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Uvalde County, Texas.
By Joseph M. Gorman and
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Preliminary results of field work

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ASPHALT DEPOSITS NEAR UVALDE, UVALDE COUNTY, TEXAS

By
Joseph M. Gorman and Raymond C. Robeck

The asphalt deposits in the Uvalde district lie in southwestern Uvalde County and southeastern Kinney County, Texas, 13 to 20 miles west-southwest of Uvalde. The district is served by branch lines of the Southern Pacific Railroad and the Missouri Pacific Asphalt Belt Railroad. It has an all-weather road to Uvalde.

The area was studied in the spring of 1945 by Joseph M. Gorman and Raymond C. Robeck of the Geological Survey, United States Department of the Interior, as part of an investigation of sources of oil and gas and allied products.

The writers acknowledge the cooperation and assistance of Mr. Joe Smyth, Mr. G. H. Alvey of the Uvalde Rock Asphalt Company, Mr. R. L. White of White's Uvalde Mines, and Dr. E. H. Sellards of the Bureau of Economic Geology, University of Texas.

HISTORY AND PRODUCTION

The Uvalde area was first developed about 1891 by H. L. Terell who opened No. 1 Original quarry at Carbonville, now named the Blewett quarry. Between 1891 and 1900 bitumen was extracted from the limestone in this quarry by solvents, and the product, termed "lithocarbon", was used in the paint and varnish trade. About 1900 the Parker Washington Company opened the Parker Washington quarry and used the rock for paving streets in San Antonio. Between 1901 and 1912 the quarries were idle. In 1911 J. B. Smyth organized the Uvalde Rock Asphalt Company and in 1912 started producing paving material from No. 1 Original quarry.

Subsequently this company opened and worked No. 1 South, No. 1 East, No. 1 Turkey Creek, No. 1 Gato, and No. 1 South Gato quarries.

About 1922 the Texas Rock Asphalt Company opened No. 2 Original quarry at Dabney. This quarry, in conjunction with No. 2 East quarry, was operated until 1941. About 1922 B. Y. Sharpe opened No. 3 Sharpe quarry and worked it for about one year. In 1923 White's Uvalde Mines opened and operated No. 4 White's Turkey Creek quarry and later No. 4 White's North quarry and White's Uvalde Mines. Between 1931 and 1933 the Standard Rock Asphalt Company opened a prospect, No. 5 Standard quarry. Between 1931 and 1932 Brown and Root opened and worked three small quarries designated as No. 6 Brown Root quarry.

No. 1 Gato quarry of the Uvalde Rock Asphalt Company and White's Uvalde Mines quarry have been the only operating quarries since 1941.

Between 1891 and 1900 about 2,000 short tons of "lithocarbon", was produced. Production of asphaltic limestone for paving material started about 1900. Between 1900 and 1919 about 150,000 short tons were produced, and since 1919 about 5,460,500 short tons of asphaltic limestone has been produced.

The following table shows the various quarry names, the operators name, dates of working, and approximate production for each quarry in the Uvalde district.

Quarry Name	Operator	Operated		Approximate Production Short Tons
		From	To	
No. 1 Original	H. L. Terell	1891	1900	2,000 (1)
do	Uvalde Rock Asphalt Co.	1912	1926	1,000,000
No. 1 Turkey Creek	do	1926	1928	65,000

Quarry Name	Operator	Operated From	Operated To	Approximate Production Short Tons
No. 1 South	do	1926	1927	80,000
No. 1 East	do	1926	1927	150,000
No. 1 Gato	do	1927	(3)	2,000,000
No. 1 South Gato	do	1940	1942	38,000
No. 2 Original	Texas Rock Asphalt Co.	1922	1941	500,000
No. 2 East	do	(2)	1941	37,500
No. 3 Sharpe	B. Y. Sharpe	1922	1923	10,000
No. 4 Turkey Creek	White's Uvalde Mines	1923	1926	325,000
No. 4 North	do	1927	1934	375,000
No. 4 White's Uvalde Mines	do	1934	(3)	900,000
Parker Washington	Parker Washington Co.	1900	1901	1,000
do	White's Uvalde Mines	1927	1934	4,000
No. 5 Standard	Standard Rock Asphalt Co.	1931	1932	Negligble
No. 6 Brown Root	Brown and Root Co.	1931	1932	125,000

