319	98.3	97.7	0.3	54.8	0.1		4	Limestone, gray to tan, fine grained, thin to thick bedded; nodular chert
64318	101.0	68.8	27.6	38.6	13.2		48	Dolomite, gray brown to buff, fine grained, mostly crystalline, thin to thick bedded; nodular chert common; few beds weather nodular; thin bed with filled burrows; thin band of secondary calcite
64317	102.0	57.2	39.5	32.1	18.9			
64316	99.0	56.6	38.9	31.8	18.6			
64315	99.0	54.6	40.0	30.7	19.1			
64314	98.0	55.0	36.4	30.9	17.4			

(CONTINUES)

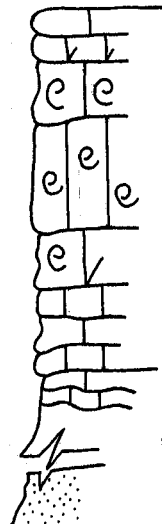

64313	100.0	56.1	40.0	31.5	19.1
64312	89.2	-	-	-	-
64311	88.2	-	-	-	-
64310	95.5	-	-	-	-
64309	95.4	-	-	-	-

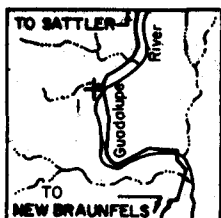
	15	Dolomite, gray brown, fine grained, mostly crystalline, thin to thick bedded; nodular weathering in middle part
	3	Limestone, gray, nodular; filled burrows in upper part
	5	Sandstone, calcareous, blue gray to brown, coarse grained, thick bedded
	34	Limestone, gray to tan, aphanitic to coarse grained, thick bedded; filled burrows, dolomitic in upper part



COLEMAN--1. Quarry of Santa Anna Silica Sand Company, Inc., Santa Anna.

Edwards Formation

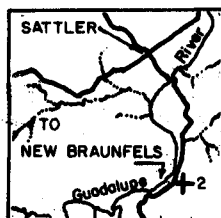
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61016	98.2	98.0	0.2	55.0	0.1		27.0	Limestone, buff gray, medium bedded in lower and upper parts, thick bedded with rudists in middle part
61015	98.3	97.9	0.3	54.9	0.1			
61014	97.6	98.0	0.0	55.0	0.0			
61013	88.9	-	-	-	-			
		(Not sampled)					73.0	From base of Edwards to quarry floor includes Comanche Peak Formation (nodular limestone), Walnut Formation (clay), and Trinity Group (clay and industrial sand)



COMAL--1. Bluff, west side of Guadalupe River at crossing of road from New Braunfels to Sattler, 5.6 miles north-northwest of New Braunfels.

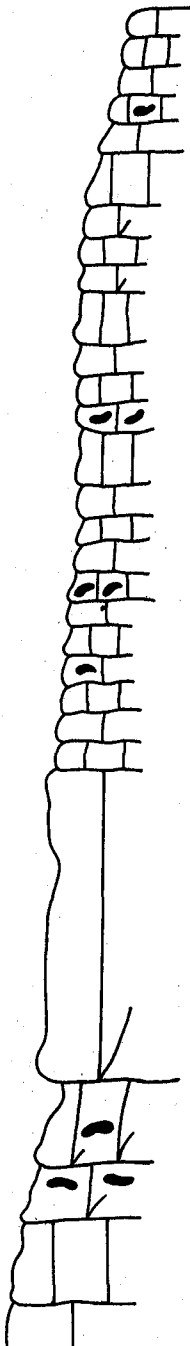
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description			
61319	99.8	97.2	1.9	54.5	0.9		6.5	Limestone, buff gray, medium grained, partly crystalline, dolomitic, vuggy			
61318	99.2										
61317	102.0	89.8	8.1	50.4	3.9		20.0	Limestone, buff to gray, fine grained, partly crystalline, thick bedded, locally dolomitized extensively			
61316	97.7										
61315	99.2	96.4	2.4	54.1	1.1		52.0	Limestone, olive buff, dense, alternating with gray, crystalline limestone and granular, dolomitic limestone; medium to thick bedded			
61314	99.4										
61313	99.6	95.8	2.7	53.8	1.3						
61312	99.6										
61311	100.3	91.1	7.0	51.1	3.3						



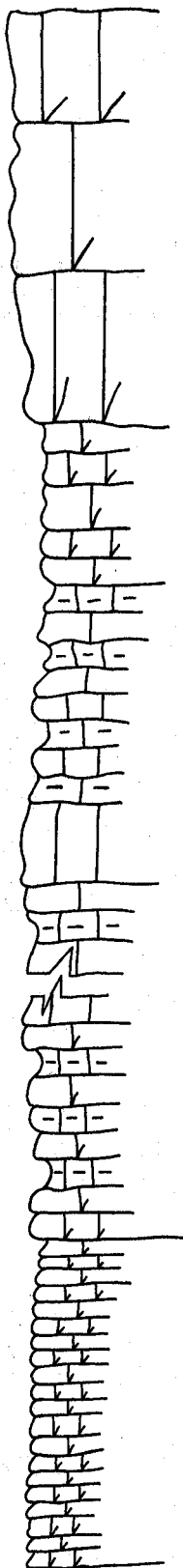
COMAL--2. Bluff, southeast side of Guadalupe River, 2.1 miles southeast of Sattler.

Edwards and Glen Rose Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61346	99.9	97.4	2.1	54.7	1.0		55.0	(Edwards Formation)	
61345	99.9							Limestone, gray to buff gray, medium crystalline to medium granular, locally fine grained, medium to thick bedded, locally dolomitic; forms receding series of ledges; few nodules of chert	
61344	99.8	98.9	0.7	55.5	0.3		22.0	Limestone, buff gray to olive gray, mostly fine grained or fine crystalline to aphanitic, hard, locally dolomitic, massive, forms prominent ledge	
61343	99.7								
61342	99.2	91.7	6.8	51.5	3.2				
61341	101.0								
61340	99.4	97.0	2.0	54.4	1.0		20.0	Limestone, buff gray, fine grained, thick bedded, recedes slightly, locally dolomitic, chert nodules in upper part	
61339	99.4								

(CONTINUES)

61338	103	81.2	17.1	45.6	8.2
61337	99.5				
61336	100.0	83.4	14.0	46.8	6.7
61335	96.5	-	-	-	-
61334	94.5	-	-	-	-
61333	100.0	56.3	39.1	31.6	18.7
61332	97.1	59.3	32.8	33.3	15.7
61331	98.9				

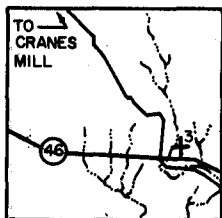


30.0	(Edwards Formation) Limestone, buff gray, fine grained, hard, massive, dolomitized; forms prominent ledge
12.0	(Glen Rose Formation) Limestone, dolomitized, brown, granular; smooth, rounded profile
75.0	Limestone, dolomitic, and dolomite, light brown, gray, nodular, aphanitic to granular, soft, with few beds of hard, granular to crystalline limestone, medium bedded
25.0	Dolomite, yellow buff, soft, nodular to medium bedded, fine grained

(CONTINUES)

61330	100.0				
61329	98.9	62.5	31.1	35.1	14.9
61328	96.9	-	-	-	-
61327	96.7	-	-	-	-
61326	96.8	-	-	-	-
61325	98.0	91.0	5.7	51.1	2.7
61324	96.2	-	-	-	-
61323	95.0	-	-	-	-
61322	94.8	-	-	-	-
61321	93.0	-	-	-	-
61320	95.2	-	-	-	-

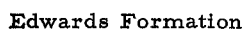
40.0	Limestone, dolomitic, and dolomite, yellow buff, soft, nodular, alternating with limestone, hard, buff gray, granular to crystalline
22.5	Limestone, buff gray, granular, hard, medium bedded, alternating with limestone, buff gray, argillaceous, shaly, soft
20.0	Limestone, buff gray, medium grained; forms rounded, protruding ledge; locally dolomitic
6.5	Limestone, silty, red buff, soft, fossiliferous
13.0	Limestone, gray, argillaceous, nodular to shaly, thin to medium bedded
16.0	Limestone, light brown gray to buff gray, fine to medium grained



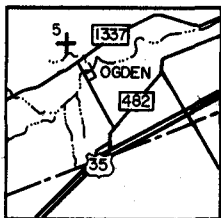
COMAL--3. Quarry, north side of State Highway 46, across stream from road to Cranes Mill.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					1.5	Limestone, buff, aphanitic, thin-bedded
							2.0	Weathered interval
61351	99.2	95.5	3.0	53.6	1.4		8.0	Limestone, dolomitic, olive buff, dense, alternating with limestone, light gray, medium grained, soft
61350	101.0	64.9	29.7	36.4	14.2		6.0	Dolomite, light yellow buff, nodular
61349	99.7						2.5	Limestone, buff gray, aphanitic to fine grained



Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61352	0.18	42.93	54.60	0.14	1.28	0.61	0.11
61353							



COMAL--5. Quarry of Servtex Materials Company at Ogden, north of
U. S. Highway 81, about 9.5 miles southwest of New Braunfels.

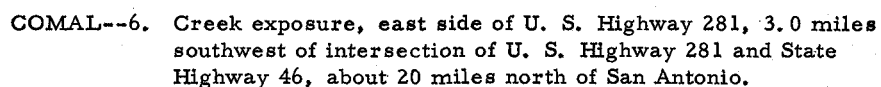
Edwards Formation

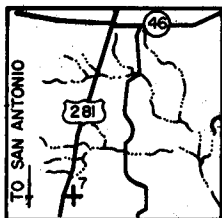
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
	(Not accessible for sampling)						26.0	Limestone, dolomitic, drab buff, vuggy, with lenses of dense, hard limestone
61387	99.8	98.2	0.9	55.1	0.4		15.0	Limestone, light gray, fine to medium grained; locally dolomitic; dark, nodular chert
61386	98.9						8.0	Limestone, light gray, fine to medium grained, thick bedded, rudists
61385	99.7	94.1	3.1	52.8	1.5		12.0	Limestone, light gray, fine to medium grained, thick bedded; few large lenticular chert masses
61384	98.4						16.0	Limestone, gray, dense, hard, alternating with limestone, dolomitic, vuggy, weathered; abundant fossil molds
61383	96.6						11.0	Limestone, dolomitic, buff gray, fine grained in lower part; dense, aphanitic in upper part

(CONTINUES)

25.0	Limestone, gray to light buff gray, fine grained to aphanitic, medium to thick bedded
2.0	Limestone, red brown, weathered
9.0	Limestone, gray, fine grained, massive

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61384	0.10	43.52	52.80	1.48	1.01	0.19	0.05
61385							

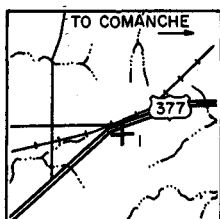
[illegible][illegible]



COMAL--7. Road cut, U. S. Highway 281, 3.3 miles south of intersection of U. S. Highway 281 and State Highway 46.

Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61394	95.8	-	-	-	-		12.0	Limestone, buff gray, medium to coarse grained, partly crystalline, medium to thick bedded, abundant rudists
61393	98.5	97.9	0.5	54.9	0.2		6.0	Limestone, buff, granular, soft, rudists in upper part



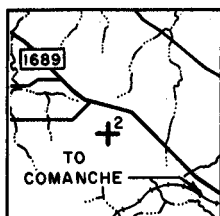
COMANCHE--1. Quarry, south side of U. S. Highways 67 and 377, 7.5 miles west-southwest of Comanche.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
						<p>Quarry floor</p>		(North face of quarry)
60471	103.7	56.3	40.4	31.6	19.3		5	Dolomite, brown, fine crystalline; nodular chert in lower part
60470	98.3	97.3	0.8	54.6	0.4		15	Limestone, thick bedded, abundant rudists; lower part covered with rubble

60475	103.0	55.4	40.0	31.1	19.1	<p>Quarry floor</p>		(South face of quarry)
60474	103.2	57.6	37.8	32.3	18.1		19 to 24	Dolomite, brown, fine crystalline; interbedded with limestone, dolomitized, buff gray; thin to medium bedded; nodular chert in lower part
60472	98.3	94.9	2.8	53.2	1.3		7 to 12	Limestone, dolomitic, light gray to light brown; abundant rudists
60473	101.8	69.3	28.4	38.9	13.6		-	Dolomite, brown, fine crystalline

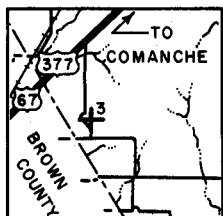
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60475	0.39	46.07	31.10	19.10	1.73	0.98	0.18
60473	0.15	45.29	38.90	13.60	0.75	0.62	0.16



COMANCHE--2. Dimension stone quarry, northeast face of mesa, 5.8 miles west-northwest of Comanche.

Edwards Formation

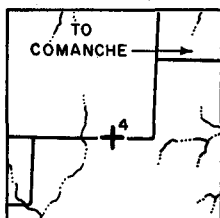
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60477	99.2	97.7	1.3	54.8	0.6		15	Limestone, white to buff, fine to medium grained, medium to thick bedded



COMANCHE--3. Road cut, east side of gravel road and west-facing slope of mesa, 10 miles southwest of Comanche and 1 mile south of U. S. Highway 67.

Edwards Formation

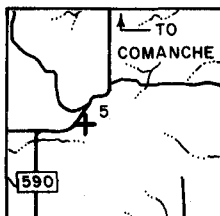
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60480	99.1	98.6	0.4	55.3	0.2		25	Dolomite, fine to coarse grained in lower part, grading to limestone, fine grained in upper part; dolomitized limestone at top; thick bedded; abundant rudists; chert float on slope
60479	102.0	69.0	27.7	38.7	13.2			
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



COMANCHE--4. Exposure in ditch and road bed on east-west gravel road, 7.5 miles southwest of Comanche.

Edwards Formation

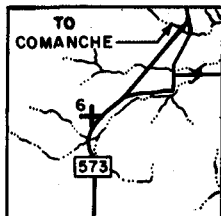
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61904	102.1	55.8	38.8	31.6	15.1		20	Dolomite, light brown, thick bedded; abundant rudists
61903	101.5							
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)



COMANCHE--5. Southwest slope of hill immediately northwest of Mercers Gap church, 8.5 miles south-southwest of Comanche on east side of Farm Road 590.

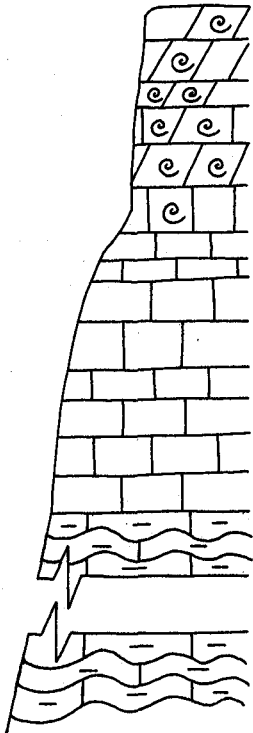
Edwards Formation

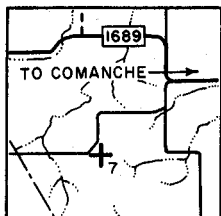
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60482	97.4	53.8	37.0	30.2	17.7		11	Dolomite, thick bedded; chert float on slope
	(Not sampled)						25	Limestone, gray, nodular (Comanche Peak Formation)



COMANCHE--6. Slope of south-facing mesa, northwest side of Farm Road 573, 11.5 miles south-southwest of Comanche.

Edwards Formation

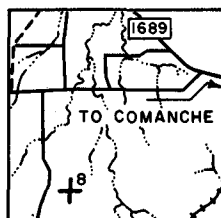
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60485	102.4	56.0	39.2	31.4	18.8		16	Dolomite, light brown, fine crystalline; interbedded with few beds of limestone, buff gray; rudists common
60484	101.9	56.2	37.6	31.5	18.0			
61906	97.3	96.2	0.9	54.0	0.4		20	Limestone, buff gray, medium to thick bedded, fine to medium grained
61905	96.5	-	-	-	-			
		(Not sampled)						125



COMANCHE--7. Northwest nose of mesa, west side of gravel road,
13 miles northwest of Comanche.

Edwards Formation

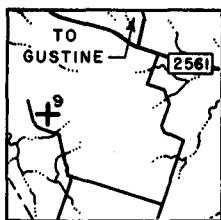
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61022	105.0	56.3	41.4	31.6	19.8		47	Limestone and dolomitic limestone in lower part; dolomite in upper part; medium to thick bedded; fossil detritus; dark, nodular chert
61021	104.0	58.5	38.6	32.8	18.5			
61020	99.0	87.7	9.7	49.2	4.6			
61019	99.6	99.6	0.0	55.9	0.0			
		(Not sampled)						
							-	Limestone, gray, nodular (Comanche Peak Formation)



COMANCHE--8. Quarry, north end of mesa on east side of north-south gravel road, 8 miles west of Comanche.

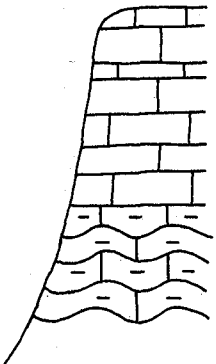
Edwards Formation

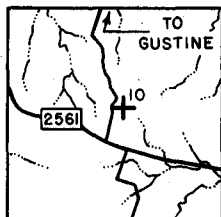
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61027	101.1	55.8	38.0	31.3	18.2		35	Limestone, buff gray, fine to coarse grained, thick bedded in lower part, beds dipping slightly; rudists common; dolomite, fine crystalline in upper part, thin to thick bedded; chert nodules in upper part
61026	68.1	-	-	-	-			
61025	98.4	98.0	0.3	55.0	0.1		10	Limestone, gray, medium to thick bedded, fine grained; dolomitic in lower part
61024	99.6	96.7	2.4	54.3	1.1			
61023	102.8	57.8	37.7	32.4	18.0		15	Dolomite, buff, thick bedded, fine crystalline; numerous filled burrows
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



COMANCHE--9. South nose of south part of Cow House Mountain, northeast side of poor gravel road, 9.5 miles south-southwest of Gustin.

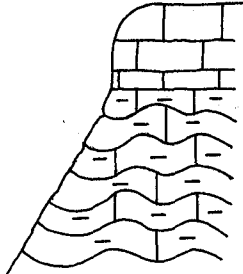
Edwards Formation

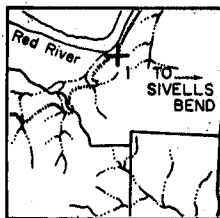
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61017	99.3	98.4	0.8	55.2	0.4		14	Limestone, buff to gray, thin to thick bedded; chert float
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



COMANCHE--10. Exposure along west flank of north outlier of Cow House Mountain, east side of gravel road, 7.5 miles south-southwest of Gustin.

Edwards Formation

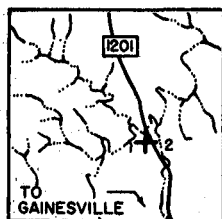
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								
61018	99.5	99.5	0.0	55.8	-		6	Limestone, buff to gray, medium to thick bedded; float of nodular chert
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



COOKE--1. Bluff on south side of Red River, 1.8 miles northwest of Sivells Bend.

Goodland Formation

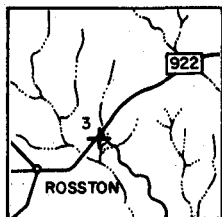
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)						
		(Not sampled)					30	Clay, gray brown (Kiamichi Formation)
61911	97.3	95.8	1.3	53.8	0.6		25	Limestone, fine to medium grained, thick bedded; forms prominent cliff
61910	96.1	-	-	-	-			
		(Not sampled)					200	Clay and limestone in upper part (Walnut Formation) Sandstone and clay in lower part (Trinity Group)



COOKE--2. Quarry on west side of Farm Road 1201, 10.5 miles northwest of Gainesville.

Goodland Formation

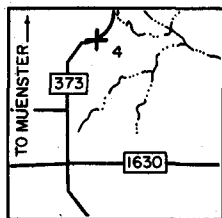
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61913	96.8	-	-	-	-		18	Limestone, gray, fine grained, thin to thick bedded; weathers nodular
61912	95.6	-	-	-	-			
		(Not sampled)					7.5	Limestone, blue gray, argillaceous, nodular (Walnut Formation)



COOKE--3. Road cut on Farm Road 922, north side of Clear Creek, 0.8 mile northeast of Rosston.

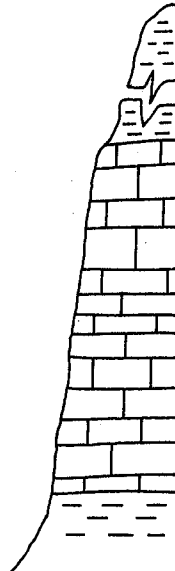
Goodland Formation

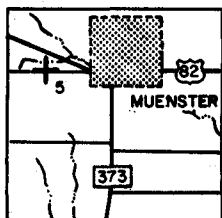
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60365	96.5	-	-	-	-		14	Limestone, gray, fine grained, hard, medium bedded; weathers nodular
		(Not sampled)					50	Clay and limestone (Walnut Formation) Sandstone (Antlers Formation)



COOKE--4. Road cut and in ditch along Farm Road 373, south of Elm Fork of Trinity River, 3 miles south of Muenster.

Goodland Formation

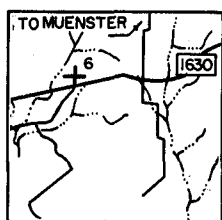
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								
		(Not sampled)					25	Clay, gray brown (Kiamichi Formation)
60367	92.3	-	-	-	-		25	Limestone, gray, fine grained, thin to medium bedded; weathers nodular (poorly exposed)
60366	94.9	-	-	-	-			
		(Not sampled)					-	Clay and limestone (Walnut Formation)



COOKE--5. Exposures in bed of gravel road and in ditch beside road, 1.2 miles west of Muenster.

Goodland Formation

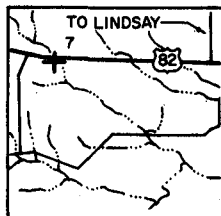
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61909	95.1	-	-	-	-		30	Limestone, gray, fine grained, hard, thin to medium bedded; weathers nodular (poorly exposed)
61908	94.8	-	-	-	-			
61907	95.0	-	-	-	-			



COOKE--6. Road metal quarry and road cut on north side of Farm Road 1630, 7.5 miles southwest of Muenster.

Goodland Formation

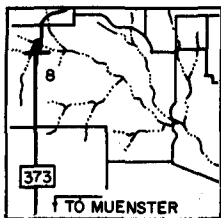
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60369	95.2	-	-	-	-		14	Limestone, gray, fine grained, hard, thin to thick bedded; weathers nodular
	(Not sampled)						-	Clay and limestone (Walnut Formation)



COOKE--7. Bluff along Elm Creek at Roadside Park, south side of U. S. Highway 82, 3.3 miles west of Lindsay.

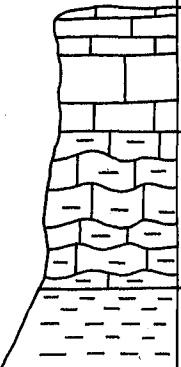
Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60357	92.2	-	-	-	-		10	Limestone, gray, fine grained, thin to thick bedded, lower part nodular
	(Not sampled)						5	Clay and limestone (Walnut Formation)

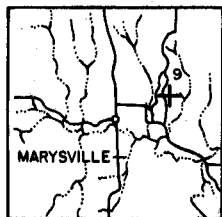


COOKE--8. Road cut on Farm Road 373, 2.2 miles north of Münster.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60370	97.8	97.5	0.0	54.7	0.0		9	Limestone, gray, fine grained, hard, thin to thick bedded; weathers nodular
(Not sampled)							11	Limestone, nodular, blue gray, argillaceous (Walnut Formation)
							6	Clay, dark gray brown, shaly (Walnut Formation)

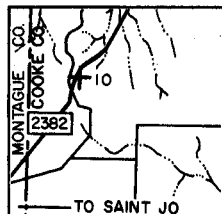
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60370	0.21	43.02	54.70	0.00	1.14	0.57	0.35



COOKE--9. Exposure along gravel road, 0.8 mile east of Marysville.