1 "lithocarbon

2 Date unknown, probably late '30's.

3 Operating in May 1945.

ROCK FORMATIONS

The geology of the Uvalde region and the asphalt deposits have been described previously by numerous individuals whose works have been consulted during the preparation of the present report. 1,2,3,4,5,6,7,8,9 /

The commercial asphalt deposits in the Uvalde district occur in the Anacacho limestone, of Upper Cretaceous age, which crops out over most of the mapped area. Sedimentary rocks assigned to the Austin chalk, also

or the Upper Cretaceous age, are exposed in the north part of the mapped area. Alluvium, assigned a Tertiary age, occurs in the south portion of the mapped area where it probably covers the contact between the Anacacho limestone and the overlying Escondido formation. Drilled wells have penetrated the Glen Rose limestone of Lower Cretaceous age. Basaltic type igneous intrusives are present and are thought to be of Tertiary age. Drilled wells and core borings have encountered serpentine of Upper Cretaceous age. The relations between the several rock units exposed in the Uvalde district are shown in the following table.

Generalized thickness of rocks exposed in the Uvalde Asphalt District, Uvalde County, Texas

	Thickness in feet
Tertiary:	
Alluvium	0-30
Basalt intrusives. — Stocks or plugs	
Upper Cretaceous:	
Anacacho limestone. — Coquina, crystalline limestone, marl, shale, and sedimentary serpentine	500±
Austin chalk. — Chalk, marly limestone, crystalline limestone and sedimentary serpentine	500±

Austin chalk. — Sedimentary rocks assigned to the Austin chalk crop out in the northern part of the mapped area. These rocks consist of white to yellow chalk, marly limestone, and crystalline limestone. About 50 feet of these beds are exposed but well records indicate that the Austin chalk is about 500 feet thick. Well records also show sedimentary serpentine units in the Austin chalk.

Anacacho limestone. - - The Anacacho limestone is composed of coquina, buff to light-brown crystalline limestone, marly limestone, shale, and serpentine. It rests with apparent conformity on the Austin chalk at Asphalt and Cline Mountains.

The Anacacho represents a reef or near shore deposit and varies greatly in lithology. Individual beds cannot be traced very far nor correlated in the quarries.

The major part of the Anacacho consists of coquina composed of shell fragments of bryozoa, pelecypods, echinoids, gastropods, cephalopods, corals, and other invertebrates. Locally it also contains complete shells and interior casts of pelecypods, gastropods, cephalopods, and echinoids. Overlying the coquina are discontinuous beds of dense, crystalline, gray to yellow-brown, fossiliferous limestone that weathers gray to buff.

In other exposures the Anacacho limestone contains crystalline limestone and marly beds. The crystalline limestone is buff to light-brown, dense, thick-bedded, and contains a few fossils. These beds form barren outcrops with little or no soil. They weather into blocks with prominent solution cavities and ridges. Chalcedony "rosebud" concretions averaging a quarter of an inch in diameter are found on some outcrops. The marly beds are yellow to light-gray, soft, slabby, marly limestone.

Shale and serpentine beds are known from quarry and drilling operations but these beds seldom crop out.

Igneous rocks. - - The igneous masses that crop out in the Uvalde asphalt district are shown on the regional map. The rocks are stocks or plugs composed predominantly of nephelite basalt. They are associated with the Balcones fault system and are assigned an early Tertiary age.

Serpentine occurs as weathered residues of the basaltic rocks and also as interbedded units of the sedimentary rocks of Upper Cretaceous age. Lonsdale 7/ gives an excellent discussion of the geology and petrography of these igneous rocks.