Goodland Formation

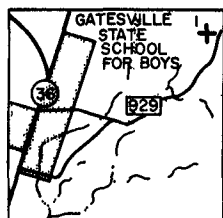
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60372	95.3	-	-	-	-		5	Limestone, gray, fine grained, hard, thin to medium bedded; weathers nodular
	(Not sampled)						45	Clay and limestone (Walnut Formation) Sandstone and clay (Antlers Formation)



COOKE--10. Road cut on Farm Road 2382, 4 miles northeast of Saint Jo.

Goodland Formation

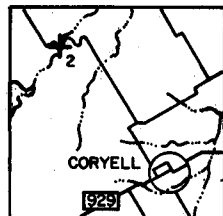
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60371	96.3	-	-	-	-		9	Limestone, gray, fine grained, hard, thin to thick bedded; weathers nodular
	(Not sampled)						73	Clay and limestone (Walnut Formation) Sandstone and clay (Antlers Formation)



CORYELL--1. Exposure along Farm Road 929, 3.5 miles northeast of intersection with State Highway 36.

Edwards Formation

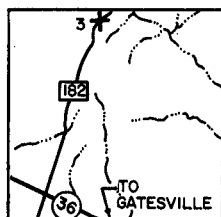
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					4.0	Clay (Kiamichi Formation)
61121	99.2	98.4	0.7	55.2	0.3		2.0	Limestone, buff gray, hard, fine grained, crystalline
61120	98.1	97.3	0.7	54.6	0.3		12.0	Limestone, buff, fine grained, thin to medium bedded
61119	93.0	-	-	-	-		14.0	Limestone, gray, fine to coarse grained, rudist fragments, thick bedded
61118	99.5	98.3	1.0	55.2	0.5			
61117	98.3	97.3	0.8	54.6	0.4			
								(Comanche Peak Formation--mostly covered)



CORYELL--2. Exposure along gravel road, 2.2 miles northwest of Coryell (city), immediately south of Cove Creek.

Edwards Formation

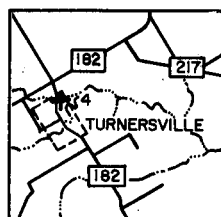
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61125	99.4	98.7	0.6	55.4	0.3		15.0	Limestone, buff, fine to medium grained, medium to thick bedded
61124	99.3	98.8	0.4	55.4	0.2			
61123	98.5	97.7	0.7	54.8	0.3		15.0	Limestone, buff gray, coarse grained, thick bedded, rudist fragments
61122	98.5	97.9	0.5	54.9	0.2			
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)



CORYELL--3. Road cut, Farm Road 182, immediately south of Coryell Creek crossing, 2.6 miles north of intersection with State Highway 36.

Edwards Formation

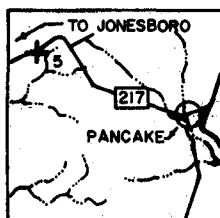
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61128	99.6	99.5	0.1	55.8	0.0		28.0	Limestone, gray, abundant rudists in fine-grained, partly crystalline matrix, thick bedded, large calcite crystals, nodular chert in upper 5 feet
61127	99.4	99.1	0.3	55.6	0.1			
61126	98.3	97.7	0.5	54.8	0.2			
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



CORYELL--4. Exposure in Goldys Branch of Middle Bosque Creek at north city limits of Turnersville.

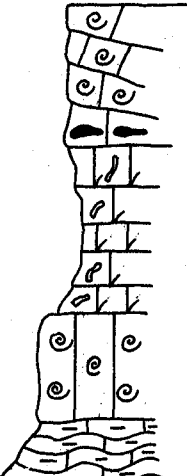
Edwards Formation

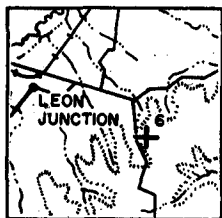
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
61130	99.5	-	-	-	-		4.0	Limestone, gray, hard, aphanitic, thin bedded
61129	99.5	-	-	-	-		14.0	Limestone, light buff, fine grained, partly crystalline, medium to thick bedded, few nodules of dark chert



CORYELL--5. Road cut on Farm Road 217, between Pancake and Jonesboro, 2 miles west of Pancake.

Edwards Formation

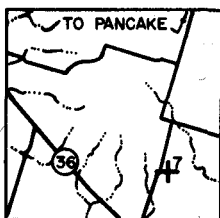
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61133	95.9	-	-	-	-		8.0	Limestone, buff, coarse grained, medium bedded, detrital, beds dip 10° west, with calcite vugs
61132	99.0	83.7	12.5	47.0	6.0		3.0	Limestone as below with chert bed at top
							12.0	Limestone, dolomitized, blue gray, fine grained, medium to thick bedded; filled, tubular burrows
61131	99.3	98.9	0.3	55.5	0.1		7.0	Limestone, buff gray, hard, coarse grained, thick bedded, abundant rudists
		(Not sampled)					-	Limestone, nodular, gray (Comanche Peak Formation)



CORYELL--6. Bluff, east side of gravel road, between Leon Junction and State Highway 36, 2.5 miles east of Leon Junction.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61196	99.4	97.0	1.9	54.4	0.9		13.0	Limestone, buff gray, medium grained, interbedded with limestone containing fragmental rudists
61195	99.2	97.7	1.3	54.8	0.6			
61194	99.3						10.0	Limestone, coarse grained with rudist fragments, medium bedded



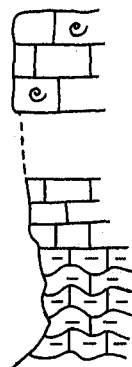
CORYELL--7. Quarry on east side of gravel road, between State Highway 36 and Pancake, 1.2 miles from Highway 36.

CORYELL--7A. 100 yards south of CORYELL--7, road cut and field exposure.

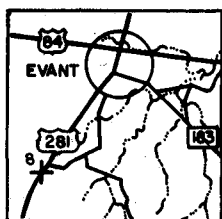
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61137	99.6	99.1	0.4	55.6	0.2		12.0	7. Limestone, hard, coarse grained, thick bedded, fragmental, abundant rudists
61136	99.6	99.4	0.2	55.8	0.1			

61135	99.3	98.9	0.3	55.5	0.1
61134	100.1	97.2	2.4	54.6	1.1
		(Not sampled)			



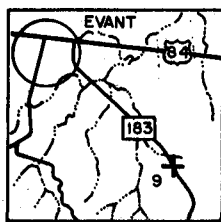
7.0	7A. Limestone, coarse grained, thick bedded, detrital, rudist fragments
5.0	Covered interval
4.8	Limestone, dolomitic, argillaceous, fine grained
-	Limestone, argillaceous, nodular, less nodular at top (Comanche Peak Formation)



CORYELL--8. Road cut, U. S. Highway 281, 2.0 miles south of Evant.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61140	104.2	58.2	38.7	32.7	18.5		12.0	Limestone, dolomitized, buff, fine to medium grained, medium bedded, nodular and bedded chert in upper part
61139	101.0	75.4	21.6	42.6	10.3		8.0	Limestone, dolomitized, buff, coarse grained
61138	97.4	83.9	11.2	47.1	5.4		4.0	Limestone, dolomitic, light brown, granular, filled tubular burrows
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)

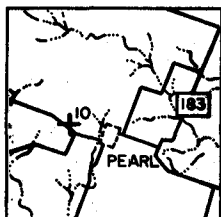


CORYELL--9. Road cut, Farm Road 183, 2.6 miles southeast of Evant.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61152	98.2	97.3	0.8	54.6	0.4		6.0	Limestone, coarse grained, thick bedded
61151	96.7	-	-	-	-		8.0	Limestone, pulverulent with lenses of secondary calcite
61150	99.5	98.2	1.1	55.1	0.5		4.0	Limestone, buff to yellow, fine grained, partly crystalline, abundant chert
61149	104.9	57.2	40.0	32.1	19.1		4.0	Dolomite, soft, aphanitic
		(Not sampled)					1.5	Limestone, pulverulent
61148	105.0	55.7	41.2	31.2	19.7		6.0	Dolomite, soft, aphanitic
		(Not sampled)					0.8	Limestone, pulverulent
61147	104.2	61.1	36.8	34.2	17.6		7.0	Dolomite, fine grained, medium to thick bedded, chert nodules
		(Not sampled)					1.5	Limestone, pulverulent
61146	99.0	99.0	0.0	-	-		5.0	Limestone, buff, fine to medium grained, partly crystalline, dipping beds
		(Not sampled)					2.0	Dolomite
		(Not sampled)					1.5	Limestone, pulverulent
61145	98.4	97.5	0.8	54.6	0.4		11.0	Limestone, buff, fine grained, partly crystalline, massive, abundant rudists
		(Not sampled)						Dolomite, brown, few non-dolomitized, filled burrows
61144	104.0	59.0	37.1	33.1	17.7		5.0	Limestone, dolomitic, brown and white mottled, massive, with rudists
61143	99.0	94.6	3.7	53.1	1.8		4.0	Dolomite, light brown, fossiliferous, fossils leached
61142	99.5	61.1	32.2	34.3	15.4		3.5	
61141	98.5	86.6	9.7	48.6	4.6		3.0	Limestone, dolomitic, buff, medium to coarse grained
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)

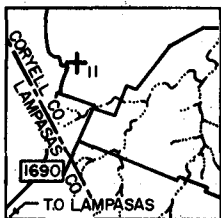
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61144	0.07	46.61	33.10	17.70	0.72	0.41	0.18
61145	0.05	43.31	54.60	0.38	1.03	0.29	0.07
61147	0.06	46.62	34.20	17.60	0.50	0.32	0.07
61149	0.02	47.08	32.10	19.10	0.58	0.35	0.10



CORYELL--10. Scarp, north side of gravel road, north of Farm Road 183 and 0.5 mile northwest of Pearl.

Edwards Formation

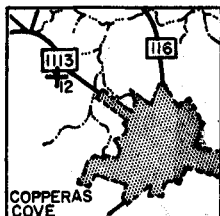
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61153	99.6	-	-	-	-		18.0	Limestone, buff, fine to medium grained, thick bedded with much chert
								Covered slope



CORYELL--11. Butte, north side of gravel road, 0.8 mile north of intersection of Farm Road 1690 and Coryell-Lampasas County line.

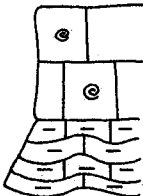
Edwards Formation

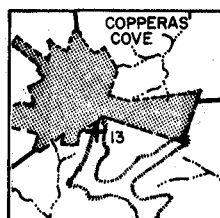
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61155	99.6	-	-	-	-			(Top of butte)
61154	99.6	-	-	-	-		12.0	Limestone, light buff, medium to coarse grained, chert float near top
								Covered slope



CORYELL--12. Butte, west side of Farm Road 1113, 1.7 miles northwest of Copperas Cove.

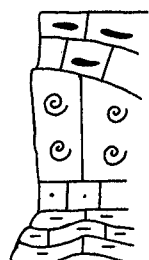
Edwards Formation

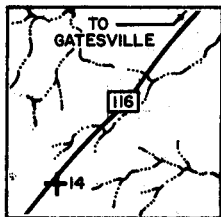
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								(Top of butte)
61156	99.4	-	-	-	-		8.0	Limestone, light buff, medium grained, partly crystalline, thick bedded, few rudists
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)



CORYELL--13. Quarry at north end of Seven Mile Mountain, southern city limits of Copperas Cove.

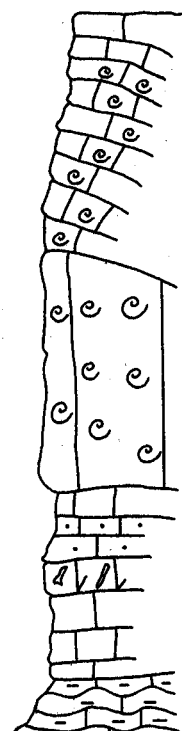
Edwards Formation

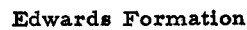
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								
61159	99.5	96.4	2.6	54.1	1.2		2.0-12.0	Limestone, buff gray, hard, aphanitic to coarse grained, nodular chert
61158	99.6	98.2	1.0	55.1	0.5		3.0-10.0	Limestone, abundant rudists in hard, vuggy, crystalline matrix
61157	99.3						1.3	Limestone, pulverulent
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



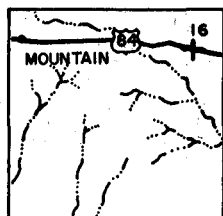
CORYELL--14. Road cut, Farm Road 116, 5.5 miles north of Pidcoke and 6.5 miles southwest of intersection of Farm Road 116 and U. S. Highway 84.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61166	100.1	99.4	0.3	55.8	0.1		7.0	Limestone, gray, medium grained, medium to thick bedded
61165	99.5						10.0	Limestone, fine to coarse grained, abundant rudist fragments
61164	99.6	97.9	1.4	54.9	0.7		20.0 (Max.)	Limestone, buff, hard, massive, abundant rudists, lenticular
61163	99.6							
61162	99.3	97.8	0.7	54.9	0.3		2.0	Limestone, yellow buff, medium grained
61161	98.0							
		(Not sampled)					3.3	Limestone, pulverulent
							2.5	Limestone, yellow buff, dolomitic, filled burrows
61160	94.4	-	-	-	-		6.0	Limestone, buff, fine grained, partly crystalline
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



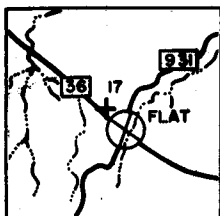
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61914	0.03	43.33	54.40	0.14	0.54	0.48	0.23
61915							



CORYELL--16. Road cut, both sides of U. S. Highway 84, 2.4 miles east of Mountain, and 1.8 miles west of intersection with Farm Road 1829.

Edwards Formation

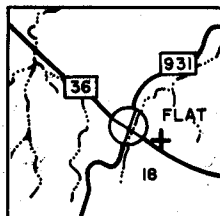
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61919	98.1	96.0	1.9	53.8	0.9		20.0	Limestone, medium to thick bedded, fine to medium grained, few rudist fragments
61918	98.3							
61175	99.4	97.1	1.7	54.5	0.8		14.0	Limestone, buff, medium grained, medium bedded, common nodules of dark chert
61174	98.9							
61173	100.1	96.4	2.4	54.1	1.1		23.0	Limestone, buff, thick bedded, bedding planes undulatory, fine- to medium-grained matrix with rudist fragments
61172	98.5							
		(Not sampled)					-	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)



CORYELL--17. Road cut, State Highway 36, at Flat.

Edwards Formation

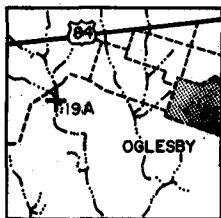
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61178	98.5	-	-	-	-		6.0	Limestone, buff, fine to medium grained, medium to thick bedded
61177	92.9	-	-	-	-		8.0	Limestone, buff, mottled, fine grained to aphanitic, medium bedded, filled tubular burrows
	(Not sampled)						10.0	Limestone, gray blue to buff, mottled, argillaceous, nodular; few filled burrows (Comanche Peak Formation)



CORYELL--18. Road cut, State Highway 36, 0.2 mile southeast of Flat.

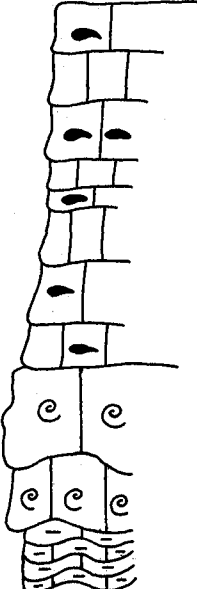
Edwards Formation

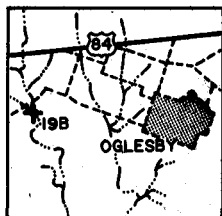
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61182	99.7	97.5	0.9	54.7	0.4		4.0	Limestone, buff, aphanitic to fine grained, medium bedded
61181	97.5						4.5	Limestone, buff gray, fine to medium grained, rudist fragments
61180	99.0	95.6	2.6	53.6	1.2		5.0	Limestone, buff, hard, fine to medium grained
	(Not sampled)						3.0	Limestone, nodular, thin bedded
61179	98.5	95.6	2.6	53.6	1.2		4.0	Limestone, buff, fine to medium grained, medium bedded, nodular chert



CORYELL--19A. Exposure in Pew Branch, south side of gravel road, 1.0 mile south of U. S. Highway 84, 2.3 miles west of Oglesby.

Edwards Formation

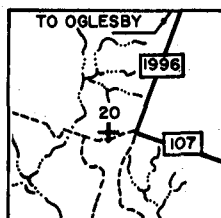
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61186	99.7	98.4	1.0	55.2	0.5		26.0	Limestone, buff, medium to thick bedded, several layers of dark, nodular chert
61185	99.6							
61184	99.5	98.6	0.8	55.3	0.4		11.0	Limestone, buff to gray, abundant rudists, thick bedded
61183	99.7							
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



CORYELL--19B. Fifty yards north of CORYELL--19A.

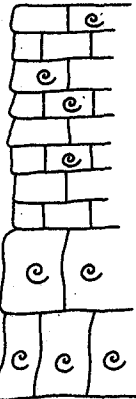
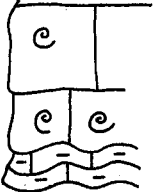
Edwards Formation

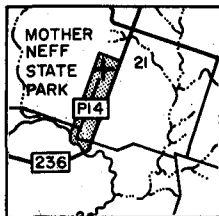
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
	(Sampled in 19A)						8.0	Limestone, buff, granular, medium bedded, abundant dark gray to brown, nodular chert
61187	99.2	99.0	0.2	55.6	0.1		16.0	Limestone, buff, fine to coarse grained, abundant rudist fragments, thick bedded
	(Sampled in 19A)						13.0	Limestone, buff to gray, abundant rudists, thick bedded
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)



CORYELL--20. Stream exposure, north side of gravel road, 0.4 mile west of sharp turn of Farm Road 107, 3.3 miles south-southwest of Oglesby.

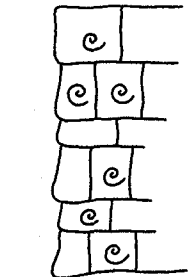
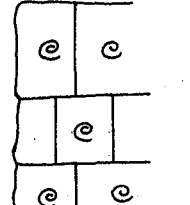

Edwards Formation

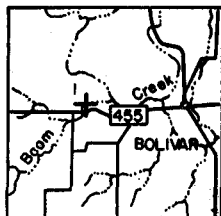
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61190	99.5	-	-	-	-		16.0	Limestone, fine to medium grained, few rudist fragments, medium bedded	
61189	98.6	-	-	-	-		12.0	Limestone, buff, thick bedded, abundant rudists in fine grained, partly crystalline matrix	
	(Not sampled)							15.0	Covered interval
61188	98.5	-	-	-	-			10.0	Limestone, buff, hard, thick bedded, abundant rudists
	(Not sampled)								-



CORYELL--21. Exposure at loop on Park Road 14, Mother Neff State Park.

Edwards Formation

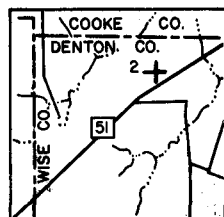
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61921	98.6	-	-	-	-		19.0	Limestone, buff, coarse grained, rudist fragments, thick bedded
61920	95.3	-	-	-	-			
Covered interval							15.0	Covered interval
61192	99.4	-	-	-	-			16.0
61191	98.4	-	-	-	-			
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)



DENTON--1. Exposure in Boom Creek, north of Farm Road 455, 5.5 miles west of Sanger.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
61926	92.3	-	-	-	-		22	Limestone, gray, fine grained, hard, medium to thick bedded; weathers nodular
61925	94.4	-	-	-	-			
		(Not sampled)					-	Clay, limy (Walnut Formation)

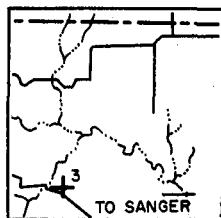


DENTON--2. Quarry on north side of State Highway 51, 11 miles west-northwest of Sanger.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60356	94.2	-	-	-	-		15	Limestone, gray, fine grained, hard, thin to thick bedded; weathers nodular

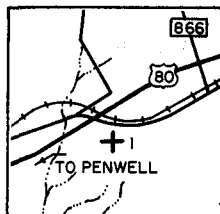
Quarry floor



DENTON--3. Slope exposure north of gravel road, 8.5 miles west-northwest of Sanger.

Goodland Formation

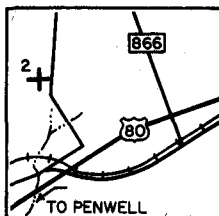
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61923	95.9	-	-	-	-		25	Limestone, gray, fine grained, hard, thin to medium bedded; weathers nodular
61922	94.2	-	-	-	-			
	(Not sampled)						-	Clay (Walnut Formation)



ECTOR--1. Quarry of Southwestern Portland Cement Co., south of U. S. Highway 80, 14 miles southwest of Odessa, and 2 miles east of Penwell.

Edwards Formation

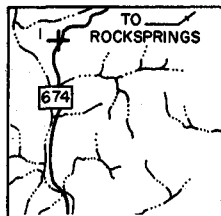
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
64583	94.0	-	-	-	-		20	Limestone, buff to gray, fine to mostly coarse grained, partly crystalline, thick bedded; abundant fossils and fossil detritus
64582	93.4	-	-	-	-			
64581	93.3	-	-	-	-			
	(Not sampled)					Quarry floor	4	Covered interval
64580	50.6	-	-	-	-		15	Limestone, gray, argillaceous, nodular; fossiliferous
64579	61.4	-	-	-	-			



ECTOR--2. Quarry of Permian Sand & Gravel Company, north side of U. S. Highway 80, 14 miles southwest of Odessa, and 2.2 miles northeast of Penwell.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)						
							-	Caliche
64585	89.0	-	-	-	-		22	Limestone, buff to gray, fine to mostly coarse grained, partly crystalline, thick bedded; abundant fossils and fossil detritus
64584	89.0	-	-	-	-			

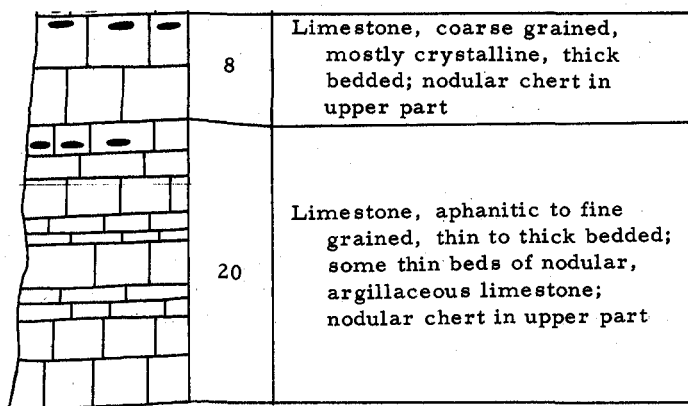


EDWARDS--1. Road cuts on west side of Ranch Road 674, 14 miles southwest of Rocksprings.

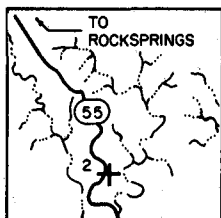
Edwards Formation (upper unit)

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61704	100.1	97.9	1.6	54.9	0.8		6	Limestone, aphanitic to fine grained, hard, thick bedded; abundant rudists
61703	99.6						11	Limestone, fine to medium grained, partly crystalline, thick bedded; few fossils
61702	99.4	97.8	1.3	54.9	0.6		53	Limestone, aphanitic to fine grained, hard, thick bedded; nodular chert common in middle; abundant rudists
61701	92.8							
61700	99.8							
61699	99.9							
61698	98.7							
							2	Limestone, medium to coarse grained, mostly crystalline, thin bedded; abundant nodular chert

(CONTINUES)

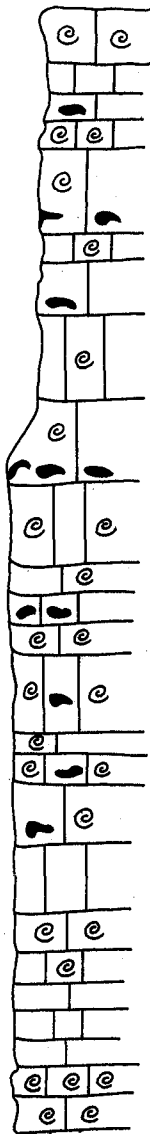


Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61696	0.17	42.96	54.00	0.76	1.30	0.10	0.08
61697							



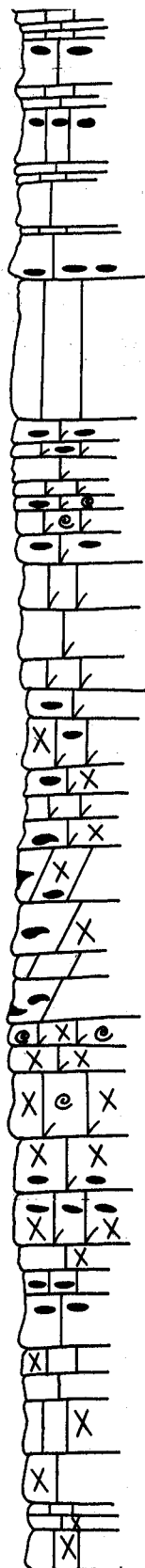
EDWARDS--2. Road cuts, east side of State Highway 55 where road descends from Edwards Plateau, 13 miles south-southeast of Rocksprings.

Edwards Formation (upper unit)

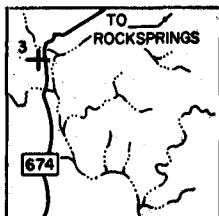
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61724	99.6	97.9	1.4	54.9	0.7		65	Limestone, gray, aphanitic to medium grained, medium to thick bedded, abundant nodular chert; lower part poorly exposed
61723	86.8	-	-	-	-			
61722	100.2	98.5	0.8	55.3	0.4			
61721	98.8							
61720	99.6	98.0	0.8	55.0	0.4			
61719	98.5							
61718	99.4	97.4	1.3	54.7	0.6			
61717	98.7							
							3	Limestone, massive, abundant rudists

(CONTINUES)

61716	98.7	97.5	0.5	54.7	0.2
61715	97.5				
61714	99.2	94.3	4.3	53.0	2.1
61713	100.6				
61712	104.9	77.9	20.1	43.7	9.6
61711	100.2				
61710	96.9	-	-	-	-
61709	102.5	72.5	24.9	40.7	11.9
61708	99.7	91.5	7.1	51.4	3.4
61707	101.2				
61706	100.0	98.5	1.3	55.3	0.6
61705	100.1				

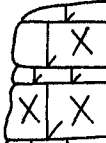
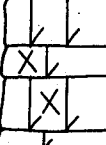
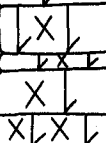
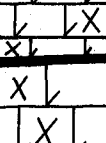
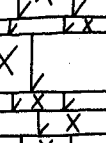
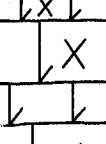
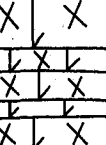
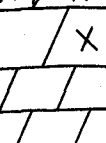
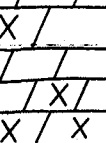


20	Limestone, fine to medium grained, hard, thin to thick bedded, few fossil fragments; chert nodules common, lower part poorly exposed
10	Limestone, fine to medium grained, thick bedded
11	Limestone, dolomitic, aphanitic to coarse grained, medium bedded; chert nodules abundant, bed of chert at base
10	Limestone, dolomitized, mostly coarse grained, thick bedded; abundant fossil shells
25	Limestone, dolomitized, and dolomite, aphanitic to coarse grained, medium to thick bedded, hard, chert nodules common; much secondary calcite
4	Limestone, dolomitic, abundant secondary calcite
13	Limestone, dolomitic, aphanitic to coarse grained, medium to thick bedded; chert nodules in lower part; altered, much secondary calcite
25	Limestone, aphanitic to coarse grained, partly crystalline, medium to thick bedded; nodular chert in upper part; altered, much secondary calcite

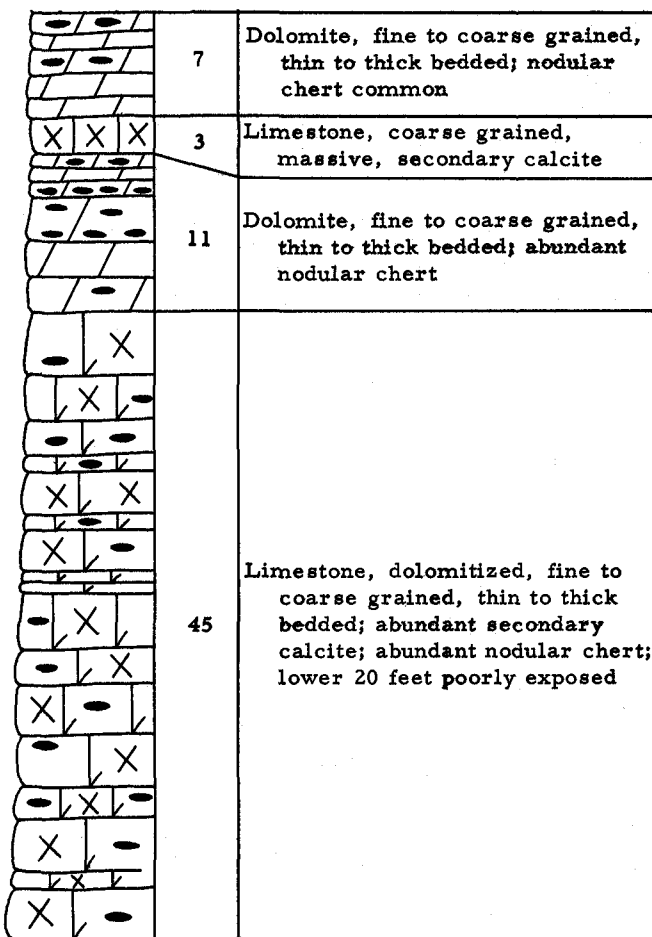


EDWARDS--3. Road cuts on west side of Ranch Road 674, west side of Nueces River, 24 miles south-southwest of Rocksprings.

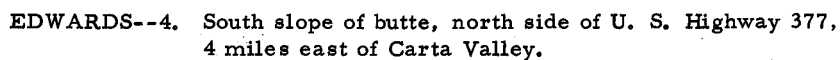
Devils River Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61740	95.6	-	-	-	-		35	Limestone, dolomitic, fine to coarse grained, thin to thick bedded; abundant secondary calcite; chert bed at base
61739	99.5	94.6	3.9	53.1	1.9			
61738	100.4	78.7	8.8	44.2	4.2			
61737	100.6							
61736	97.6							
61735	99.9	87.6	9.1	49.2	4.4		52	Limestone, dolomitic, fine to coarse grained, thin to thick bedded; lower part dolomite; abundant secondary calcite
61734	84.5	-	-	-	-			
61733	104.6	63.4	34.5	35.6	16.5			
61732	104.3							
							7	Dolomite, fine to coarse grained, thick bedded; abundant secondary calcite

(CONTINUES)

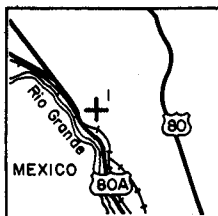


Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61733	0.00	46.09	35.60	16.50	0.48	0.29	0.06
61732							
61726	0.25	44.86	42.50	9.77	1.10	0.41	0.06
61725							



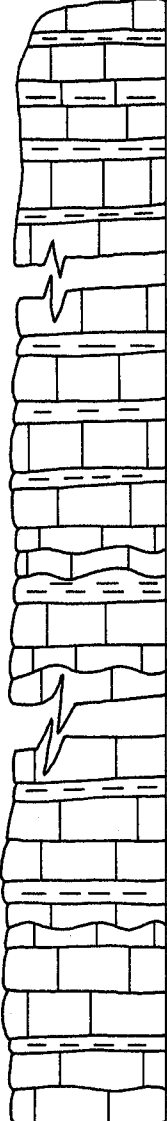
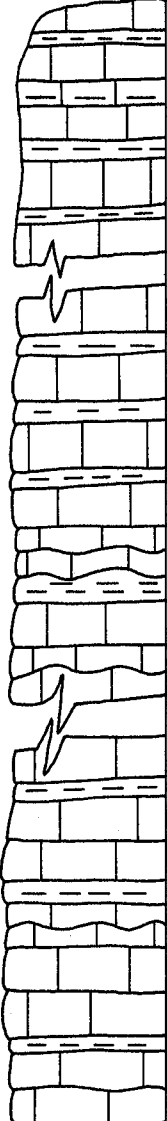
Devils River Formation

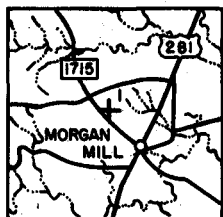
[illegible]



EL PASO--1. Quarry of Southwestern Portland Cement Company, 3.5 miles northwest of center of El Paso.

(unnamed unit)

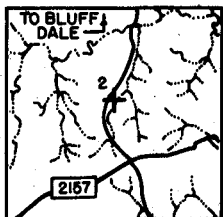
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
64611	95.0	-	-	-	-		60	Limestone, yellow gray, mostly fine grained, thin to thick bedded; interbedded with limestone, argillaceous, and clay, limy
64612	81.4	-	-	-	-			
64613	76.4	-	-	-	-		80	Limestone, blue gray, mostly fine grained, thick bedded; interbedded with limestone, nodular, argillaceous; and clay and shale, dark blue gray
64614	92.5	-	-	-	-			
64615	96.4	-	-	-	-			
64616	86.7	-	-	-	-			
64617	86.6	-	-	-	-			
64618	89.8	-	-	-	-			
64619	90.3	-	-	-	-			
64620	80.6	-	-	-	-			
64621	76.8	-	-	-	-			
64622	65.1	-	-	-	-			
64623	51.3	-	-	-	-			
64624	66.1	-	-	-	-			



ERATH--1. Road cut, Farm Road 1715, 0.5 mile northwest of Morgan Mill.

Glen Rose Formation

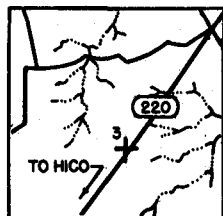
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60457	80.4	-	-	-	-		8.5	Limestone, thin bedded, alternating with clay, calcareous, silty
60456	95.4	-	-	-	-		3.5	Limestone, gray to yellow, medium bedded, thin clay bed at base
60455	73.9	-	-	-	-		3.0	Limestone, light gray, fine to coarse grained, partly crystalline, abundant fossils; sandy in lower part
	(Not sampled)						4.0	Sandstone, tan, fine grained (Travis Peak Formation)



ERATH--2. Creek bed, east side of north-south secondary road, 5 miles south of Bluff Dale.

Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60451	93.9	-	-	-	-		16	Limestone, gray, nodular, few beds of argillaceous limestone; abundant pelecypods

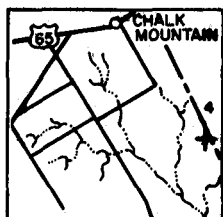


ERATH--3. Road cut on State Highway 220, 9.0 miles northeast of Hico, and 15.5 miles southwest of Glen Rose.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61928	98.6	97.4	0.9	54.6	0.4		19	Limestone, buff; fine to medium grained, thin to medium bedded in upper part; thick bedded, fine to coarse grained detrital, abundant rudists in lower part
61927	98.0	95.8	1.9	53.8	0.9			
	(Not sampled)						31	Limestone, gray, nodular (Comanche Peak Formation)

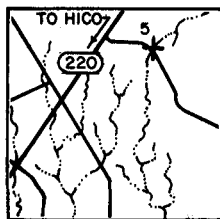
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61928	0.14	43.55	54.60	0.43	0.33	0.25	0.10



ERATH--4. Road cut and west-facing nose of mesa along Somervell-Erath County line, east side of secondary road, 2.2 miles southeast of Chalk Mountain, and 11 miles southwest of Glen Rose.

Edwards Formation

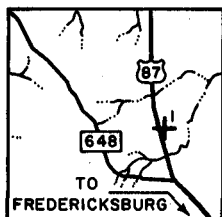
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61930	98.4	98.2	0.2	55.1	0.1		18	Limestone, gray, hard, medium to thick bedded, abundant rudists
61929	98.2	97.4	0.7	54.7	0.3			
	(Not sampled)						100	Limestone, gray, nodular (Comanche Peak Formation)



ERATH--5. West slope of hill, east side of northwest-southeast secondary road, 0.6 mile south of State Highway 220, 15 miles southwest of Glen Rose, and 8 miles northeast of Hico.

Edwards Formation

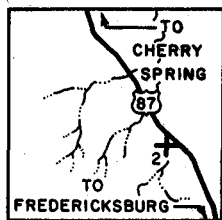
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60454	98.0	97.5	0.4	54.7	0.2		12	Limestone, buff to gray, medium to thick bedded, hard, abundant rudists
	(Not sampled)						38	Limestone, gray, nodular (Comanche Peak Formation)



GILLESPIE--1. Road cut, U. S. Highway 87, 10.0 miles northwest of Fredericksburg, and 6.6 miles southeast of Cherry Spring.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61839	97.3	96.3	0.8	54.1	0.4		22.0	Limestone, light to medium gray, hard, dense, vuggy
61838	94.0	-	-	-	-		18.0	Limestone, light gray to white, soft



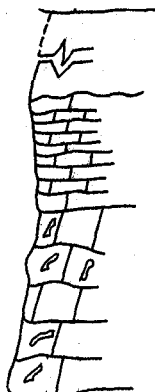
GILLESPIE--2. Road cut, U. S. Highway 87, 13.1 miles northwest of Fredericksburg, and 3.5 miles southeast of Cherry Spring.

Edwards Formation (lower unit)

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61849	100.9	66.4	30.3	37.3	14.5		4.0	Dolomite, brown, thin bedded	
							5.0	Dolomite, buff gray, soft	
							2.0	Dolomite, buff gray, dense, hard	
							2.0	Dolomite, gray brown, nodular	
61848	104.0	64.6	30.4	36.3	14.5			11.0	Dolomite, buff, thin to medium bedded
61847	100.6							16.0	Dolomite, buff to blue gray; filled tubular burrows
61846	100.9							4.0	Dolomite, buff to blue gray. hard, cherty lenses
61845	102.6							4.5	Dolomite, tan, fine grained, crystalline, hard
61844	100.7	55.8	40.6	31.3	19.4			2.0	Dolomite, buff, hard, granular
61843	102.7	54.7	41.4	30.7	19.8			10.5	Dolomite, buff gray, filled tubular burrows; abundant irregular chert nodules
61842	100.9							12.0	Dolomite, buff, fine grained, medium bedded

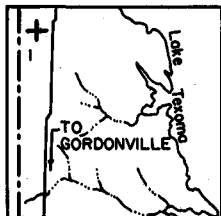
(CONTINUES)

		(Not sampled)			
61841	97.2	53.8	37.9	30.2	18.1
61840	79.2	-	-	-	-



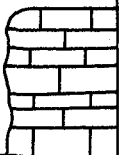
9.0	Covered interval
8.0	Dolomite, light buff gray, aphanitic, thin bedded
13.0	Dolomite, light buff, filled tubular burrows

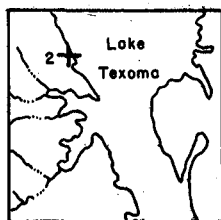
[illegible]



GRAYSON--1. Quarry west of gravel road in northwest corner of county, 10.5 miles northwest of Gordonville.

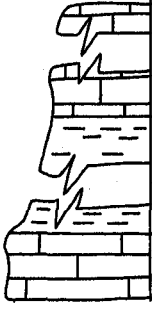
Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60361	97.3	97.3	0.0	54.6	0.0	Quarry floor 	10.5	Limestone, buff gray, fine grained, thin to medium bedded; weathers nodular

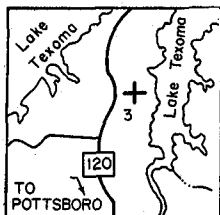


GRAYSON--2. Exposure along west edge of Lake Texoma in northwest part of county, 8 miles north-northwest of Gordonville.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
(Not sampled)								
							25	Limestone, thin bedded, argillaceous (Duck Creek Formation)
							20	Clay, gray brown (Kiamichi Formation)
60353	98.3	97.5	0.5	54.7	0.2		5	Limestone, fine grained, thin to medium bedded; nodular weathering

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60353	0.21	43.11	54.70	0.24	0.88	0.42	0.21

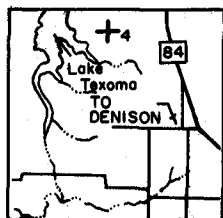


GRAYSON--3. North end of quarry of Wray Wible Road Materials, east side of State Highway 120, 5 miles north of Pottsboro.

Goodland Formation

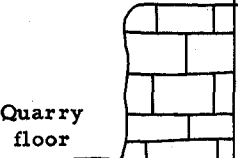
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
						<p>Quarry floor</p>		
		(Not sampled)					-	Clay, gray brown (Kiamichi Formation)
60355	97.3	97.3	0.0	54.6	0.0		13	Limestone, gray, fine grained, thin to thick bedded; weathers nodular
		(Not sampled)					-	Clay, yellow brown (Walnut Formation)

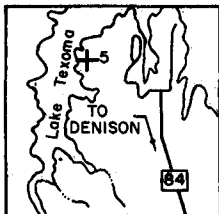
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60355	0.19	42.90	54.60	0.00	0.84	0.64	0.55



GRAYSON--4. Quarry of S. E. Evans Mining Co., west of State Highway 84, 5 miles north-northeast of Pottsboro.

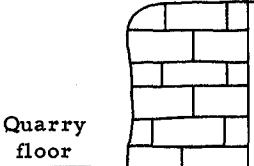
Goodland Formation

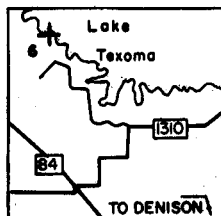
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60362	96.4	-	-	-	-	 Quarry floor	11	Limestone, gray, fine grained, thin to thick bedded; weathers nodular



GRAYSON--5. Quarry on west side of Grandpappy Point, 5.9 miles north of Pottsboro.

Goodland Formation

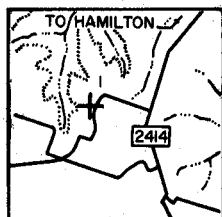
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60363	88.5	-	-	-	-	 Quarry floor	11.5	Limestone, gray, fine grained, medium bedded; weathers nodular



GRAYSON--6. Bluff on south side of Lake Texoma, west end of Eisenhower State Park, 6.6 miles northwest of Denison.

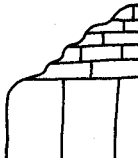
Goodland Formation

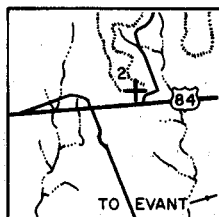
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay, gray brown (Kiamichi Formation)
60364	93.2	-	-	-	-		12.5	Limestone, gray, fine grained, medium bedded; weathers nodular
		(Not sampled)					7.5	Clay, gray brown, and limestone, thin bedded, fossiliferous (Walnut Formation)
		(Not sampled)					16	Sandstone, buff, fine grained, soft (Antlers Formation)



HAMILTON--1. Stream exposure along Pete Hollow, 1.5 miles west of Farm Road 2414, and 13 miles south-southwest of Hamilton.

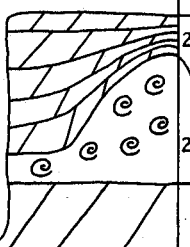
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61198	99.4	-	-	-	-		5	Limestone, light buff, fine grained, medium bedded
61197	99.2	-	-	-	-		6	Limestone, light buff, fine grained, thick bedded

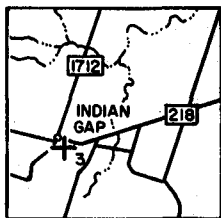


HAMILTON--2. Quarry north of U. S. Highway 84, just behind Fairview Baptist Church, 4.3 miles west of Evant.

Edwards Formation

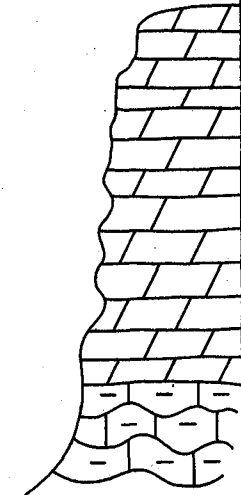
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61200	104.5	58.4	38.7	32.8	18.5		2 to 10	Dolomite, light brown, fine grained, crystalline; abundant rudists
61199	99.3	98.1	1.0	55.0	0.5		2 to 10	Limestone, light to buff gray, vuggy, hard, massive; abundant rudists
		(Not sampled)					5	Dolomite, light brown, fine grained, crystalline; forms quarry floor

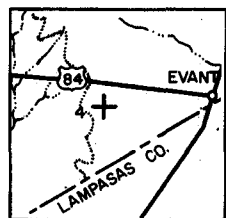
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61200	0.13	46.32	32.80	18.45	0.74	0.50	0.09



HAMILTON--3. Scarp at Indian Gap, south side of Farm Road 218.

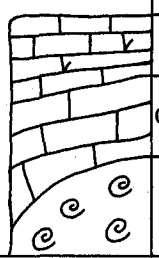
Edwards Formation

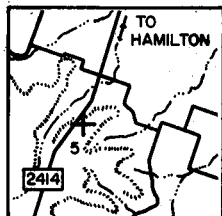
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thick- ness Feet	Rock Description
								
61218	102.8	58.7	36.5	32.9	17.4		27	Dolomite, gray buff, fine grained, crystalline; medium bedded
61217	103.3							
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



HAMILTON--4. Quarry, south of U. S. Highway 84, 1.5 miles west of Evant.

Edwards Formation

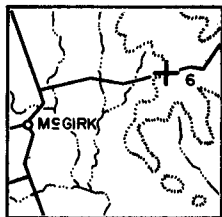
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61207	99.2	99.0	0.2	55.6	0.1		2 to 8	Limestone, light gray, fine to medium grained, medium bedded; locally dolomitic
61206	96.9	-	-	-	-		0 to 15	Limestone, buff, thick bedded, coarse grained, detrital
61205	97.4	97.3	0.1	54.6	0.0		0 to 9	Limestone, massive, vuggy, abundant rudists in matrix of aphanitic to coarsely crystalline calcite



HAMILTON--5. Road cut on Farm Road 2414, 5 miles north of intersection with U. S. Highway 84 and 11 miles south-southwest of Hamilton.

Edwards and Comanche Peak Formations

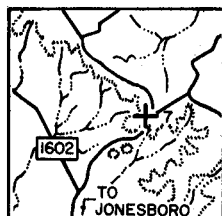
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61211	99.8	96.2	2.0	54.0	1.0		18.0	(Edwards Formation) Limestone, light buff gray, medium to thick bedded; lower part of alternating beds of coarse fossil detritus and granular limestone; upper part of alternating beds with abundant rudists and granular limestone
61210	97.4							
61209	99.2	97.2	1.7	54.6	0.8		12.0	(Comanche Peak Formation) Limestone, buff, fine grained, partly crystalline; abundant fossils
	(Not sampled)						6.5	Limestone, buff, dolomitic, soft, granular
61208	96.8	-	-	-	-		9.2	Limestone, blue gray, fine grained, argillaceous, soft; few dolomitized filled burrows
	(Not sampled)						5.5	Limestone, buff, soft, nodular



HAMILTON--6. In ravine on north side of gravel road from West Point to McGirk, 2 miles east of McGirk.

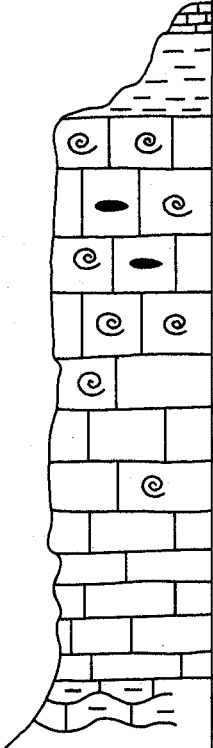
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61213	98.1	-	-	-	-		18	Limestone, buff, fine to coarse grained, medium to thick bedded; abundant fossil detritus
61212	99.1	-	-	-	-			
	(Not sampled)						-	Covered slope

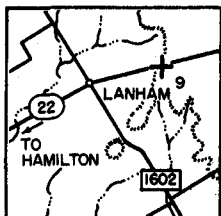


HAMILTON--7. Exposure in ravine on west side of Y-junction of gravel roads 1.4 miles west of Farm Road 1602, 3.5 miles north-northeast of Jonesboro.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Limestone, thin bedded (Duck Creek Formation)
							6	Clay (Kiamichi Formation)
61233	99.2	98.9	0.2	55.5	0.1		40	Limestone, buff gray, fine to coarse grained, thick bedded; vuggy in upper part; abundant rudists; nodular chert in upper part
61232	99.0							
61231	99.7	97.8	1.2	54.9	0.6			
61230	98.5							
		(Not sampled)						-

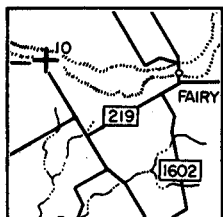
[illegible]



HAMILTON--9. Road cut on State Highway 22, 1 mile east of Lanham at intersection of State Highway 22 and Farm Road 1602.