STRUCTURE

The mapped area lies near the north edge of the Gulf Coastal Plain and within the Balcones fault zone. The strata have a low regional dip to the south-southeast with local gentle warpings. No major folds were observed although minor domes are present. No major faults were seen but numerous minor faults, of slight displacement, are exposed in the quarries. The major physiographic features are the undulating hills, formed by resistant limestone units of the Anacacho limestone.

The surface beds form dip slopes on most of the hills and dip into the stream beds. These surficial dips have resulted in minor domes which are well illustrated on the large scale quarry maps. Some of these domal structures have been interpreted as having linear trends. These structures have been previously mapped and are known as Little Fry Pan anticline, Gold Hill anticline, and Crawford anticline. They are in the southwest corner of the mapped area.

Numerous high angle minor faults, shear planes, and joints are exposed in the walls of the quarries. These exposures are interpreted as indications that the rocks have undergone mild deformation throughout the asphalt district. The fault planes usually are tight and show minor horizontal and vertical displacements with a maximum movement of 10 feet. The faults strike predominantly northeast to east-northeast. Unlike the faults, most

of the joints are leached, and they strike northwest. Details of some of the faults and joints are shown on the large scale maps of the three principal quarries in the district.

ASPHALTIC LIMESTONE DEPOSITS

General features. - - The principal deposits of asphaltic limestone occur in the coquina beds of the Anacacho limestone but drill records show asphalt in several other formations of Upper Cretaceous age. The coquina is composed almost entirely of shell fragments but contains some crystalline calcite and scattered specks of pyrite. The asphalt surrounds the barren shell fragments and calcite but does not entirely fill the interstices. The coquina is blue-gray on weathered surfaces and the barren shell fragments and calcite impart a speckled appearance. On fresh surfaces it ranges from light-gray, slightly asphaltic, calcitic coquina up to black, highly saturated coquina which bleeds during hot weather. Within the coquina are lenticular units of dense, crystalline, barren, gray limestone from six inches to two feet thick, and thin lenticular beds of shale from half an inch to two inches thick. In the Blewett area chert nodules, from one to two feet thick, are present.

Occurrences of asphalt in the Anacacho limestone are widespread and show much variability in saturation and in vertical and horizontal distribution. The typical natural exposures of the Anacacho are non-asphaltic, except locally in stream beds where erosion has exposed asphaltic limestone. The fact that outcrops are typically barren necessitates exploratory drilling for locating and delineating asphalt areas of commercial value. Numerous borings have been made in the district but the records are not available for publication. Thicknesses of 10 to 65 feet of

asphaltic limestone are exposed in quarry walls and as much as 200 feet of asphaltic limestone has been reported in drill holes.

There are only three known localities in the area mapped where the asphalt is concentrated in sufficient quantity and quality for commercial quarrying. These areas are the Blewett-White's Ranch area, the Gato quarry-Parker Washington quarry area, and the Dabney-Brown Root quarry area.

Several small occurences of asphalt outside the mapped area in Uvalde and Zavala counties that were mentioned by Vaughan 2/ and Eldridge 1/, were visited during the course of the work. None of these prospects have been worked nor do they appear to be favorable for commercial quarrying.

Grade of material. - - Schoch 10/ gives analyses of limestone from the Uvalde district which show a maximum content of 16.01 percent bitumen. Analyses of 22 samples by Terry 11/ show bitumen contents ranging from 4.82 percent to 13.35 percent and averaging 9.25 percent. Mr. R. W. Maddox, of the Texas Highway Department, states that Gato quarry and White's Uvalde Mines quarry are producing material which passes the Texas Highway Department specifications for mixes containing from two to 12 percent bitumen.

Origin. - - No evidence was found to indicate that the asphalt is indigenous to the Anacacho limestone. It is probable therefore that the source beds are older formations of Cretaceous age, and that the oil migrated to the Anacacho limestone through conduits formed by the Balcones faulting. The oil apparently was trapped in the porous coquina phase of the Anacacho and later devolatilized.