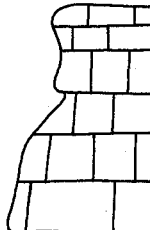
Edwards Formation

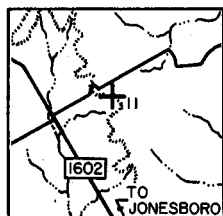
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					12	Clay (Kiamichi Formation)
61221	99.0	98.4	0.5	55.2	0.2		32	Limestone, medium to thick bedded, fine to coarse grained, partly crystalline; abundant rudists
61220	99.7	97.4	1.3	54.6	0.6			
61219	98.1							
		(Not sampled)					37	Limestone, gray, argillaceous, nodular; locally with buff gray, dolomitic limestone (Comanche Peak Formation)



HAMILTON--10. Southwest side of northwest end of Long Point, 2 miles west of Fairy.

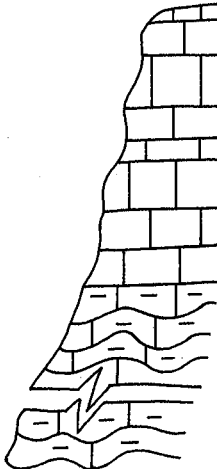
Edwards Formation

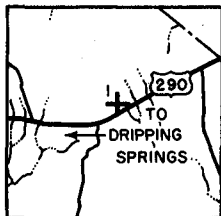
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61223	99.1	97.0	1.1	54.4	0.5		6	Limestone, light buff, fine to medium grained, medium to thick bedded
61222	97.3						10	Limestone, thick bedded; coarse, fossil fragments in crystalline matrix



HAMILTON--11. Bluff on south side of gravel road between Farm Road 1602 and Mertel Cemetery, 8.5 miles north-northwest of Jonesboro.

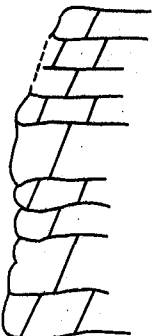
Edwards Formation

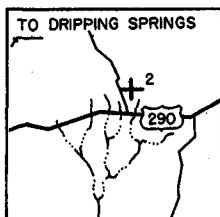
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61226	97.3	-	-	-	-		20	Limestone, buff, fine to coarse grained, partly crystalline; fossil detritus; chert float on slope
61225	99.1	-	-	-	-			
61224	98.5	-	-	-	-			
	(Not sampled)						22	Limestone, gray, nodular; poorly exposed (Comanche Peak Formation)



HAYS--1. Road cut, U. S. Highway 290, 6.5 miles east of Dripping Springs.

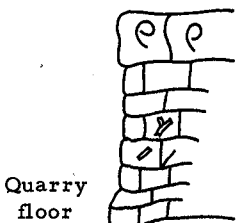
Walnut Formation

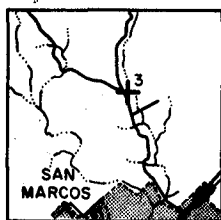
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61409	94.0	-	-	-	-		23.0	Dolomite, buff gray to brown gray, upper part poorly exposed
61408	97.3	55.1	35.5	30.9	17.0			



HAYS--2. Small quarry, east side of gravel road, north of U. S. Highway 290, 5.5 miles east of Dripping Springs.

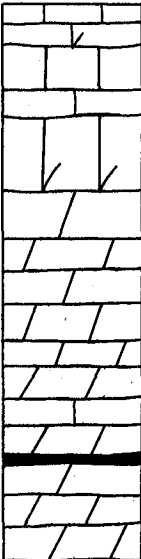
Walnut Formation

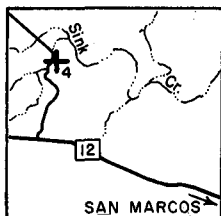
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61411	96.2	-	-	-	-		3.5	Limestone, buff gray, massive, weathers nodular, fossiliferous
61410	95.4	-	-	-	-		11.5	Limestone, yellow buff, fine grained, soft, dolomitic locally; few filled tubular burrows



HAYS--3. Core taken by Texas Highway Department, in field northeast side of gravel road from San Marcos northwest to Katt ranch, 2.6 miles north of San Marcos.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description					
61416	90.6	-	-	-	-		8.0	Limestone, light gray, chalky, granular, soft, locally dolomitic					
61415	99.4	83.8	13.8	47.0	6.6		5.5	Limestone, dolomitized, olive gray, hard, aphanitic to fine crystalline					
61414	100.9						3.5	Limestone, dolomitized, olive gray, vuggy					
61413	103.0	72.0	25.2	40.4	12.1		11.5	Dolomite, gray, vuggy, few lenses of hard, aphanitic limestone					
61412	101.4						2.0	Limestone, gray, hard, aphanitic					
							2.0						
							0.5						
						7.5	Dolomite, olive gray, fine grained, 0.5-foot chert beds						

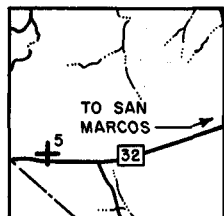


HAYS--4. Exposure along Sink Creek, east side of gravel road, 1.2 miles north of Farm Road 12 and 4.7 miles northwest of San Marcos.

Edwards Formation


Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61421	99.3	98.0	1.3	55.0	0.6		16.0	Limestone, buff, fine grained, partly crystalline, vuggy; forms receding ledges
61420	99.9						12.0	Limestone, gray to buff, hard, fine grained, partly crystalline, vuggy
61419	101.9	80.7	17.6	45.3	8.4		9.5	Limestone, medium gray, hard, fine grained, partly crystalline, thick bedded
							6.0	Limestone, dolomitized, buff, granular, vuggy, massive to thin bedded
61418	101.4						4.5	Limestone, olive gray, hard, fine grained
61417	99.6						5.5	Limestone, buff gray, hard, aphanitic to fine grained

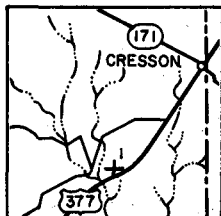
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61419	0.13	45.15	45.30	8.36	0.31	0.29	0.04



HAYS--5. Road cut, Farm Road 32, 0.4 mile east of Hays-Comal County line.

Edwards Formation

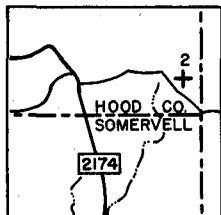
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61422	98.8	98.8	0.0	55.4	0.0		7.0	Limestone, buff to gray, fine grained, partly crystalline



HOOD--1. Road cut on U. S. Highway 377, 2 miles southwest of Cresson.

Edwards and Comanche Peak Formations

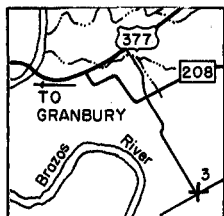
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
							4	Limestone, gray to buff, medium bedded (Edwards Formation)
60414	91.1	-	-	-	-		16	Limestone, gray, nodular (Comanche Peak Formation)



HOOD--2. South slope of hill, north side of gravel road, 0.5 mile northwest of southeast corner of Hood County, 10 miles northeast of Glen Rose.

Edwards and Comanche Peak Formations

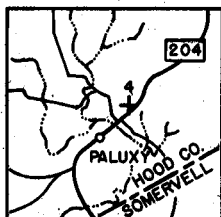
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60431	98.4	98.3	0.1	55.2	0.0		10	(Edwards Limestone) Limestone, hard, massive, fine to medium grained, thin to medium bedded
60430	95.9	-	-	-	-		55	(Comanche Peak Formation) Limestone, gray to buff, nodular



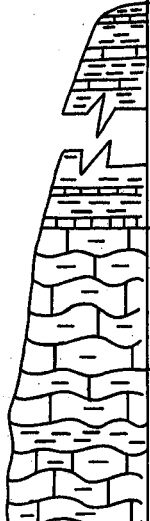
HOOD--3. Exposure at intersection of gravel roads, 4 miles east-southeast of Granbury, and 3 miles southwest of Acton.

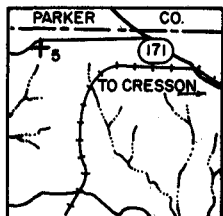
Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60415	98.6	98.2	0.4	55.1	0.2		19	Limestone, gray, fine grained, partly crystalline, thin bedded; interbedded with clay, limy, buff (only limestone beds sampled)
		(Not sampled)					-	Covered slope



Glen Rose Formation

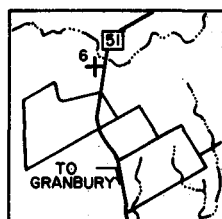
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
	(Not sampled)						50	Silt, and clay, limy, dark gray; with thin beds of gray limestone
60434	93.4	-	-	-	-		10	Limestone, gray, nodular
60433	92.7	-	-	-	-		20	Limestone, gray, nodular, hard; with few thin beds of clay



HOOD--5. Small scarp in field south of gravel road between Farm Road 51 and State Highway 171, 4.2 miles west-northwest of Cresson. HOOD--5A is a lower scarp 100 yards north of HOOD--5.

Edwards and Comanche Peak Formations

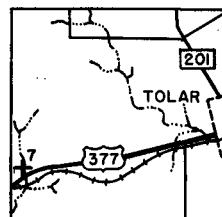
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
60417	94.8	-	-	-	-		12	HOOD--5 Limestone, buff to gray, normal bedding at top (Edwards Formation), nodular below (Comanche Peak Formation)
		(Not sampled)					70	Covered slope
60416	92.5	-	-	-	-		7	HOOD--5A Limestone, buff to gray, nodular



HOOD--6. Road cut on Farm Road 51, just south of Long Creek crossing, 5.5 miles north of Granbury.

Glen Rose Formation

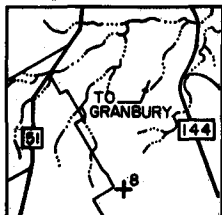
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61419	98.5	98.5	0.0	55.3	0.0		4.5	Limestone, gray, hard, fine to medium grained, partly crystalline; cross bedded
		(Not sampled)					10.0	Clay, dark gray, limy; with thin beds of limestone
61418	93.5	-	-	-	-		6.0	Limestone, gray, thin to medium bedded, partly nodular
		(Not sampled)					40	Clay, dark gray, limy; with thin beds of limestone



HOOD--7. West bank of small creek, north side of U. S. Highway 377, 3.0 miles west-southwest of Tolar.

Glen Rose Formation

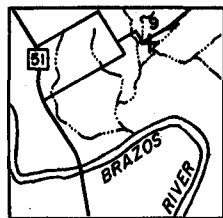
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60435	93.1	-	-	-	-		17	Limestone, hard, nodular; alternating with limestone, soft, argillaceous
		(Not sampled)						Covered slope



HOOD--8. Northwest slope of Comanche Peak, 4.3 miles south of Granbury.

Edwards and Comanche Peak Formations

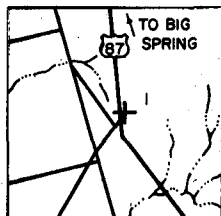
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60425	99.6	99.6	0.0	55.9	0.0		15	(Edwards Formation) Limestone, buff gray, medium to coarse grained, partly crystalline
60424	93.9	-	-	-	-		49	(Comanche Peak Formation) Limestone, gray, nodular; alternating with clay, limy, dark gray, with thin limestone beds
60423	96.6	-	-	-	-		12	Limestone, gray, nodular
	(Not sampled)						-	Clay, dark gray, limy; with thin limestone beds (Walnut Formation)



HOOD--9. Exposure on gravel road between Farm Roads 51 and 167,
4.3 miles north of Granbury.

Glen Rose Formation

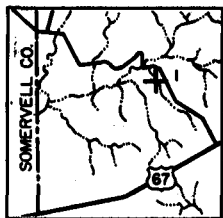
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60422	95.6	-	-	-	-		5.5	Limestone, gray, hard, fine grained, partly crystalline; partly argillaceous
		(Not sampled)					15.0	Covered slope



HOWARD--1. Quarry on east side of U. S. Highway 87, 5 miles south of Big Spring.

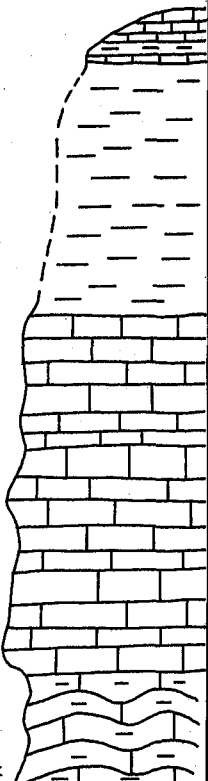
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
63805	91.9	-	-	-	-		8	Limestone, buff gray, coarse grained, thick bedded; fossil detritus
63804	93.5	-	-	-	-		4.5	Limestone, buff gray to pink gray, fine grained, medium bedded; filled burrows
63803	96.0	-	-	-	-		19	Limestone, light gray to buff gray, fine grained, thick bedded; locally argillaceous; upper part with filled burrows
63802	93.4	-	-	-	-			

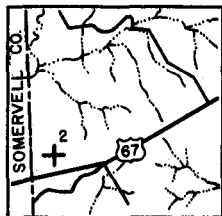


JOHNSON--1. Exposure on west bank of creek and hill slope, west of road, 1.0 mile north of U. S. Highway 67, 5.5 miles west of Bono.

Duck Creek, Edwards, and Comanche Peak Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60438	97.7	97.6	0.1	54.8	0.0		-	(Duck Creek Formation) Limestone, thin bedded, fossiliferous, interbedded with clay
	(Not sampled)						18.0	(Kiamichi Formation) Clay (mostly covered)
61932	97.8	95.7	1.6	53.7	0.8		25.5	(Edwards Formation) Limestone, buff, hard, thin to medium bedded
61931	97.4							
60436	93.3	-	-	-	-		8.0	(Comanche Peak Formation) Limestone, gray, nodular
						Creek		

Creek

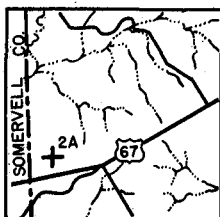


JOHNSON--2. County road metal pit, west edge of county, north side of U. S. Highway 67, 14 miles west of Cleburne.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)				<p>Quarry floor</p>	-	Clay (Kiamichi Formation)
60442	97.2	97.1	0.0	54.5	0.0			
60441	99.1	97.7	1.2	54.8	0.6			
60440	99.4	99.3	0.1	55.7	0.0			
60439	98.6	98.3	0.3	55.2	0.1		25	Limestone, light gray to buff, fine to coarse grained, massive with abundant rudists in lower part; fine to coarse grained, beds dipping in upper part

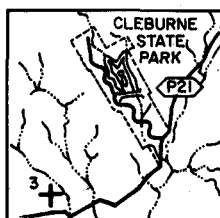
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60442	0.15	43.38	54.50	0.00	0.77	0.47	0.36



JOHNSON--2A. County road metal pit, west edge of county on north side of U. S. Highway 67, about 100 yards southeast of JOHNSON--2.

Edwards Formation

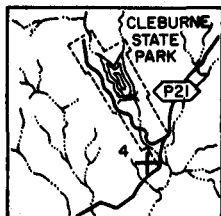
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60446	99.0	97.5	1.3	54.7	0.6		17	Limestone, buff, aphanitic, medium to thick bedded; chert nodules in definite band, 1 to 4 inches in diameter
60445	98.6	96.6	1.7	54.2	0.8		5	Limestone, light gray to buff, massive, abundant rudists
	(Not sampled)						-	Limestone, gray, argillaceous



JOHNSON--3. Quarry of Texas Lime Company, north of secondary road, southwest of Cleburne State Park, 10 miles east of Glen Rose.

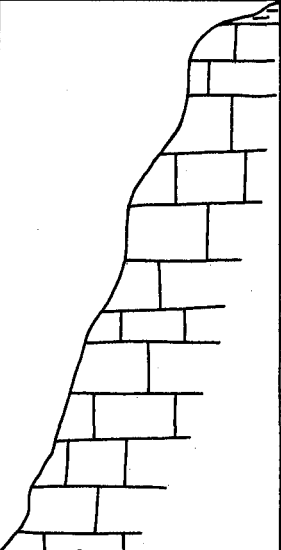
Edwards Formation

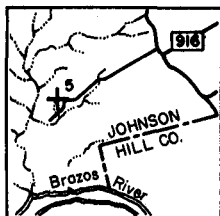
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60448	99.6	98.6	0.8	55.3	0.4		30	Limestone, light gray to buff, granular, medium to thick bedded; locally massive with abundant rudists; slightly dolomitic in part
60447	99.0	96.2	2.4	54.0	1.1			



JOHNSON--4. Quarry of Texas Lime Company, north side of secondary road, 1.7 miles northeast of JOHNSON--3 and 12.0 miles east of Glen Rose.

Edwards Formation

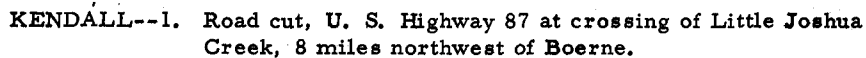
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
	(Not sampled)						-	Clay (Kiamichi Formation)
61936	99.6	98.0	0.9	55.0	0.4		38	Limestone, buff, medium to thick bedded; some fossil detritus in upper part
61935	98.7							
61934	96.9	-	-	-	-			
61933	96.0	-	-	-	-			



JOHNSON--5. Road cut, north side of secondary road, 12 miles south-southwest of Cleburne, and 1 mile northeast of Ham Creek.

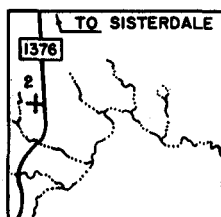
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61940	97.5	97.5	0.2	54.7	0.1		21	Limestone, buff gray, aphanitic to fine grained, thick bedded, partly massive; common fossil detritus and rudists
61939	97.9							
61938	94.5	-	-	-	-		16	Limestone, buff to gray, medium to thick bedded; upper part nodular, lower part hard, detrital
61937	95.0	-	-	-	-			
		(Not sampled)					-	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)



Glen Rose Formation

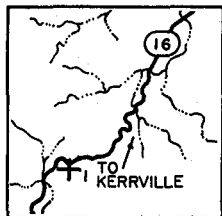
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61424	0.24	43.14	54.30	0.10	1.20	0.50	0.50
61423							



KENDALL--2. Road cut, Farm Road 1892, 4 miles south of Sisterdale, and 9 miles north of Boerne.

Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					2.0	Limestone, thin bedded, few rudists
							8.0	Limestone, light gray, pulverulent
							1.0	Limestone, gray, nodular
							7.5	Limestone, argillaceous, gray, laminated; locally pulverulent
61431	91.2	-	-	-	-		13.0	Limestone, buff gray, fine to coarse grained; filled burrows; locally abundant rudist fragments
61430	96.0	-	-	-	-		1.0	Clay, limy, shaly, buff gray, forms recess
61429	96.1	-	-	-	-		4.0	Limestone, buff gray, medium to coarse grained, partly crystalline; thick bedded; abundant rudist fragments
61428	90.7	-	-	-	-		8.5	Limestone, buff gray, fine grained to locally aphanitic, massive; rudists common
61427	95.8	-	-	-	-		15.0	Limestone, buff gray, fine grained to locally aphanitic, hard to locally soft and argillaceous, medium bedded; abundant rudists
61426	95.4	-	-	-	-		9.0	Limestone, light buff gray, massive; fine grained, weathers nodular; few rudists
							0.5	Limestone, thin bedded, medium grained
61425	86.3	-	-	-	-		3.5	Limestone, buff gray, medium to coarse grained; abundant rudists
							2.0	Limestone, buff gray, fine to medium grained; abundant filled burrows
							2.0	Limestone, fine grained, hard
							4.0	Limestone, nodular, argillaceous
							2.0	Limestone, buff gray, fine to medium grained, hard
		(Not sampled)						Covered slope



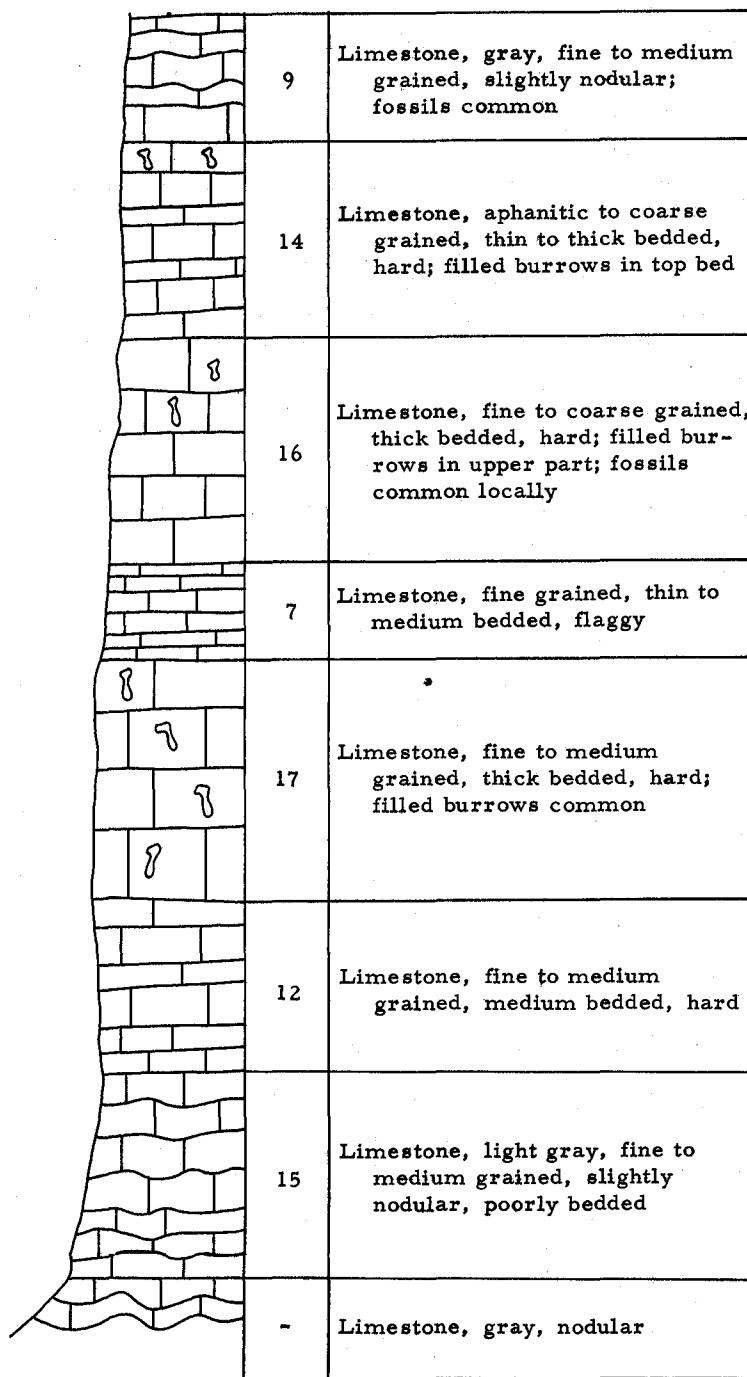
KERR--1. Road cut on east side of State Highway 16, 11.5 miles southwest of Kerrville.

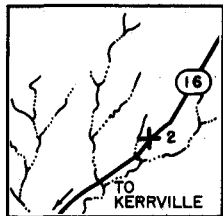
Devils River Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61537	98.5	97.5	0.7	54.7	0.3		65	Limestone, aphanitic to coarse grained, thin to thick bedded; fossils common, especially in lower part; nodular chert in upper part
61536	99.4	98.1	0.7	55.0	0.3			
61535	98.4							
61534	99.4	96.4	2.4	54.1	1.1			
61533	98.8							
61532	102.0	89.0	8.8	50.0	4.2		2	Limestone, dolomitized, fine to medium grained, hard; filled burrows
							5	Dolomite, fine to coarse grained, massive, soft; fossils common
61531	99.0						10	Limestone, dolomitic, fine to coarse grained, thick bedded; fossils common

(CONTINUES)

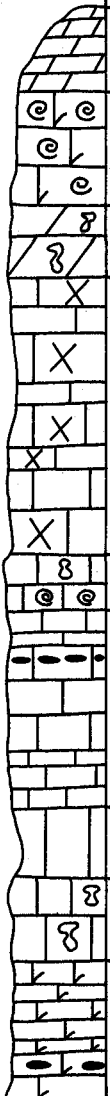
61530	98.4	97.4	1.2	54.6	0.6
61529	99.3				
61528	98.8	98.0	0.7	55.0	0.3
61527	98.9				
61526	98.7	97.4	1.1	54.6	0.5
61525	98.6	98.1	0.1	55.0	0.1
61524	98.2				
61523	94.4	-	-	-	-
(Not sampled)					

[illegible]



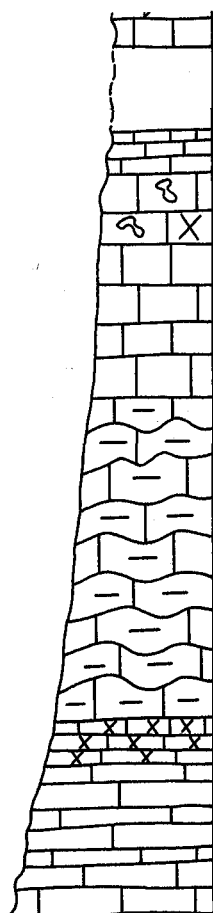
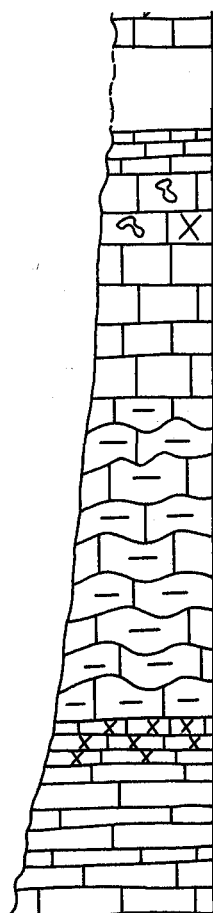
KERR--2. Series of three road cuts on State Highway 16, 4 miles northeast of Kerrville.

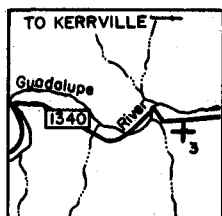
Edwards and Glen Rose Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								(Edwards Formation)
61499	106.2	69.2	29.2	38.8	14.0		6	Dolomite, fine grained, thin to thick bedded
61498	102.1						8	Limestone, dolomitic, fine to coarse grained, thick bedded; rudists common
		5	Dolomite, aphanitic to medium grained, thick bedded; filled burrows					
		(Not sampled)	20	Limestone, soft, deeply weathered, poorly bedded; much secondary calcite				
61497	99.1			4	Limestone, fine to coarse grained, thick bedded; filled burrows at top, rudists below			
61496	99.5			14	Limestone, fine to coarse grained, thin to thick bedded; coarse shell detritus			
				(Not sampled)	5		Limestone, soft, massive, deeply weathered	
61494	99.6	6	Limestone, fine grained, thick bedded; filled burrows					
61495	99.3	90.3	7.7	50.7	3.7		10	Limestone, dolomitic, aphanitic to medium grained, thin to medium bedded; nodular chert in lower part

(CONTINUES)

		(Not sampled)			
61493	94.6	-	-	-	-
61492	87.5	-	-	-	-
61491	89.2	-	-	-	-
61490	90.2	-	-	-	-

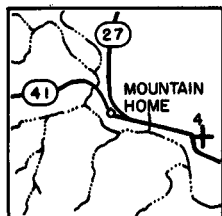
	2	Limestone, soft, deeply weathered
	6	Covered interval
	3	Limestone, fine grained, thin bedded, platy
	5	Limestone, fine grained, thick bedded; filled burrows; secondary calcite
	11	Limestone, fine to medium grained, thick bedded
	26	Limestone, light gray, nodular, argillaceous; lower 3 feet altered
	11	(Glen Rose Formation) Limestone, light gray, fine grained, thin to medium bedded; fossils common



KERR--3. Slope south of Ranch Road 1340, south side of north fork of Guadalupe River, 16.5 miles west of Kerrville.

Glen Rose Formation

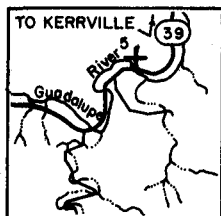
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61507	99.2	93.8	5.1	52.6	2.4		9	Limestone, aphanitic to fine grained, thin to thick bedded, commonly flaggy; dolomitic in lower part	
61506	100.5						12	Limestone, dolomitic, fine grained, medium to thick bedded	
61505	98.7	98.1	0.5	55.0	0.2		10	Limestone, light gray, fine grained, thin to medium bedded, hard; fossils common	
61504	98.7						13	Limestone, dolomitic, fine grained, medium to thick bedded, hard	
61503	99.5						6	Limestone, medium to coarse grained, thin to thick bedded; nodular chert common	
61502	98.8	98.6	0.2	55.3	0.1		17	Limestone, fine grained, thick bedded, hard	
61501	98.8								
61500	96.3	-	-	-	-		13	Limestone, fine to medium grained, thick bedded, hard; abundant <i>Orbitolina</i> foraminifers	



KERR--4. Road cut on north side of State Highway 27, 1 mile east of Mountain Home and 15 miles west-northwest of Kerrville.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description					
61512	99.3	92.3	6.1	51.8	2.9		12.0	Limestone, dolomitic, aphanitic to medium grained, medium to thick bedded; nodular chert					
61511	101.6						3.0	Limestone, massive secondary calcite					
							1.5	Dolomite, fine grained, massive, soft					
							2.0	Limestone, massive secondary calcite					
							3.5	Limestone, dolomitic, fine to coarse grained; abundant rudists					
61510	100.9						5.0	Limestone, dolomitic, aphanitic to medium grained, medium to thick bedded					
							8.0	Limestone, dolomitized, fine to medium grained, nodular, soft; filled burrows in upper part					
61509	100.3	86.9	11.8	48.8	5.6		17.0	Limestone, dolomitized, fine to medium grained, thin to thick bedded					
61508	98.0						6.0	Limestone, dolomitic, fine to medium grained, nodular					



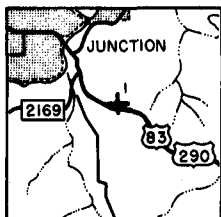
KERR--5. Slope on north side of State Highway 39, north side of south fork of Guadalupe River, 14 miles west of Kerrville.

Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61522	99.8	97.9	1.3	54.9	0.6		3	Limestone, fine to coarse grained, thick bedded; fossils
61521	99.0						13	Limestone, fine to coarse grained, thin to thick bedded; fossils common; abundant secondary calcite
61520	100.0	97.4	1.9	54.6	0.9		33	Limestone, light gray to gray brown, fine to coarse grained, thin to thick bedded; fossils
61519	99.2							
61518	99.1	98.0	0.7	55.0	0.3		39	Limestone, light gray, fine to medium grained, thick bedded; nodular chert in upper part; lower half dolomitic
61517	98.5							
61516	99.5	95.7	2.5	53.7	1.2			
61515	98.2							

(CONTINUES)

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61516	0.17	43.46	53.70	1.20	0.72	0.22	0.10
61515							



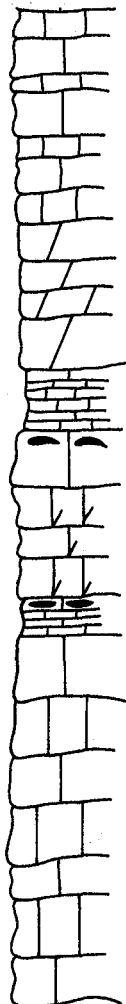
KIMBLE--1. Road cut, U. S. Highway 83, 1.5 miles southeast of Junction.

Edwards Formation (lower unit)

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61863	97.7	97.5	0.1	54.7	0.0		20.0	Limestone, gray, fine grained, mostly crystalline, few dolomite beds; few chert nodules
61862	94.1	-	-	-	-		8.0	Limestone, light gray, fine to medium grained, few fossil fragments
61861	102.8	79.3	17.8	44.5	8.5		7.0	Limestone, dolomitized, gray, fine grained, few chert nodules
61860	98.4						20.0	Limestone, dolomitized, gray, aphanitic to medium grained; few chert nodules
61859	101.8	74.4	21.3	41.8	10.2		1.0	Limestone, gray, argillaceous
61858	98.4						10.5	Limestone, dolomitized, drab brown to olive gray, fine grained, thick bedded, nodular chert
							3.5	Limestone, buff gray, aphanitic to medium gray, hard
							3.0	Limestone, white, soft, abundant fossils
61857	96.9	-	-	-	-		6.0	Limestone, light gray, coarse grained, locally dolomitic, fossiliferous
							5.0	Limestone, white, soft

(CONTINUES)

61856	98.8	70.0	25.7	39.3	12.3
61855	102.4				
61854	97.8	75.0	20.7	42.1	9.9
61853	101.9				
61852	96.8	-	-	-	-
61851	96.1	-	-	-	-
61850	91.3	-	-	-	-

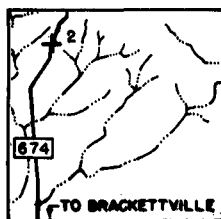


15.0	Limestone, buff gray, fine grained, medium to thick bedded
10.0	Dolomite, buff gray to olive gray, fine grained
4.5	Limestone, buff, aphanitic to locally fine grained, thin bedded
4.0	Limestone, buff gray, fine grained, weathers nodular, chert nodules at top
8.5	Limestone, dolomitized, gray, fine grained, thick bedded
2.5	Limestone, buff gray, thin bedded, aphanitic; few chert nodules
27.0	Limestone, buff gray, fine grained, thick bedded; with fine to coarse fossil detritus

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61855	0.10	45.15	39.30	12.27	1.36	0.84	0.12
61856							
61863	0.09	43.80	54.70	0.05	0.56	0.32	0.05

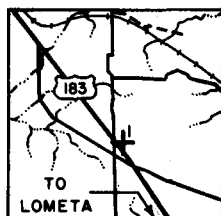
[illegible]

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61744	0.00	43.11	55.00	0.48	0.43	0.33	0.03
61743							



Salmon Peak Formation

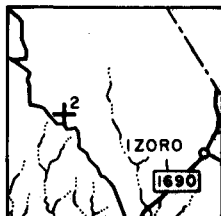
[illegible]



LAMPASAS--1. Butte on east side of U. S. Highway 183, 4 miles northwest of Lometa.

Edwards Formation

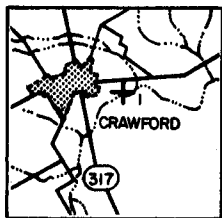
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					14	Covered interval, limestone and chert float
61114	103.2	57.2	38.6	32.1	18.5		12	Dolomite, buff, fine grained, medium to thick bedded; locally argillaceous
61113	103.7	58.8	37.0	33.0	17.7		5	Limestone, dolomitized, buff, fine grained, partly crystalline, thick bedded; chert nodules in upper part
61112	100.9	82.2	15.7	46.1	7.5		4.5	Dolomite, fine grained, thick bedded
61111	102.0	69.9	26.3	39.2	12.6		-	Poorly exposed (Comanche Peak Formation)
		(Not sampled)						



LAMPASAS--2. Butte on east side of gravel road, 2 miles west-northwest of Izoro.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61116	99.4	98.0	1.2	55.0	0.6		8	Limestone, buff, fine to coarse grained, partly crystalline, thick bedded; few rudists
		(Not sampled)					16	Covered interval
61115	99.5	94.1	4.4	53.0	2.1		2	Limestone, dolomitic, fine to medium grained, medium bedded
		(Not sampled)					-	Covered slope

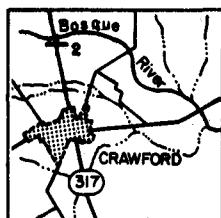


McLENNAN--1. Tonk quarry, 0.6 mile east of Crawford.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60500	97.3	97.2	0.0	54.5	0.0		3.5	Limestone, fine grained, partly crystalline, thin to medium bedded; weathered
60499	97.3	96.7	0.5	54.2	0.2		8.0	Limestone, gray buff, fine to coarse grained, partly crystalline, medium bedded
60498	97.8	95.7	1.6	53.7	0.8		8.5	Limestone, gray buff, fine to medium grained, partly crystalline, massive
60497	97.8	96.1	1.4	53.9	0.7		6.0	Limestone, gray, fine to medium grained, medium to thick bedded

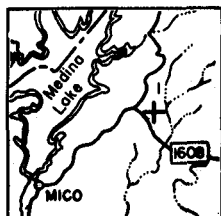
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60500	0.15	43.44	54.50	0.00	0.38	0.27	0.11
60498	0.27	44.31	53.70	0.77	0.29	0.35	0.23



McLENNAN--2. Road cut on State Highway 317, 1.3 miles north of Crawford.

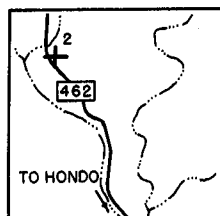
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					9.5	Limestone, thin bedded, and clay (Duck Creek and Kiamichi Formations)
60504	99.0	98.2	0.7	55.1	0.3		26	Limestone, buff gray, fine to medium grained, partly crystalline, thick bedded
60503	97.8	96.7	0.9	54.3	0.4			
60502	97.7	96.6	0.9	54.2	0.4			
60501	97.7	96.5	1.0	54.2	0.5		2	Limestone, nodular
		(Not sampled)					9	Limestone, fine to medium grained, thick bedded
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



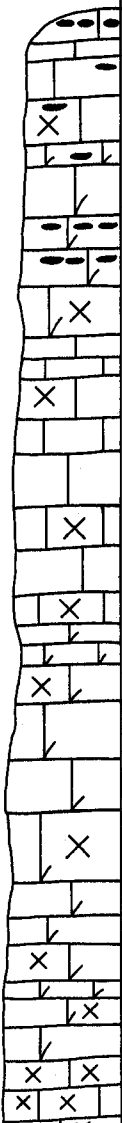
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61571	100.5	97.7	2.4	54.8	1.1		18	Limestone, aphanitic to coarse grained, partly crystalline, thin to thick bedded, hard; partly dolomitic; fossils abundant locally; filled burrows in middle; nodular chert in lower part
61570	100.8	98.1	1.9	55.0	0.9		8	Limestone, aphanitic to medium grained, thick bedded; abundant filled burrows; nodular chert in upper part
61569	100.0							
61568	100.0	98.5	1.3	55.3	0.6		14	Limestone, aphanitic to coarse grained, partly crystalline, thin to thick bedded, hard; fossils abundant locally
61567	100.2							
61566	100.1	97.1	2.5	54.6	1.2		50	Limestone, dolomitic, aphanitic to medium grained, thick bedded; abundant filled burrows
61565	100.1							
61564	99.8							
61563	100.0	97.3	2.2	54.7	1.1			



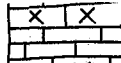
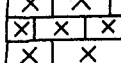
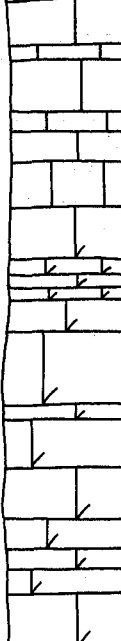
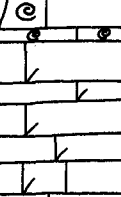

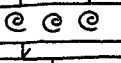
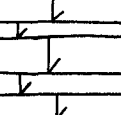
MEDINA--2. Road cut and slope on east side of Ranch Road 462, 14 miles north-northwest of Hondo.

Devils River Formation

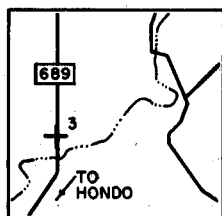
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61604	100.0	97.8	1.9	54.9	0.9		75	Limestone, partly dolomitic, aphanitic to medium grained, thin to thick bedded, hard; fossils common locally; nodular chert in upper part; coarse crystalline secondary calcite common
61603	100.2	96.9	2.7	54.4	1.3			
61602	100.1							
61601	100.2	97.5	1.3	54.7	0.6			
61600	99.4							
61599	100.6	97.0	2.9	54.4	1.4			
61598	100.5							
61597	100.4	97.9	2.0	54.9	1.0			
61596	100.2							

(CONTINUES)

61595	100.0	98.7	0.8	55.4	0.4
61594	99.5				
61593	98.0	94.8	2.7	53.2	1.3
61592	98.4				
61591	98.8	95.9	2.4	53.8	1.2
61590	99.0				
61589	100.0	97.4	2.2	54.6	1.1
61588	100.0				

	2	Limestone, aphanitic to fine grained, thin bedded
	6	Limestone; coarse crystalline secondary calcite
	46	Limestone, aphanitic to fine grained, thin to thick bedded, hard; lower part dolomitic
	14	Limestone, dolomitic, fine grained, thin to thick bedded, hard; large fossils in upper part; fossil detritus common
	12	Limestone, dolomitic, aphanitic to fine grained, thin to thick bedded, hard
	2	Limestone, fine to coarse grained, massive; abundant rudists
	11	Limestone, dolomitic, aphanitic to fine grained, thin to thick bedded, hard

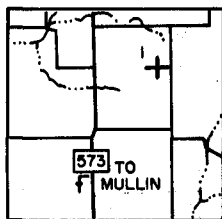
(CONTINUES)



MEDINA--3. Road cut on Ranch Road 689, north side of Verde Creek, 11 miles north of Hondo.

Devils River Formation

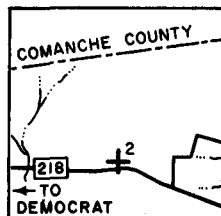
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description						
61585	96.4	-	-	-	-		17	Limestone, aphanitic to fine grained, thin to thick bedded, hard; abundant nodular chert						
							3	Limestone; coarse crystalline secondary calcite; nodular chert						
61584	98.8	98.1	0.6	55.0	0.3		11	Limestone, aphanitic to fine grained, thin to thick bedded, hard; abundant nodular chert						
61583	95.1	-	-	-	-		6	Limestone; coarse crystalline secondary calcite; abundant nodular chert						
61582	81.0	-	-	-	-		24	Limestone, aphanitic to fine grained, thin to thick bedded, hard; abundant nodular chert						
61581	100.5	97.8	2.0	54.9	1.0									
61580	100.2													
61579	99.2	97.6	1.4	54.8	0.7		6	Limestone, highly altered; coarse crystalline calcite; abundant nodular chert						
							3	Limestone, aphanitic, thin bedded; nodular chert						
							2	Limestone; coarse crystalline secondary calcite						
61578	99.4						8	Limestone, aphanitic to fine grained, thin to medium bedded, hard; filled burrows						
							3	Limestone, nodular, altered; much secondary calcite						



MILLS--1. Southeast face of small mesa, west side of road and north of house, 5.0 miles north-northeast of Mullin.

Edwards Formation

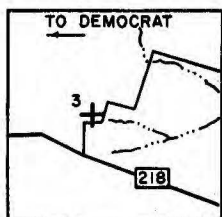
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61047	103.1	78.2	20.9	43.9	10.0		9	Limestone, dolomitized, gray to buff, fine to medium grained, thin to medium bedded; few chert nodules
61046	101.8	83.2	15.2	46.7	7.3		4	Limestone, dolomitized, buff, fine to coarse grained, massive; abundant rudists
							5	Limestone, dolomitized, gray to buff, fine to medium grained, thin to medium bedded
61045	99.6	98.8	0.7	55.4	0.3		3	Limestone, dolomitized, gray to buff, fine to medium grained, thin to medium bedded
							7	Limestone, dolomitic, buff, massive; abundant rudists
								Limestone, gray to buff, fine to medium grained, thin to medium bedded
61044	99.5	99.4	0.1	55.8	0.0		10	Limestone, gray to buff, fine to coarse grained, thick bedded; abundant fossil detritus
		(Not sampled)					-	Limestone, gray, argillaceous, nodular; poorly exposed (Comanche Peak Formation)



MILLS--2. Road cut, north side of Farm Road 218, 3 miles east of Democrat.

Edwards Formation

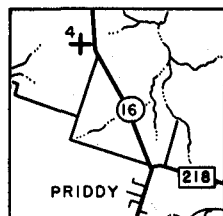
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61050	101.0	56.3	37.2	31.6	17.8		12	Dolomite, light brown, fine to medium grained, mostly crystalline, medium to thick bedded
61049	98.4	97.8	0.5	54.9	0.2		3	Limestone, white, pulverulent
61048	98.2	97.3	0.8	54.6	0.4		5	Limestone, thick bedded, partly nodular; abundant filled burrows



MILLS--3. South-facing slope, north side of secondary road 4 miles east of Democrat.

Edwards Formation

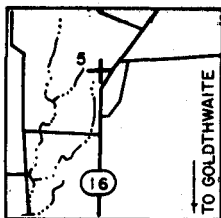
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61053	99.1	99.1	0.0	55.6	0.0		16	Limestone, gray to buff, thin to medium bedded, fine to coarse grained, fossil detritus in upper part; locally dolomitic
61052	99.5	99.5	0.0	55.8	0.0		12	Limestone, fine to coarse grained, thin to medium bedded; abundant rudists in upper and middle bed
61051	102.0	57.6	37.3	32.3	17.8		8	Dolomite, light brown, fine to coarse grained, partly crystalline, thick bedded, fossil detritus
		(Not sampled)					-	Limestone, gray, nodular, argillaceous, mostly covered (Comanche Peak Formation)



MILLS--4. East slope of mesa, west side of State Highway 16, 2.5 miles north-northwest of Priddy.

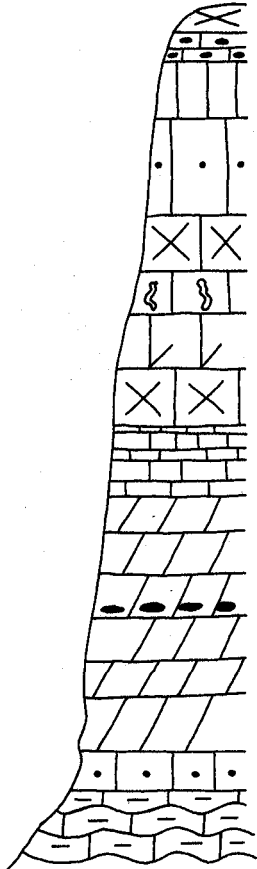
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								Dolomite, light brown, fine to coarse grained, mostly crystalline, thin to medium bedded; abundant rudists in upper part
61058	105.3	55.6	41.4	31.2	19.8		8	
61057	104.0	56.5	39.6	31.7	18.9		12	Dolomite, light brown, mostly coarse grained, mostly crystalline, thick bedded, abundant rudists; chert nodules at base and top
61056	103.1	57.8	37.8	32.5	18.1			
61055	98.1	97.2	0.8	54.6	0.4		12	Limestone, gray to buff, fine to medium grained, thin to thick bedded
61943	99.0	87.1	8.6	48.9	4.1		7	Limestone, dolomitic, mostly coarse grained, thick bedded; abundant shell detritus
61942	97.7						10	Limestone, dolomitic, fine to medium grained, thick bedded, numerous filled burrows
		(Not sampled)					-	Limestone, gray, nodular; poorly exposed (Comanche Peak Formation)

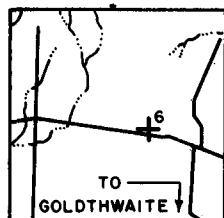


MILLS--5. Long road cut, both sides of State Highway 16, 9 miles north of Goldthwaite.