Baker 6/ suggests that the oil was originally in bituminous shales,

below the Anacacho limestone, and that the intrusive igneous rocks caused distillation and migration to the Anacacho. Field studies of the present investigation suggest that the intrusives are younger than the asphalt concentrations and that they had little if any effect on the Anacacho or the contained asphalt. Barren as well as asphaltic limestone is found adjacent to the intrusive rocks.

Folds seem to have played only a minor role in localizing the accumulation of asphalt. Areal distribution and concentration appears to have been controlled by localization of porous coquina horizons and favorable position of conduits.

Reserves. - - The minable reserves of asphaltic limestone in the mapped area total 200,000,000 cubic yards, of which 105,000,000 cubic yards are indicated by geologic evidence, and 95,000,000 cubic yards are inferred. Assuming that one cubic yard of saturated limestone weighs 1.7 tons and that the average bitumen content is eight percent by weight, the district contains about 154,000,000 barrels of asphalt.

The overburden consisting of limestone, marl and soil ranges from a few feet up to 50 feet in thickness in the district.

OIL AND GAS POSSIBILITIES

Although extensive asphalt deposits occur in the mapped area, no oil seeps have been observed. Three wells have been drilled in the district. Logs of the Pure Oil Company Smyth and Smith No. 1 wells record shows of oil in the Eagle Ford shale and Edwards limestone of Cretaceous age. Getzendaner 12/ states that wells, southeast of the area, in Zavala County have produced gas and non-commercial quantities of oil. The gas was found in the Midway group of Palocene age and the Escondido formation of uppermost

Cretaceous age. The oil occured in the Escondido formation, Anacacho limestone, Eagle Ford shale, Edwards limestone, and Glen Rose limestone, all of Cretaceous age. These showings of oil have been black and heavy, ranging from 12° to 23,8° Baume.

1/ Eldridge, G. H., The asphalt and bituminous rock deposits of the United States: U. S. Geol. Survey 22nd Ann. Rept., pt. 1, pp. 322-327, 1901.

2/ Vaughan, T. W., The asphalt deposits of Western Texas: U. S. Geol. Survey 18th Ann. Rept., pt.V (cont.), pp. 930-935, 1896-97.
Vaughan, T. W., U. S. Geol. Survey Geol. Atlas, Uvalde folio (no. 64), 1900.

3/ Phillips, W. B., Coal, lignite, and asphalt rocks: Texas Univ. Min. Survey Bull. 3, pp. 90-97, 1902.

4/ Getzendaner, F. M., Uvalde County: Texas Univ. Bur. Econ. Geology, Min. Res. Texas, pp. 93-111, 1931.
Getzendaner, F. M., Geologic section of Rio Grande embayment, Texas, and implied history: Am. Assoc. Petroleum Geologists Bull., vol. 14, no. 11, pp. 1425-37, 1930.

5/ Liddle, R. A., Magnetometer survey of Little Fry Pan area, Uvalde and Kinney Counties Texas: Am. Assoc. Petroleum Geologists Bull., vol. 14, pp. 509-516, 1930.

6/ Baker, C. L., Possible distillation of oil from organic sediments by heat and other processes of igneous intrusions; Asphalt in the Anacacho formation of Texas: Am. Assoc. Petroleum Geologists Bull., vol. 12, no. 10, pp. 995-1003, 1928.

7/ Lonsdale, J. T., Igneous rocks of the Balcones fault region of Texas: Texas Univ. Bull. 2744, 1927.

8/ Schoch, E. P., Chemical analyses of Texas rocks and minerals: Texas Univ. Bull. 1814, pp. 65,67,73,184-187, 1918.

9/ Adkins, W. S., The geology of Texas, Part 2. The Mesozoic systems in Texas: Texas Univ. Bull. 3232, pp. 239-518, 1933.

10/ Schoch, E. P., op. cit. pp. 67, 184.

11/ Terry, W. M., The natural asphalts and asphalt rocks of Texas, Unpublished thesis on file with Bureau of Economic Geology, University of Texas, Austin Texas, 1942.

12/ Getzendaner, F. M., Zavala County: Texas Univ. Bur. Econ. Geology, Min. Res. Texas, pp. 119, 1931.