Edwards Formation

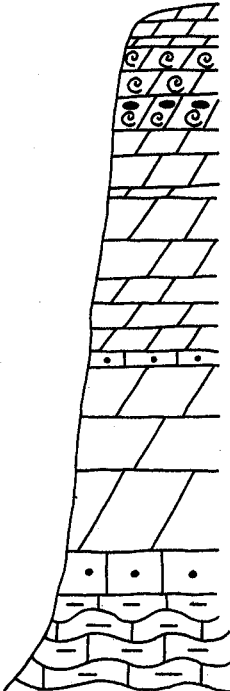
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)						
		(Not sampled)					2	(Deeply weathered)
61066	96.6	-	-	-	-		2	Limestone, fine to medium grained, medium bedded, hard; abundant nodules
							4	Limestone, mostly coarse crystalline; massive
61065	97.4	96.6	0.6	54.2	0.3		7	Limestone, white, pulverulent; massive
61064	97.7	96.2	1.3	54.0	0.6		4	Limestone, coarse crystalline; massive
61063	99.6	97.2	2.0	54.6	1.0		3	Limestone, hard; filled dolomitized burrows; nodular chert
							4	Limestone, dolomitic, massive; chert nodules at base
61062	99.6	98.9	0.6	55.5	0.3		4	Limestone, coarse crystalline; massive
61061	96.5	-	-	-	-		5	Limestone, fine to coarse grained, partly crystalline; thin to thick bedded; hard; dolomitic
61060	105.7	54.9	41.8	30.8	20.0		18	Dolomite, light brown, aphanitic to fine grained, mostly crystalline, thick bedded; nodular chert in upper part
61059	103.0	59.7	36.6	33.5	17.5			
		(Not sampled)					3	Limestone, white, pulverulent
		(Not sampled)					-	Limestone, gray, argillaceous, nodular (Comanche Peak Formation)

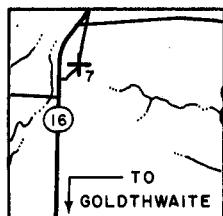
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61065	0.29	43.21	54.20	0.29	0.94	0.38	0.15
61060	0.10	46.89	30.80	20.00	0.36	0.45	0.22



MILLS--6. Road cut, north side of east-west gravel road, 11 miles north of Goldthwaite.

Edwards Formation

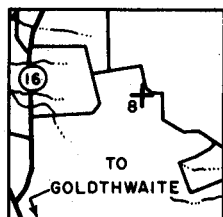
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61071	103.1	63.0	33.4	35.4	16.0		3	Dolomite, fine grained, thin to medium bedded, hard
61070	104.2	60.2	37.3	33.8	17.8		6	Dolomite, fine to coarse grained, thick bedded; abundant rudists; nodular chert in lower part
61946	105.5	55.5	41.5	31.1	19.8		16	Dolomite, thin to thick bedded, fine to medium grained
61945	104.8						1	Limestone, pulverulent
61944	101.7	56.8	37.6	31.9	18.0		13	Dolomite, fine grained, thick bedded
61067	104.5	57.4	39.9	32.2	19.1		3	Limestone, pulverulent
		(Not sampled)					-	Limestone, gray, nodular (Comanche Peak Formation)



MILLS--7. Road cut on east side of State Highway 16 and quarry above road cut, 9 miles north-northeast of Goldthwaite.

Edwards Formation

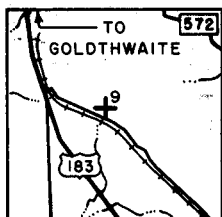
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61074	103.2	67.3	30.4	37.8	14.5		8	Dolomite, fine grained, thin bedded; rudists abundant locally
61073	103.9	57.3	39.5	32.2	18.9		10	Dolomite, fine grained, thick bedded, band of chert nodules near middle
61072	101.5	79.0	19.3	44.3	9.2		10	Limestone, dolomitized, fine to coarse grained, thick bedded; abundant rudists; few chert nodules
							2	Covered interval
		(Not sampled)					60	Limestone, gray, nodular, partly argillaceous (Comanche Peak Formation)



MILLS--8. Slope on west side of gravel road at right-angle bend, 4 miles north-northeast of Goldthwaite.

Edwards Formation

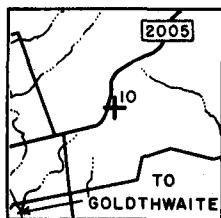
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61076	103.0	72.6	25.5	40.8	12.2		7	Dolomite, mostly fine grained, thin to thick bedded; rudists common near base
61075	96.9	-	-	-	-		11	Limestone, fine to medium grained, thick bedded, with dolomitized, filled burrows



MILLS--9. Scarp along gravel road and G. C. & S. F. RR., 3.5 miles south-southeast of Goldthwaite, and 1.0 mile east of U. S. Highway 183.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61103	103.2	76.3	22.1	42.8	10.6		4 to 10	Limestone, dolomitized, light buff, massive, vuggy; abundant rudists
61102	102.8	77.1	21.3	43.3	10.2		5	Limestone, dolomitized, buff, fine grained; few chert nodules
61101	99.5	97.8	1.4	54.9	0.7		5 to 11	Limestone, slightly dolomitized, light buff, massive, vuggy; abundant rudists

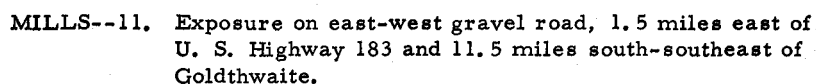


MILLS--10. Road cut on Farm Road 2005, 10 miles east-northeast of Goldthwaite.

Edwards and Comanche Peak Formations

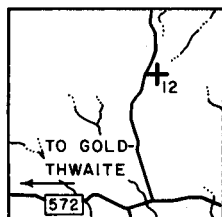
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					6	Silicified limestone (rubble slope; poorly exposed)
							2	Dolomite, fine grained, thin bedded
61085	102.8	53.6	41.4	30.1	19.8		10	Dolomite, light brown, fine grained, thick bedded; abundant nodules of dark chert
61084	104.4	55.1	41.6	30.9	19.9		4	Dolomite, thin to medium bedded
61083	105.3	56.3	41.0	31.6	19.6		9	Dolomite, thick bedded; chert nodules
61082	104.5	56.2	40.4	31.5	19.3		1	Dolomite, fine to coarse grained; abundant rudists
							7	Dolomite, thick bedded; chert nodules
61081	99.9	87.1	10.5	48.9	5.0		6	Limestone, dolomitic, gray, nodular above and below; white, pulverulent in middle

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61085	0.42	46.57	30.10	19.80	1.16	0.56	0.20
61083	0.18	46.92	31.60	19.60	0.53	0.42	0.21
61081	0.11	44.52	48.90	4.97	0.70	0.49	0.23



Edwards Formation

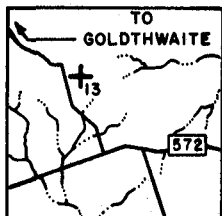
Lab. Number	Neutral- ization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thick- ness Feet	Rock Description
61100	103.3	55.7	40.4	31.3	19.3		10	Dolomite, buff, fine to coarse grained, medium bedded, vuggy; few rudists
61099	97.9	96.4	1.3	54.1	0.6		4	Limestone, gray buff, fine grained, soft, argillaceous
61098	97.4	97.4	0.0	54.7	0.0		14.5	Limestone, light buff, mostly coarse grained, vuggy; abundant rudists
61097	98.8	98.3	0.4	55.2	0.2		3.5	Limestone, light buff, mostly coarse grained; rudists
61096	99.1	99.1	0.0	55.6	0.0		7.5	Limestone, light buff gray, fine to medium grained, thin to thick bedded, hard
		(Not sampled)					-	Limestone, nodular; poorly exposed (Comanche Peak Formation)



MILLS--12. Exposure along gravel road from Center City to Mt. Pleasant Church, 9 miles east-southeast of Goldthwaite.

Edwards Formation

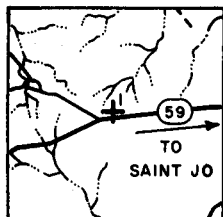
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61107	101.9	78.0	20.0	43.8	9.6		21	Limestone, dolomitized in upper part, dolomite in lower part; buff to olive buff, fine to coarse grained, partly crystalline, medium to thick bedded; vuggy; few rudists
61106	104.6	59.3	38.0	33.3	18.2			
61105	100.4	92.7	6.2	52.0	3.0			
		(Not sampled)						
							8	Limestone, dolomitic, buff gray, fine to coarse grained, partly crystalline, thick bedded; vuggy; rudists common
							-	Limestone, gray, nodular, poorly exposed (Comanche Peak Formation)



MILLS--13. Scarp, east of gravel road, 1.3 miles north of Farm Road 572 and 12 miles east-southeast of Goldthwaite.

Edwards Formation

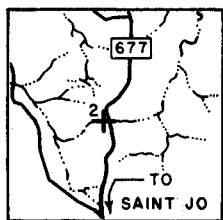
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61110	103.5	68.8	28.9	38.6	13.8		28	Dolomite, olive buff, fine to coarse grained, partly crystalline, thick bedded; vuggy in upper part; rudists in upper part
61109	102.4	74.7	22.9	41.9	11.0			
61108	104.2	57.9	38.5	32.5	18.4			
		(Not sampled)					-	Limestone, gray, nodular, argillaceous (Comanche Peak Formation)



MONTAGUE--1. Quarry on north side of State Highway 59, 3.4 miles west of Saint Jo.

Goodland Formation

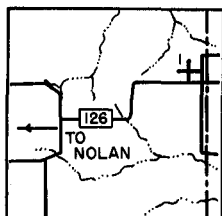
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60354	95.9	-	-	-	-		14	Limestone, gray, fine grained, hard, thin to thick bedded; nodular weathering
		(Not sampled)					4	Limestone, gray blue, argillaceous, nodular (Walnut Formation)



MONTAGUE--2. Road cut on Farm Road 677, 2.6 miles north of Saint Jo.

Goodland Formation

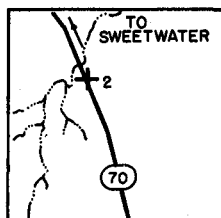
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60352	93.6	-	-	-	-		11	Limestone, gray, fine grained, hard, thin to thick bedded; weathers nodular
		(Not sampled)					110	Clay and limestone (Walnut Formation) Sandstone and clay (Antlers Formation)



NOLAN--1. Missile launching site No. 7 (Nolan site), north side of Farm Road 126, 0.3 mile west of Nolan-Taylor County line. (Only upper part of pit sampled.)

Edwards Formation

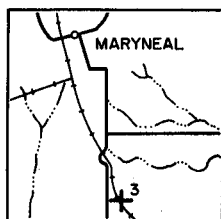
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60544	99.0	98.6	0.3	55.3	0.1		12	Limestone, fine to coarse grained, thin to thick bedded; rudists common; upper part weathered
60543	98.4	97.3	0.9	54.6	0.4			
60542	98.5	80.6	14.6	45.2	7.0		15	Limestone, dolomitized, fine to medium grained, partly crystalline, thick bedded
60541	99.0	85.8	11.0	48.2	5.3			



NOLAN--2. Road cut on State Highway 70, 8 miles south-southeast of Sweetwater.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60527	99.4	99.1	0.3	55.6	0.1		15.0	Limestone, buff, fine to coarse grained, medium to thick bedded; fossil detritus common
60526	99.4	99.5	0.0	55.8	0.0			
60525	98.4	98.6	0.0	55.3	0.0		15.0	Limestone, gray to buff, aphanitic to coarse grained, partly crystalline, thin to thick bedded; secondary calcite-lined vugs
60524	97.7	97.6	0.1	54.8	0.0			
60523	96.2	-	-	-	-		10.5	Limestone, buff gray, mostly coarse grained, thick bedded to massive; rudists abundant
(Not sampled)							3.5	Limestone, buff, argillaceous; and clay, blue gray
60522	98.6	98.4	0.2	55.2	0.1		12.0	Limestone, buff to gray, mostly coarse grained, medium to thick bedded; rudists abundant; coarse fossil detritus
60521	99.4	98.1	1.1	55.0	0.5			
60520	98.6	98.5	0.1	55.3	0.0		8.5	Limestone, buff to gray, aphanitic to medium grained, partly crystalline, medium to thick bedded; abundant filled burrows
60519	94.3	-	-	-	-		21.5	Limestone, buff to blue gray, argillaceous, nodular to well bedded; some fine-grained fossil detritus; filled burrows common in upper part
(Not sampled)								
60518	95.9	-	-	-	-		11.0	Limestone, argillaceous, fine grained, partly crystalline, thick bedded; few thin beds of clay
(Not sampled)							-	Clay, yellow buff (Comanche Peak and Walnut Formations)

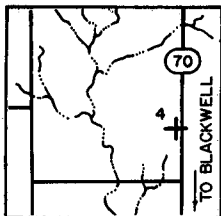


NOLAN--3. Railroad cut, Panhandle and Santa Fe Railroad, 2.5 miles south-southeast of Maryneal.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60535	98.9	98.9	0.0	55.5	0.0		6	Limestone, buff gray, fine to medium grained, partly crystalline, thin to medium bedded
60534	98.4	97.7	0.6	54.8	0.3		18	Limestone, buff gray, fine to coarse grained, partly crystalline, thick bedded; abundant rudists
60533	100.0	61.8	31.9	35.2	15.3		13	Dolomite, gray brown, fine grained, crystalline, massive, lower part thick bedded
60532	100.0	82.2	14.7	46.1	7.0		2	Limestone, dolomitized, fine grained, thin bedded; chert bed in middle
60531	100.1	77.6	19.1	43.6	9.1		6	Limestone, dolomitized, fine grained, thick bedded

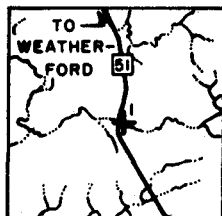
Tracks



NOLAN--4. Road cuts on State Highway 70, 8.5 miles north of Blackwell.

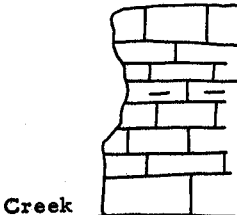
Edwards Formation

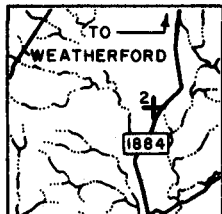
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60539	101.7	57.4	37.1	32.2	17.7		25	Limestone, dolomitized, and dolomite; weathered. (This exposure is 3/4 mile north of lower exposures.)
	(Not sampled)						15	Covered interval
60538	97.2	97.2	0.0	54.5	0.0		5.5	Limestone, buff to gray, fine to medium grained, thin to medium bedded
60537	96.0	-	-	-	-		10	Limestone, gray to buff, fine to coarse grained, mostly thick bedded; few rudists
60536	97.4	95.6	1.5	53.6	0.7		7.5	Limestone, buff to gray, fine to medium grained, medium to thick bedded; abundant filled burrows



PARKER--1. Exposure in Cidwell Branch at bridge on State Highway 51, 11.5 miles south of Weatherford.

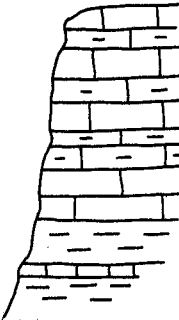
Glen Rose Formation

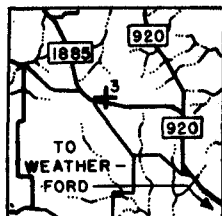
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60401	95.0	-	-	-	-		15	Limestone, fine grained, thin to medium bedded; locally argillaceous



PARKER--2. Road cut on Farm Road 1884, 7 miles south-southeast of Weatherford.


Glen Rose Formation

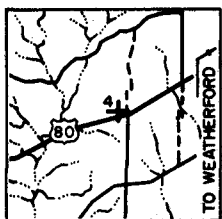
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60402	94.5	-	-	-	-		15	Limestone, buff to gray, fine grained, thin to medium bedded; locally argillaceous; fossils common
		(Not sampled)					-	Sandstone, clay, and limestone (Travis Peak Formation)



PARKER--3. Exposure along Farm Road 1885, 6.6 miles northwest of Weatherford.

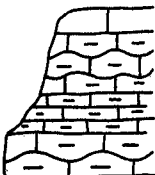
Goodland Formation

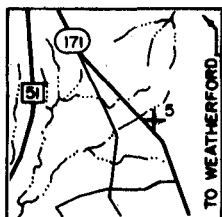
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60389	92.2	-	-	-	-		5	Limestone, gray, fine grained; nodular weathering



PARKER--4. Road cut on U. S. Highway 80, 5 miles west-southwest of Weatherford.

Glen Rose Formation

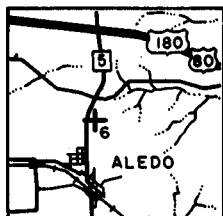
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60408	93.8	-	-	-	-		12	Limestone, argillaceous, fine grained, thin to medium bedded; weathers nodular



PARKER--5. Road cut on State Highway 171, 4.5 miles south-southeast of Weatherford.

Goodland Formation

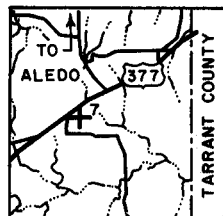
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description



PARKER--6. Road cut on Farm Road 5, 0.9 mile north of Aledo.

Goodland Formation

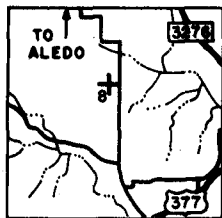
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61969	91.8	-	-	-	-		12	Limestone, argillaceous, nodular
		(Not sampled)					4	Clay, limy
61968	93.1	-	-	-	-		12	Limestone, argillaceous, nodular



PARKER--7. Quarry on south side of U. S. Highway 377, 7.2 miles south of Aledo.

Goodland Formation

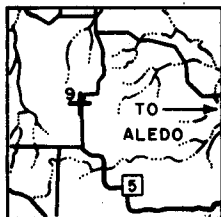
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60385	94.3	-	-	-	-	Quarry floor 	12	Limestone, gray, fine grained, nodular



PARKER--8. Road cut and ditch exposure along blacktop road, 5 miles south-southeast of Aledo.

Goodland Formation

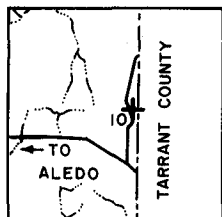
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61951	94.5	-	-	-	-		20	Limestone, gray, nodular	
61950	94.7	-	-	-	-				
		(Not sampled)					4	Clay, limy	
		(Not sampled)					15	Limestone, gray, nodular	
		(Not sampled)					5	Clay, limy; and limestone, thin, lenticular	
60386	94.7	-	-	-	-		13	Limestone, gray, nodular	



PARKER--9. Ditch exposure and low road cut along gravel road, 4.6 miles west of Aledo.

Goodland Formation

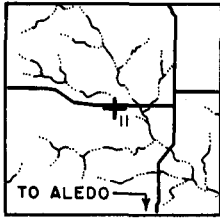
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
61955	86.8	-	-	-	-		50	Limestone, gray, nodular; interbedded with clay, limy, dark gray (poorly exposed)
61954	94.1	-	-	-	-			
61953	93.8	-	-	-	-			
61952	91.9	-	-	-	-			
61951	94.5	-	-	-	-			



PARKER--10. Ditch exposure and low road cut on east side of gravel road, 7 miles north-northeast of Aledo.

Goodland Formation

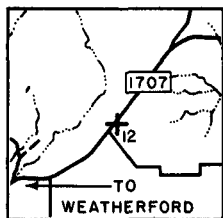
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
	(Not sampled)						-	Clay (Kiamichi Formation)	
60399	93.6	-	-	-	-		11	Limestone, gray, nodular; forms ledge	
							30	Covered interval	
		(Not sampled)					4	Limestone, gray, nodular	
							10	Covered interval	
61967	94.8	-	-	-	-		20	Limestone, gray, nodular; lower part argillaceous and with interbedded clay	
61966	91.8	-	-	-	-				
61965	92.3	-	-	-	-	7	Limestone, gray, nodular; forms ledge		



PARKER--11. Ditch and low road cut on south side of gravel road, 6 miles north of Aledo.

Goodland Formation

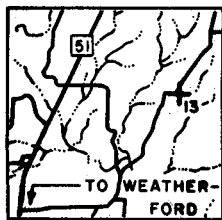
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60396	93.4	-	-	-	-		15	Limestone, gray, nodular, with thin interbeds of clay
		(Not sampled)					2	Clay, dark gray, limy
60395	93.2	-	-	-	-		10	Limestone, gray, nodular
		(Not sampled)					5	Clay, gray, limy; few nodules of limestone
60394	94.6	-	-	-	-		6	Limestone, gray, nodular



PARKER--12. Road cut on Farm Road 1707, 8.2 miles east-northeast of Weatherford.

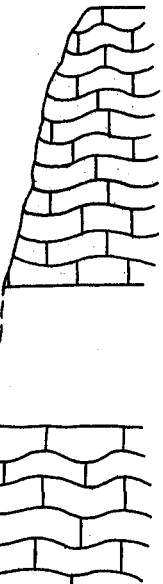
Goodland Formation

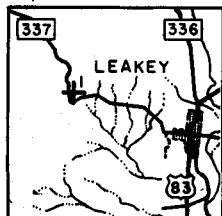
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
61960	92.1	-	-	-	-		18	Limestone, gray, nodular; forms ledge
61959	93.7	-	-	-	-			
		(Not sampled)					14	Clay, dark gray, limy; few nodules and beds of limestone
60392	94.0	-	-	-	-		11	Limestone, gray, nodular



PARKER--13. Exposure in ditch and low road cut on east side of gravel road, 9.3 miles north-northeast of Weatherford.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61958	93.4	-	-	-	-		20	Limestone, gray, nodular
61957	93.2	-	-	-	-		10	Covered interval
60390	95.1	-	-	-	-		12	Limestone, gray, nodular



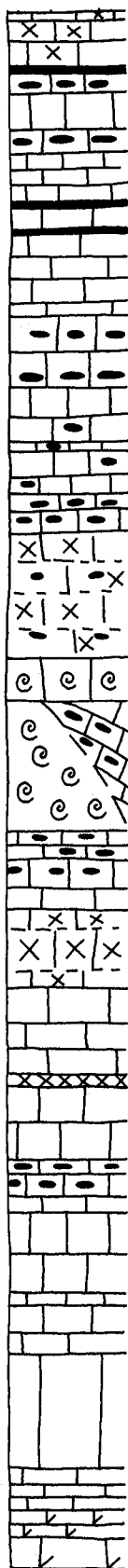
REAL--1. Series of road cuts along Ranch Road 337, 3.5 to 4 miles west-northwest of Leakey.

Devils River Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61649	100.1	98.3	1.5	55.2	0.7		13	Limestone, buff gray, aphanitic to fine grained, thin to medium bedded, hard; few chert nodules
							3	Limestone, thick bedded; shell detritus in aphanitic matrix
		(Not sampled)					10	Covered interval
61648	100.1	98.3	1.5	55.2	0.7		18	Limestone, buff gray, aphanitic to medium grained, hard, thin to thick bedded; few fossils; chert nodules common in upper part
61647	100.3							
61646	100.3	98.9	1.2	55.5	0.6		7	Limestone, gray buff, fine to coarse grained, thin to thick bedded; few rudists; chert nodules common
							7	Limestone, massive; abundant rudists
61645	92.2	-	-	-	-		9	Limestone, thin to thick bedded, aphanitic; filled burrows; nodular chert common
61644	100.5	98.9	1.3	55.5	0.6		10	Limestone, medium to thick bedded, mostly coarse grained; rudists abundant; nodular chert

(CONTINUES)

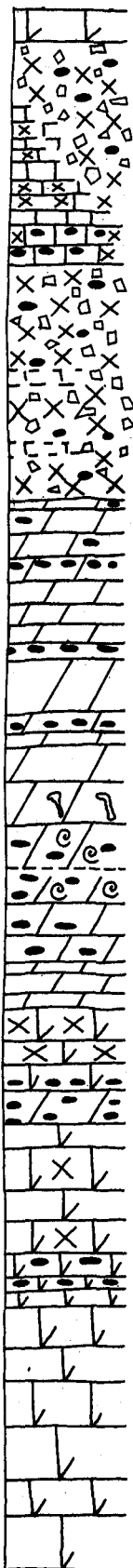
61643	100.5	98.9	1.3	55.5	0.6
61642	100.5				
61641	81.2	-	-	-	-
61640	100.2	99.0	1.0	55.6	0.5
61639	100.1	98.7	1.3	55.4	0.6
61638	100.6				
61637	98.9	99.0	0.4	55.6	0.2
61636	100.1				
61635	99.0	97.2	1.5	54.6	0.7
61634	98.5	96.0	2.1	53.9	1.0
61633	99.0				



4	Limestone, thin to medium bedded, fine grained with much coarse secondary calcite
36	Limestone, mostly fine grained, thin to thick bedded, hard; nodular and bedded chert abundant; fossils common
10	Limestone, poorly bedded, altered; nodular chert
3	Limestone, massive; abundant rudists
10	Limestone, massive, abundant rudists, grades laterally to aphanitic, hard, bedded limestone with chert nodules; secondary calcite common
6	Limestone, hard, medium to thick bedded; abundant chert
6	Limestone, poorly bedded; altered, abundant secondary calcite
13	Limestone, fine to medium grained, thin to mostly thick bedded, hard; fossil detritus; thin layers of secondary calcite near middle
15	Limestone, fine to coarse grained, thin to thick bedded; abundant chert nodules in upper part; secondary calcite
12	Limestone, gray, aphanitic to coarse grained, hard, mostly massive; some fossil detritus
7	Limestone, dolomitic, fine to coarse grained, hard, thin to thick bedded

(CONTINUES)

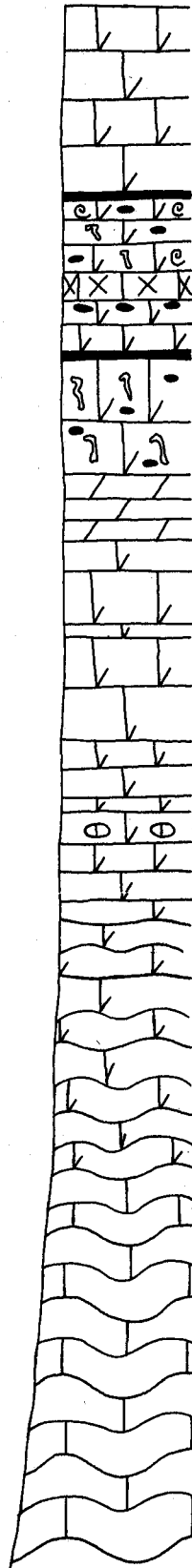
61632	98.8	79.6	16.7	44.7	8.0
61631	102.0				
61630	104.2	81.1	18.0	45.5	8.6
61629	101.4				
61628	104.5	60.2	34.0	33.7	16.3
61627	96.5				
61626	105.5	64.8	34.2	36.4	16.4
61625	107.0				
61624	101.2	76.8	21.5	43.1	10.3
61623	104.1				
61622	99.7	92.3	6.0	51.8	2.9
61621	99.3				



36	Limestone, dolomitic, hard, mostly massive; highly altered; abundant secondary calcite; brecciated, upper part grades laterally and vertically to bedded limestone; chert nodules common; secondary silica
25	Dolomite, fine grained, thin to thick bedded, hard; chert nodules common; filled burrows at base
6	Dolomite, poorly bedded, hard; rudists common
8	Dolomite, fine to medium grained, thin to thick bedded, hard; nodular chert in upper part
6.5	Limestone, dolomitized, hard, aphanitic to medium grained; altered; abundant secondary calcite; nodular chert at base
2.5	Dolomite, light brown, soft; abundant nodular chert
10	Limestone, dolomitic, fine to coarse grained, hard, medium to thick bedded; abundant fossil detritus; common secondary calcite
4	Limestone, dolomitized, fine to medium grained, hard, medium bedded; nodular chert in upper part
20	Limestone, dolomitic, largely covered, apparently similar to limestone below

(CONTINUES)

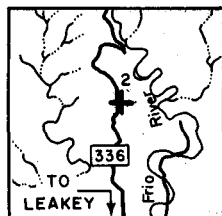
61620	99.3	95.6	2.9	53.6	1.4
61619	101.5				
61618	99.5	92.8	5.9	52.1	2.8
61617	101.5				
61616	100.1	96.6	2.9	54.2	1.4
61615	100.1				
61614	99.4	95.0	2.7	53.3	1.3
61613	97.4				
61612	95.6	-	-	-	-
61611	96.3	-	-	-	-
61610	96.3	-	-	-	-



14	Limestone, dolomitic, fine to medium grained, thick bedded
6	Limestone, dolomitic, aphanitic to medium grained, thick bedded; nodular and bedded chert; filled burrows; abundant fossils
2	Limestone, highly altered, abundant secondary calcite
4	Limestone, dolomitic, fine to medium grained, thick bedded; nodular chert at top
9	Limestone, dolomitic, aphanitic to medium grained, thick bedded, hard; filled burrows; nodular and bedded chert
5	Dolomite, light brown, fine grained, soft
27	Limestone, dolomitic, aphanitic to medium grained, thin to thick bedded; filled burrows; abundant fossils; nodules of banded calcite in lower part
50	Limestone, light gray, thin to thick bedded, mostly nodular; abundant fossils; dolomitic in upper part

(CONTINUES)

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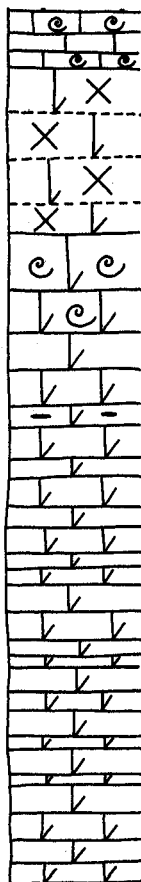
REAL--2. Road cuts, east side of Ranch Road 336, 12 miles north of Leahey.

Edwards Formation (upper unit).

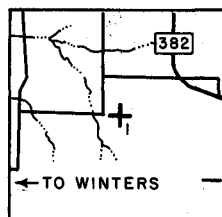
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61662	100.4	97.6	2.3	54.8	1.1			

(CONTINUES)

61655	100.2	95.4	3.0	53.6	1.4
61654	99.4				
61653	97.7	95.1	2.1	53.4	1.0
	97.6				
61651	96.2	-	-	-	-
61650	98.8	96.0	2.4	53.9	1.1



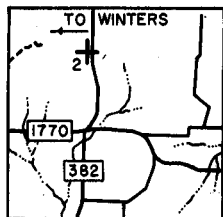
4	Limestone, fine to coarse grained, medium to thick bedded; abundant fossils
12	Limestone, dolomitic, fine to medium grained, poorly bedded, nodular weathering
7	Limestone, fine to coarse grained to thick bedded, hard; abundant fossils
14	Limestone, dolomitic, gray, aphanitic to fine grained, medium to thick bedded in upper part; locally nodular and argillaceous
4	Limestone, dolomitic, gray, aphanitic to fine grained, thin to medium bedded
9	Limestone, dolomitic, gray, aphanitic to fine grained, thin bedded, locally nodular
12	Limestone, dolomitic, gray, aphanitic to fine grained, thin to medium bedded, hard



RUNNELS--1. North slope of Table Mountain, 12 miles northeast of Winters.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60493	98.5	97.1	1.2	54.4	0.6		12	Limestone, medium to coarse grained, partly crystalline, thin to medium bedded; abundant rudists
60492	98.9	96.5	2.0	54.1	1.0		7	Limestone, mostly coarse grained, massive; abundant rudists; secondary calcite
	(Not sampled)						8	Covered interval
60491	96.7	-	-	-	-		10	Limestone, buff gray, argillaceous, fine to medium grained; upper part nodular; lower part massive
	(Not sampled)					20	Limestone, gray to buff gray, nodular, argillaceous (Comanche Peak Formation)	

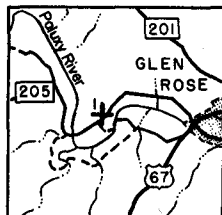


RUNNELS--2. Road cut on Farm Road 382, 1.2 miles north of intersection with Farm Road 1770.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60496	102.0	55.9	39.1	31.4	18.7		4	Dolomite, argillaceous, thin bedded; few thin clay beds
60495	98.7	96.6	1.6	54.2	0.8		5	Limestone, buff gray, fine to coarse grained, medium bedded; rudists common
60494	97.6	95.3	1.9	53.5	0.9		8	Limestone, blue gray, fine to coarse grained, medium to thick bedded; rudists common

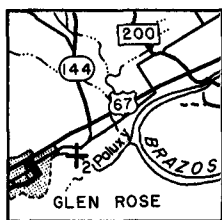
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO_2	% Al_2O_3	% Fe_2O_3
60496	0.32	45.75	31.40	18.70	1.71	1.07	0.24
60495	0.12	43.45	54.20	0.77	0.52	0.30	0.18



SOMERVELL--1. Road cut, north side of Farm Road 205, 2.5 miles west of Glen Rose.

Glen Rose Formation

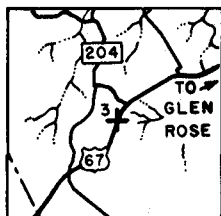
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60467	94.5	-	-	-	-		18	Limestone, light gray, nodular, thin to medium bedded
							6	Limestone, gray, thick bedded, hard; abundant fossils



SOMERVELL--2. North bank of Paluxy River, beside State Highway 144, 1.5 miles from center of Glen Rose.

Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60458	95.5	-	-	-	-		16	Limestone, mostly coarse grained, thick bedded, abundant fossils in middle and upper parts; lower part nodular

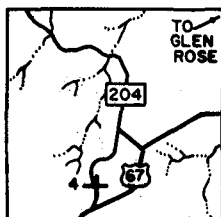


SOMERVELL--3. Road cut on U. S. Highway 67, just west of junction with Farm Road 204, 8.5 miles southwest of Glen Rose.

Edwards and Comanche Peak Formations

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61973	97.8	97.1	0.5	54.5	0.2		0 to 8	Limestone, buff, fine to medium grained, thin to thick bedded
61972	97.7	96.8	0.8	54.3	0.4		2 to 23	Limestone, buff, fine to coarse grained, medium to thick bedded; abundant rudists; beds dip slightly
61971	97.1	96.4	0.6	54.1	0.3		12 to 32	Limestone, light gray, mostly coarse grained, massive; abundant rudists
61970	98.1	97.2	0.5	54.6	0.2		25	Limestone, gray, nodular (Comanche Peak Formation)
60459	95.3	-	-	-	-			

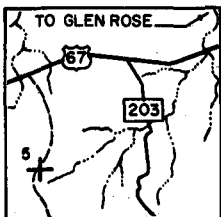
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61973	0.06	44.46	54.50	0.24	0.29	0.22	0.15
61970	0.12	43.34	54.60	0.24	0.50	0.35	0.10



SOMERVELL--4. Road cut, crest of old U. S. Highway 67, 200 yards northeast of junction with new U. S. Highway 67, 9.5 miles southwest of Glen Rose.

Edwards Formation

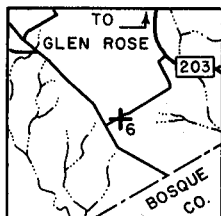
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61977	99.8	98.5	0.2	55.3	0.1		0 to 12	Limestone, light gray to buff, fine to coarse grained, thin to medium bedded; abundant fossil detritus
61976	97.6						8 to 20	Limestone, light gray, mostly coarse grained, massive, abundant rudists



SOMERVELL--5. Road cut and ditch exposure, east side of north-south gravel road, 1.5 miles south of U. S. Highway 67 and 7.5 miles southwest of Glen Rose.

Edwards Formation

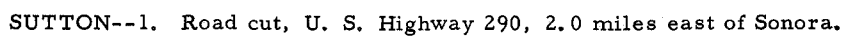
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61975	98.0	97.9	0.1	54.9	0.0		17	Limestone, buff gray, fine to mostly coarse grained, thick bedded, hard; abundant rudists
61974	97.9							
		(Not sampled)					73	Limestone, gray, nodular (Comanche Peak Formation)



SOMERVELL--6. Exposure in ditch, south side of gravel road, 9.5 miles south-southwest of Glen Rose.

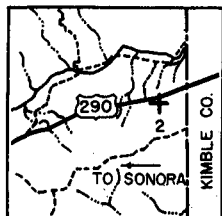
Edwards Formation

Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60464	98.5	97.5	0.8	54.7	0.4		8	Limestone, light gray, mostly coarse grained, thick bedded; abundant rudists
							9	Limestone, light gray, fine to coarse grained, hard, medium bedded; fossil detritus
		(Not sampled)					13	Limestone, gray, nodular (Comanche Peak Formation)



Edwards Formation (lower unit)

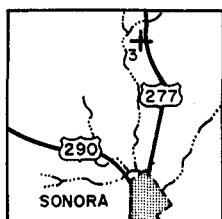
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61865	0.12	43.28	54.40	0.24	0.60	0.11	0.04
61866							



SUTTON--2. Road cut, U. S. Highway 290, 0.8 mile west of Sutton-Kimble County line.

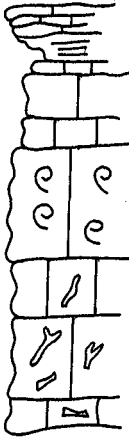
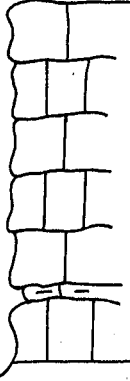

Edwards Formation (lower unit)

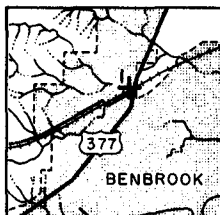
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description				
61874	98.5	97.6	0.4	54.8	0.2		14.0	Limestone, gray, fine grained to aphanitic, medium bedded; chert nodules				
61873	97.8						6.0	Limestone, gray, hard, thin bedded				
	(Not sampled)						3.0	Covered interval				
61872	99.3	82.5	13.8	46.3	6.6		3.0	Limestone, drab gray, granular				
							3.0	Limestone, buff gray, granular				
							3.2	Limestone, thin bedded;				
61871	98.8						3.0	nodular chert				
							3.0	Limestone, dolomitized; dark gray, granular; nodular chert				
							2.5	Limestone, dolomitic, gray, hard; chert nodules				
61870	101.0	97.4	2.2	54.7	1.1		7.0	Limestone, dolomitic, gray, aphanitic, hard, thin bedded; nodular chert				
61869	98.4										11.0	Limestone, gray to buff, abundant fossils



SUTTON--3. Series of road cuts, U. S. Highway 277, 4.8 - 5.2 miles north of Sonora.

Edwards Formation (lower unit)

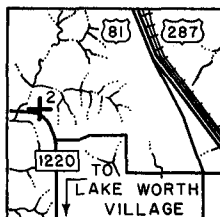
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61877	96.8	-	-	-	-		5.0	Limestone, light to dark gray, weathered, thin bedded
							5.0	Limestone, buff gray, fine grained, thick bedded
61876	98.0	97.8	0.2	54.9	0.1		8.5	Limestone, light gray to light buff gray; abundant large rudists in fine grained to aphanitic matrix
61875	98.0						12.0	Limestone, buff gray, fine to medium grained, thick bedded; filled, dolomitic, tubular burrows
61879	97.9	97.2	0.6	54.5	0.3		23.0	Limestone, buff gray, aphanitic to fine grained, locally mottled, medium to thick bedded
61878	95.9	-	-	-	-			
61883	98.7	96.3	2.0	54.1	1.0		11.0	Limestone, buff gray, fine grained, medium bedded
61882	97.7	96.9	0.8	54.4	0.4		12.5	Limestone, lavender, aphanitic to fine crystalline, hard; few rudists; crystal-lined cavities
							4.0	Limestone, buff gray, fine grained; few filled tubular burrows
61881	98.0						4.0	Limestone, light gray, hard, abundant rudists in aphanitic matrix
61880	97.9	97.2	0.6	54.5	0.3		3.3	Limestone, buff gray, medium grained, locally cross-bedded



TARRANT--1. Exposure in Walnut Creek west of U. S. Highway 377 bridge, in Benbrook.

Goodland Formation

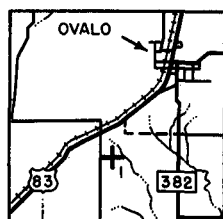
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60413	90.9	-	-	-	-	 Creek	16.5	Limestone, gray, nodular, interbedded with limestone, nodular, argillaceous and clay



TARRANT--2. Road cut on Farm Road 1220, 5.4 miles north of Lake Worth Village.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					-	Clay (Kiamichi Formation)
60412	93.1	-	-	-	-		15	Limestone, gray, nodular
60411	92.6	-	-	-	-		24	Limestone, gray, nodular, interbedded with clay, gray brown
		(Not sampled)						
60410	94.4	-	-	-	-			

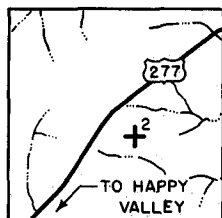


TAYLOR--1. Quarry, southeast of U. S. Highway 83, 1.7 miles southwest of Ovalo.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60515	97.7	97.9	0.0	54.8	0.0		9.0	Limestone, buff gray, fine grained matrix; abundant fossil detritus; filled tubular burrows
60514	98.4	98.7	0.0	55.4	0.0		4.0	Limestone, gray, hard, coarse grained, partly crystalline, medium bedded
60513	96.4	-	-	-	-		5.0	Limestone, gray, medium grained, partly crystalline, thick bedded
		(Not sampled)						Limestone, gray, nodular (Comanche Peak Formation)

Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60515	0.18	43.20	54.80	0.00	0.86	0.49	0.19



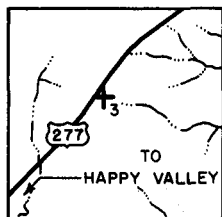
TAYLOR--2. Excavation. Shep missile launching site, southeast side of U. S. Highway 277, 7.1 miles northeast of Happy Valley.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60509	99.0	98.4	0.5	55.2	0.2		8.0	Limestone, light buff gray, dense, fine to coarse grained, partly crystalline; few chert nodules; few rudists
60508	102.0	57.0	38.5	32.0	18.4		8.5	Dolomite, buff, fine grained, soft
60507	99.0	98.4	0.5	55.2	0.2		3.5	Limestone, buff gray, aphanitic to fine grained, partly crystalline; nodular chert
60506	99.5	52.8	38.8	29.6	18.3		10.5	Dolomite, buff, fine grained, thick bedded, soft
		(Not sampled)					2.5	Limestone, gray buff, granular, thin bedded; irregular beds and nodules of chert

Additional 40 feet of Edwards Formation indicated in core

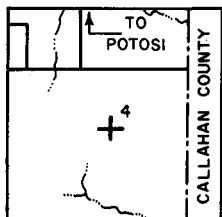
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
60508	0.23	46.00	32.00	18.40	1.39	0.76	0.29



TAYLOR--3. Road cut, U. S. Highway 277, 6.4 miles northeast of Happy Valley and 0.7 mile southwest of TAYLOR--2.

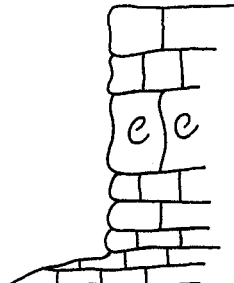
Edwards Formation

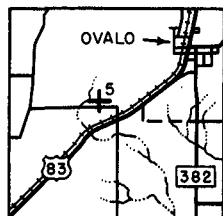
Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60511	96.6	-	-	-	-		4.0	Limestone, buff, coarse grained, partly crystalline; rudists in upper part
60510	98.3	98.2	0.1	55.1	0.1		9.0	Limestone, buff gray, medium to coarse grained, partly crystalline, thin to medium bedded



TAYLOR--4. Quarry operated by H. B. Zachry Company, 3.0 miles south of Potosi.

Edwards Formation

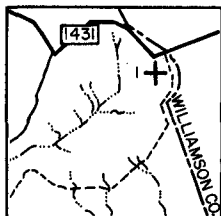
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								
60517	99.6	98.9	0.6	55.7	0.3		17.0	Limestone, gray buff, hard, dense; coarse fossil detritus; common calcite-lined cavities; weathered at top
60516	99.1	99.2	0.0	55.7	0.0			
(Not sampled--forms floor of quarry)								Limestone, blue gray, granular



TAYLOR--5. Upper part of butte northwest of U. S. Highway 83, 1.5 miles southwest of Ovalo.

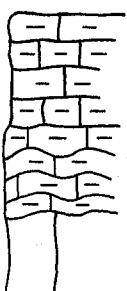
Edwards Formation

Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60512	98.0	97.9	0.1	54.9	0.1		4.0	Limestone, buff gray, fine to medium grained, partly crystalline, thick bedded
		(Not sampled)					10.0	Limestone, gray, nodular (Comanche Peak Formation)



TRAVIS--1. Dimension stone quarry, south side of Farm Road 1431, immediately west of Travis-Williamson County line, 2 miles southwest of Whitestone.

Walnut Formation

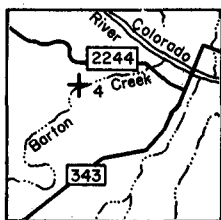
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61790	94.0	-	-	-	-		8.0	Limestone, argillaceous, buff gray, medium bedded
							6.5	Limestone, argillaceous, buff to blue gray, nodular
61789	99.9	99.9	0.0	56.1	0.0		6.0	Limestone, buff, granular, dimension stone

TRAVIS--3. Quarry (abandoned) of Texas Crushed Stone Company, west side of Balcones Drive, northwest Austin.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					4.0	Limestone, red, weathered
61799	98.9	77.4	19.5	43.3	9.3		8.0	Limestone, gray, hard, aphanitic
61798	103.6						7.5	Limestone, dolomitized, medium bedded; chert in lower part
61797	99.8	97.9	1.5	54.9	0.7		16.5	Limestone, gray, thick bedded, abundant rudist molds; nodular chert in upper part
61796	99.6							
						Quarry floor		

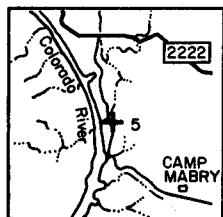
[illegible]



TRAVIS--4. Exposure, north side of Barton Creek, 0.7 mile west of Barton Springs, Austin.

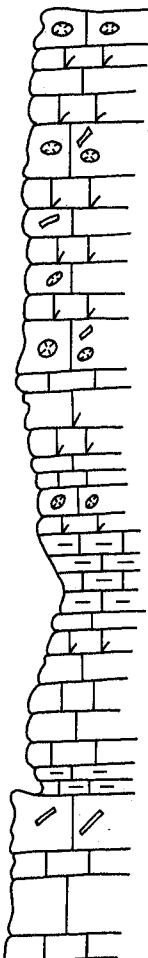
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61804	94.8	-	-	-	-		27.5	Limestone, gray to buff, hard, thin bedded, upper part covered
61803	98.5	98.0	0.4	55.0	0.2		22.5	Limestone, gray to buff, thick bedded, locally weathered; few nodules of chert
61802	101.0	94.8	4.9	53.2	2.3		34.5	Limestone, dolomitic, gray to buff, fine grained, partly crystalline, vuggy; nodules and beds of chert
61801	100.9	94.6	4.9	53.1	2.3			
61800	101.6	83.3	14.7	46.7	7.0		16.5	Limestone, dolomitized, buff to gray, fine grained, partly crystalline; chert nodules



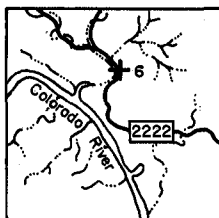
TRAVIS--5. Road cut, east side of Mt. Bonnell Drive, Austin.

Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61812	94.0	-	-	-	-		27.5	Limestone, dolomitic, thin to thick bedded; filled tubular burrows; celestite pockets	
61811	89.8								
61810	92.8								
61809	83.3								
		(Not sampled)						11.0	Limestone, dolomitic, buff to gray, thin to thick bedded; celestite pockets in lower part
								6.6	Limestone, argillaceous, buff
61808	93.4	-	-	-	-			11.3	Limestone, buff to gray, fine grained, thin to thick bedded
61807	92.6	-	-	-	-			2.0	Limestone, argillaceous, buff
							11.5	Limestone, buff, thick bedded; filled tubular burrows in upper part	

(CONTINUES)

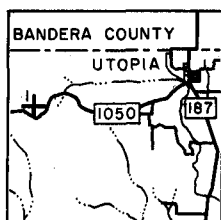
13.5	Limestone, argillaceous, soft, nodular
11.0	Limestone, buff to gray, thin to thick bedded
4.0	Limestone, argillaceous, nodular
8.5	Limestone, buff to gray, hard, aphanitic to fine grained; filled tubular burrows



TRAVIS--6. Road cut, Farm Road 2222 (Bull Creek Road), 0.3 mile east of Bull Creek Lodge, Austin.

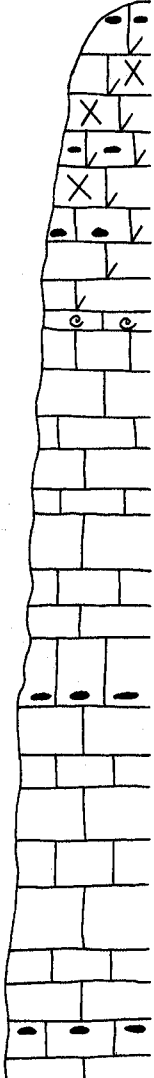
Glen Rose Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61817	94.8	-	-	-	-		10.0	Limestone, buff to gray, fine grained, thin to thick bedded, aphanitic, soft in lower part
61816	89.8	-	-	-	-		12.5	Limestone, buff to gray, thin to thick bedded, nodular; fossiliferous
61815	93.4	-	-	-	-		12.2	Limestone, buff, thick bedded; fossiliferous
61814	93.7	-	-	-	-		11.4	Limestone, dolomitic, gray to buff, fine grained
61813	93.5	-	-	-	-		10.5	Limestone, dolomitic, buff to gray, hard, thin to thick bedded

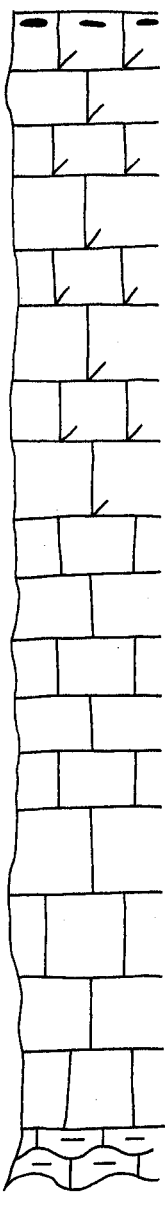


UVALDE--1. Slope, north side of Ranch Road 1050, 4.5 miles west of Utopia.

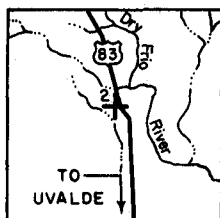
Devils River Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61677	100.5	98.0	2.0	55.0	1.0		22	Limestone, dolomitic, buff gray, medium to thick bedded, aphanitic to coarse grained, partly crystalline; abundant secondary calcite; nodular chert common
61676	100.3							
61675	100.5	99.0	1.0	55.6	0.5		10	Limestone, fine grained to aphanitic, hard, medium to thick bedded; forms prominent cliff
61674	99.9							
61673	100.3	97.7	0.3	54.8	0.1		45	Limestone, hard, mostly fine grained, thick bedded; nodular chert in middle and lower parts
61672	99.4							
61671	93.8	-	-	-	-			

(CONTINUES)

61670	99.9	97.2	2.4	54.6	1.1		36	Limestone, dolomitic, aphanitic to fine grained, hard, thick bedded; nodular chert at top
61669	100.3							
61668	100.2	97.0	2.6	54.4	1.2			
61667	100.0							
61666	98.6	98.0	0.0	55.0	0.0		43	Limestone, light gray, medium grained, thick bedded; poorly exposed
61665	96.5	-	-	-	-			
61664	96.3	-	-	-	-			
61663	95.7	-	-	-	-			
		(Not sampled)					-	-

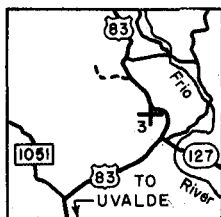
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61673	0.28	43.06	54.80	0.12	1.20	0.58	0.11
61672							
61666	0.27	43.50	55.00	0.00	0.63	0.29	0.13



UVALDE--2. Road cut, U. S. Highway 83, 14 miles north of Uvalde.

Devils River Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61679	100.0	-	-	-	-		8.5	Limestone, light gray brown, aphanitic to fine grained; fossiliferous
61678	99.9	-	-	-	-		6.5	Limestone, light gray brown, aphanitic to fine grained, thick bedded
							5.0	Limestone, light gray brown, aphanitic to fine grained, hard, thin to thick bedded

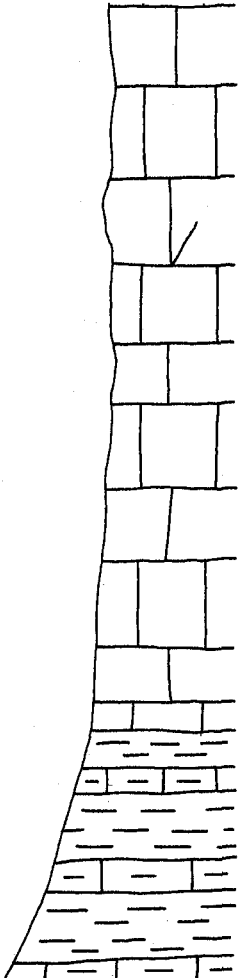


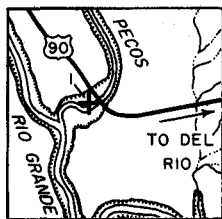
UVALDE--3. Road cut and slope, west side of U. S. Highway 83, 21 miles north of Uvalde.

Devils River Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61691	99.9						42	Limestone, gray buff, aphanitic to coarse grained, medium to thick bedded; abundant replacement calcite; few rudists and other fossils in lower part; lower part dolomitic
61690	99.0	98.3	0.9	55.2	0.4			
61689	101.0							
61688	99.8	96.0	2.7	53.9	1.3			
61687	100.0							
61686	97.5	94.3	2.3	52.9	1.1			
61685	95.0	-	-	-	-			

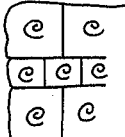
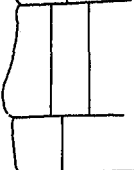
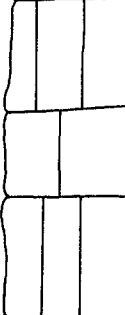
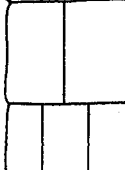
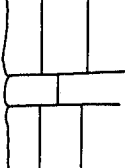
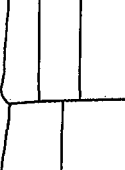
(CONTINUES)

61684	95.6	-	-	-	-		75	Limestone, gray buff, aphanitic to fine grained, thick bedded, hard; locally dolomitic
61683	97.0	93.9	2.6	52.7	1.2			
61682	96.1	-	-	-	-			
61681	93.5	-	-	-	-			
61680	95.6	-	-	-	-			
		(Not sampled)				20		Limestone, argillaceous, interbedded with clay (Glen Rose Formation)



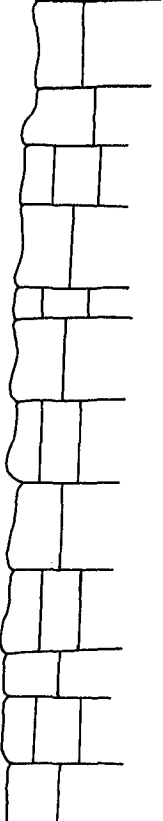
VAL VERDE--1. Road cuts, old road on west side of Pecos River, just south of west end of Pecos River bridge, U. S. Highway 90, 37.0 miles northwest of Del Rio.

Devils River Formation

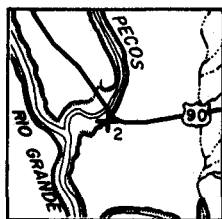
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61771	99.5	99.4	0.1	55.8	0.0		11.0	Limestone, fine grained, thick bedded; rudists common
61770	99.5	99.1	0.3	55.6	0.1		12.0	Limestone, buff gray, aphanitic to locally fine grained, thick bedded
61769	99.4						23.0	
61768	96.2	-	-	-	-			
61767	98.1	98.1	0.3	55.0	0.1			
61766	98.9							
61765	98.4	96.8	1.2	54.3	0.6			
61764	98.0							
61763	97.6	97.0	0.3	54.4	0.1		24.0	
61762	97.0							

(CONTINUES)

61761	97.6	97.0	0.3	54.4	0.1
61760	97.3				
61759	97.1	97.3	0.0	54.6	0.0
61758	98.0				
61757	96.5	-	-	-	-
61756	98.9	97.8	0.9	54.9	0.4

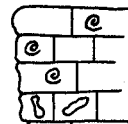
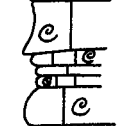
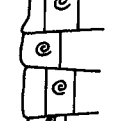
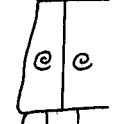
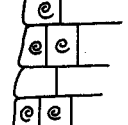
	<p>59.0</p>	<p>Limestone, tan to gray, hard, thick bedded, fine grained to aphanitic</p>
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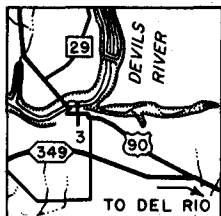
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61758	0.18	42.75	54.60	0.00	1.60	0.44	0.18
61759							
61766	0.10	43.21	55.00	0.14	1.24	0.23	0.19
61767							



VAL VERDE--2. Road cut, U. S. Highway 90, east end of bridge over Pecos River; stratigraphically higher than VAL VERDE--1.

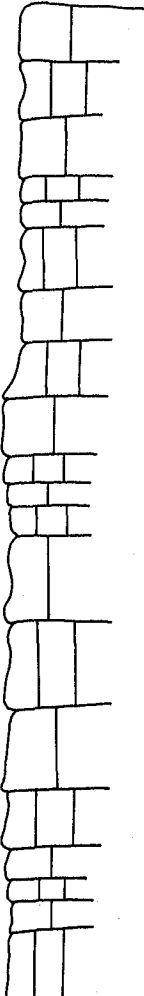
Devils River Formation

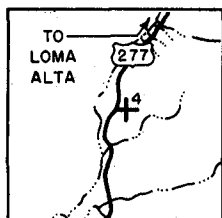
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61781	99.0	98.7	0.5	55.4	0.2		9.0	Limestone, buff gray, medium to thick bedded; abundant fossils; lower part with filled tubular burrows
61780	99.7							
61779	98.7	97.6	0.7	54.8	0.3		54.5	Limestone, buff gray, fine grained, thin to mostly thick bedded; abundant fossils
61778	98.1							
61777	98.2	97.7	0.0	54.8	0.0			
61776	97.3							
61775	98.8	97.3	0.7	54.6	0.3		2.5	Limestone, hard, dense; filled tubular burrows
61774	97.4						2.0	Limestone, medium bedded, fine grained; abundant fossils
61773	99.0	98.5	0.3	55.3	0.1		12.0	Limestone, fine grained, hard, medium to thick bedded; abundant fossils
61772	98.7						20.0	Limestone, fine grained to aphanitic, thick bedded; forms cliff; abundant fossils



VAL VERDE--3. Road cut, U. S. Highway 90, east end of bridge over Devils River, 10.0 miles northwest of Del Rio.

Salmon Peak Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61788	96.4	-	-	-	-		71.0	Limestone, buff to gray, medium to mostly thick bedded, hard, aphanitic
61787	97.6	96.0	1.3	53.9	0.6			
61786	97.4	96.8	0.4	54.3	0.2			
61785	97.2							
61784	97.7	96.4	0.9	54.1	0.4			
61783	97.4							
61782	95.8	-	-	-	-			



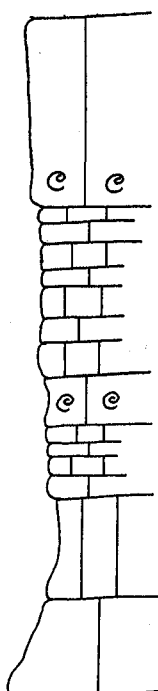
VAL VERDE--4. Road cuts, U. S. Highway 277, 5.2 miles south of Loma Alta.

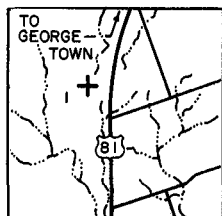
Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61837	100.0	99.3	0.6	55.7	0.3		15.0	Limestone, buff gray, medium bedded, fine grained; forms retreating ledges
61836	98.0	97.6	0.1	54.8	0.0		29.0	Limestone, buff gray, fine to medium grained, thick bedded; forms rounded ledges; few fossils
61835	97.5							
61834	98.0	98.3	0.0	55.2	0.0			
61833	98.5							
61832	98.3	98.6	0.0	55.3	0.0		24.0	Limestone, gray to buff, fine grained to locally aphanitic, hard, medium to thick bedded
61831	98.5							

(CONTINUES)

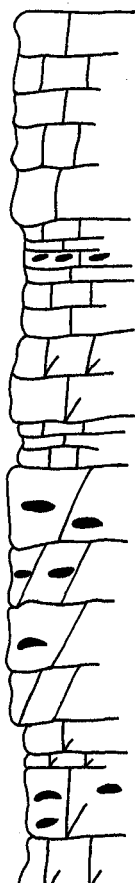
61830	98.5	97.9	0.3	54.9	0.1
61829	98.1				
61828	97.8	97.4	0.4	54.7	0.2
61827	98.1				
61826	98.3	98.1	0.1	55.0	0.0
61825	98.2				

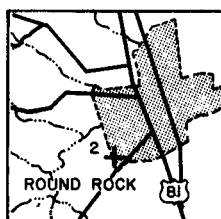
	14.0	Limestone, gray, fine to medium grained, thick bedded; few fossils
	3.0	Limestone, dark gray, aphanitic
	10.0	Limestone, gray, aphanitic to fine grained, hard; few fossils
	3.2	Limestone, buff gray, fine to medium grained, medium bedded
	5.5	Limestone, buff gray, medium to coarse grained, medium bedded
	14.0	Limestone, buff gray, medium to coarse grained, oolitic; abundant fossils



WILLIAMSON--1. Quarry of Texas Crushed Stone Company, west side of U. S. Highway 81, 3.7 miles south of Georgetown.

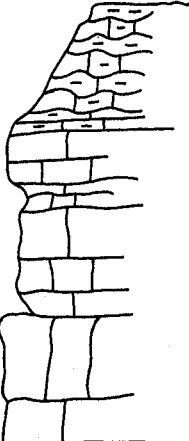
Edwards Formation

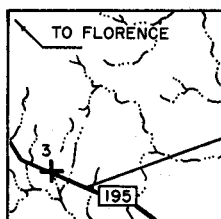
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description	
61283	99.5	99.4	0.3	55.8	0.1		15.0	Limestone, gray to buff, aphanitic to fine grained, medium to thick bedded	
61282	100.0								
61281	100.1	94.8	4.4	53.2	2.1		3.0	Limestone, coarse grained; nodular chert	
61280	100.1						1.0	Limestone, gray, hard to soft, aphanitic to fine grained	
							4.0	Limestone, dolomitic, gray, fine grained, partly crystalline, thick bedded	
61279	105.5	73.5	25.7	41.3	12.3		6.0	Limestone, gray, fine grained, thin to medium bedded	
							3.4	Dolomite, gray, soft, fine grained, partly crystalline, thick bedded; numerous small cavities; nodular chert common	
61278	102.9								
61277	103.4	77.5	21.5	43.5	10.3		Quarry floor	12.0	Limestone, dolomitized, gray, fine to coarse grained, partly crystalline, thick bedded, dolomitic; nodular chert in upper part



WILLIAMSON--2. Quarry of Round Rock White Lime Company, southwest corner of Round Rock, west of U. S. Highway 81.

Edwards Formation

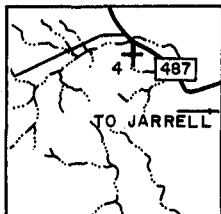
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)					9.0	Limestone, buff to gray, nodular, argillaceous; few rudists (Georgetown Formation)
							3.8	Limestone, gray, aphanitic to fine grained, partly crystalline; few small vugs
61307	95.5	-	-	-	-		2.0	Limestone, dark gray, nodular
61306	98.4	98.5	0.0	55.3	0.0		6.0	Limestone, light brown, aphanitic to fine grained, medium to thin bedded
61305	98.6						1.4	Limestone, hard, medium to coarse grained, detrital to crystalline
61304	99.3	98.4	0.9	55.2	0.4		9.0	Limestone, gray, soft, fine to medium grained, thick bedded
61303	99.7							



WILLIAMSON--3. Ditch exposure, along State Highway 195, 6.4 miles south-southeast of Florence.

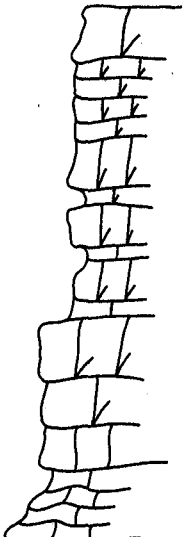

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61285	100.3	90.4	8.1	50.8	3.9		20.0	Limestone, gray to pink, hard, fine to coarse grained, partly crystalline, with shell detritus, interbedded with limestone, dolomitic, brown, fine grained

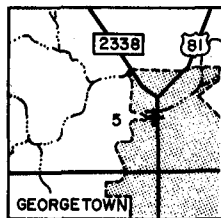


WILLIAMSON--4. Northwest-facing scarp, south side of Farm Road 487, south of bridge over Salado Creek, 5.5 miles west of Jarrell.

Edwards Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61288	100.1	57.2	36.8	32.1	17.6		33.0	Limestone, dolomitic, fine grained, partly crystalline in lower part; dolomite, fine grained, mostly crystalline in upper part, medium to thick bedded, chert float near top
61287	100.8	88.6	9.4	49.6	4.5			
61286	100.8							
	(Not sampled)						-	Limestone, gray, nodular (Comanche Peak Formation)

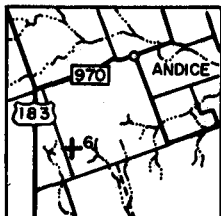
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61286	0.04	44.65	49.60	4.48	0.43	0.47	0.12
61287							
61288	0.34	45.65	32.00	17.70	1.94	0.96	0.25



WILLIAMSON--5. South bank of North Fork of San Gabriel River, 0.2 mile upstream from U. S. Highway 81 bridge at Georgetown.

Edwards Formation

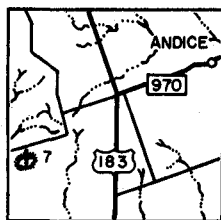
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61292	99.5	98.5	0.7	55.3	0.3		10.0	Limestone, gray, fine grained, partly crystalline, thick bedded; chert float
61291	99.2						7.0	Limestone, buff gray, fine grained, partly crystalline, thick bedded; layer of chert nodules
61290	98.3	97.4	0.3	54.6	0.1		13.0	
61289	97.4						8.0	
		(Not tested)				12.0	Limestone, gray, nodular (Comanche Peak Formation)	



WILLIAMSON--6. Small hill, east side of gravel road, east of U. S. Highway 183, 1.6 miles southwest of Andice.

Edwards Formation

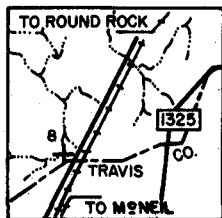
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61293	101.5	-	-	-	-		3.0	Limestone, light gray, fine grained, partly crystalline; chert float
							6.0	Limestone, dolomitized, brown, fine grained, mostly crystalline; abundant molds of small fossils (<i>Dictyoconus</i>)
		(Not sampled)					43.0	Limestone, gray, nodular (Comanche Peak Formation)



WILLIAMSON--7. North slope of Gabriel Peak, west of U. S. Highway 183, south side of gravel road, 3.0 miles west-southwest of Andice.

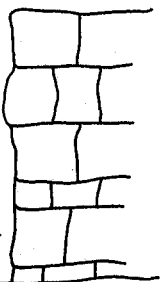
Edwards Formation

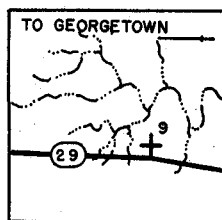
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
		(Not sampled)						Covered slope with chert float
61295	102.0	79.4	18.9	44.6	9.4		3.0	Limestone, dolomitized, gray to tan, fine grained, thin to medium bedded; chert nodules
61294	103.7	-	-	-	-		9.0	Limestone, dolomitized, brown, fine grained, mostly crystalline, medium to thick bedded; rudist molds
		(Not sampled)						Limestone, gray, nodular (Comanche Peak Formation)



WILLIAMSON--8. Quarry of Austin White Lime Company, between Round Rock and McNeil, 1.3 miles northeast of McNeil.

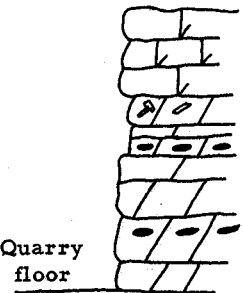
Edwards Formation

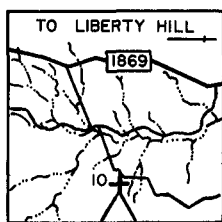
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61310	99.4	98.7	0.5	55.4	0.2		19.0	Limestone, gray, fine to medium grained, locally aphanitic, thin to thick bedded
61309	99.2							



WILLIAMSON--9. Quarry on north side of State Highway 29, 7.2 miles west of Georgetown.

Edwards Formation

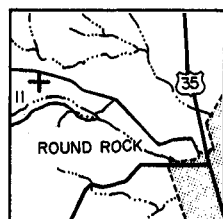
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
								
61298	105.0	67.8	30.9	38.1	14.8		6.0	Limestone, dolomitized, gray, medium bedded; some shell detritus
							1.0	Dolomite with filled tubular burrows
							0.8	Limestone, gray, massive, dense
							0.8	Dolomite, fine grained, crystalline
61297	103.4					5.0	Dolomite, brown, massive; abundant molds of fossils	
						6.0	Dolomite, dark brown, thick bedded	



WILLIAMSON--10. Liberty Hill quarry, 5.5 miles west-southwest of Liberty Hill.

Walnut Formation

Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61299	99.5	98.4	0.9	55.2	0.4		10	Limestone, cream colored, fine grained, thick bedded; abundant shell molds

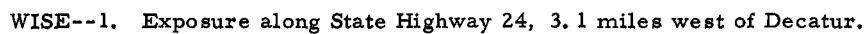


WILLIAMSON--11. Quarry, south side of gravel road, 3.2 miles northwest of Round Rock.

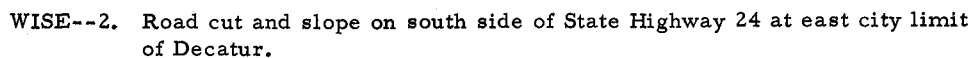
Edwards Formation

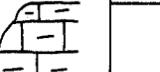
Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61301	106.6	58.0	41.2	32.6	19.7		15.0	(East wall of quarry)
61300	106.7							Dolomite, gray, fine grained, crystalline, thin to medium bedded; abundant chert nodules
								(West wall of quarry)
61302	107.2	56.2	42.1	31.5	20.1		0.0 - 5.0	Dolomite, massive; abundant molds of rudists, lenticular

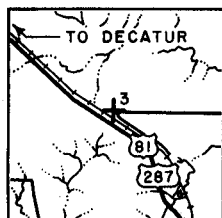
Lab. No.	% Moisture	% Ign. Loss	% CaO	% MgO	% SiO ₂	% Al ₂ O ₃	% Fe ₂ O ₃
61302	0.09	47.12	31.50	20.10	0.18	0.01	0.22



Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61348	90.8	-	-	-	-		7.5	Limestone, buff gray, fine to coarse grained, partly crystalline, thin to thick bedded; abundant fossil detritus

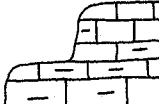


Lab. Number	Neutralization Value	% CaCO ₃	% MgCO ₃	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
61979	95.0	-	-	-	-		20	Limestone, interbedded with limestone, argillaceous, and limy clay
61978	93.0	-	-	-	-			



WISE--3. Road metal pit east of U. S. Highway 81, 7.2 miles southeast of Decatur.

Goodland Formation

Lab. Number	Neutralization Value	% CaCO_3	% MgCO_3	% CaO	% MgO	Diagrammatic Section	Thickness Feet	Rock Description
60376	96.8	-	-	-	-		7	Limestone, argillaceous, gray, thin to medium bedded; weathers nodular

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