

**KANSAS GEOLOGICAL SURVEY  
OPEN-FILE REPORT 56-5**

**GEOLOGY OF THE AREA NEAR KEREFORD QUARRIES  
ATCHISON, KANSAS**

**By**

**Robert O. Kulstad**

*Disclaimer*

The Kansas Geological Survey does not guarantee this document to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations based on data used in the production of this document or decisions based thereon. This report is intended to make results of research available at the earliest possible date, but is not intended to constitute final or formal publications.

Kansas Geological Survey  
1930 Constant Avenue  
University of Kansas  
Lawrence, KS 66047-3726

GEOLOGY OF THE AREA NEAR KEREFORD QUARRIES  
ATCHISON, KANSAS

by

Robert O. Kulstad  
State Geological Survey  
University of Kansas  
Lawrence, Kansas

Open-file Report 56-5

## GEOLOGY OF THE AREA NEAR KEREFORD QUARRIES ATCHISON, KANSAS

by: Robert O. Kulstad, State Geological Survey

**Location of area.**--Kereford quarries are in the SE 1/4 of the NE 1/4 of the SW 1/4 section 7, T. 6 S., R. 21 E. just south of the Atchison city limits, east of highway U.S. 73 and Kansas 7, and west of the Missouri Pacific Railroad tracks and the Missouri River. Limestone is quarried underground from two opposing east-west trending bluffs. Crushing and other rock processing machinery are on low ground lying between the bluffs. The shaft of an abandoned coal mine is also located between these bluffs. Quarrying operations have left a large amount of space underground, which for many years has been used for storage of material by both commercial and governmental agencies.

**Surficial deposits.**--The northeast portion of the State of Kansas, where Atchison is located, was glaciated during Pleistocene time. Evidence for this is the considerable amount of glacial till and outwash material found there. Glacial till in the area is a tough, claylike substance which may or may not contain boulders of various types of rocks. It is interpreted to have been deposited directly from glacial ice. Outwash may be sand, gravel, or silt deposited by melt water of glaciers and usually is well sorted with respect to the size of material. Deposits of this type have sporadic occurrence in the area.

**Bed rock.**--The bed rock of the area is of Pennsylvanian age. It consists of alternating beds of limestone, sandstone, and shale. Detailed descriptions of the rocks of Kereford quarry and nearby Jackson Park are found in Table 1. The accompanying graphic column is shown in Figure 1. Information for the table and figure was obtained from the files of the State Geological Survey of Kansas. Bed 14, the Plattsmouth Limestone, is the source of rock being mined in the Kereford quarry; consequently, it is the rock exposed in the underground storage areas.

Information regarding the subsurface of the area is available from the published log of the core of a hole drilled prior to the sinking of the coal mine shaft (Haworth, 1902). Table 2 and Figure 2 are taken from this log and its accompanying graphic column. Although the log extends to rocks of Mississippian age, for this report only the description of rocks from the land surface to a point slightly below the position of the Bethany Falls Limestone is included. Bed 1 is regarded as surficial material. Beds 2 through 13 are interpreted to be the clastic rocks of the Douglas Group with bed 13 the Tonganoxie sandstone. Lansing Group is represented by beds 14 through 25. However, beds 14 through 18 may belong in the Pedee Group. Beds 26 through 64 are classified in the Kansas City Group. The top of the Pleasanton Group is judged to be at the top of bed 65.

If these interpretations are correct, the Bethany Fall Limestone Member of the Swope formation, of particular interest in this report, would be beds 58 and 59. It (Bethany Falls) is reported to be 17 feet thick; its top is 464 feet and its base 481 feet below the land surface. Little more can be said about the Bethany Falls Limestone at Kereford quarry beyond the description given in the log of the core; however, in the Kansas City area it is one of the most sought after beds of rock for construction material. According to Peele (1941, p. 5-03) limestone weights 2.27 tons per cubic yard in place. Experience shows that Pennsylvanian limestones in Kansas weight somewhat less than that. A very conservative estimate would make the rock weigh 1.85 tons per cubic yard in place. Using the smaller figure and assuming the thickness does not vary there should be 151,000 tons of Bethany Falls Limestone per acre. Not all of this would be available for mining since according to Young (1946, p. 615) 20 percent to 25 percent of the rock should be left behind for roof supporting pillars. Somewhat more than 113,000 tons per acre should therefore be available. The shaft of the coal mine presumably extends to the coal beds in the Cherokee Group which have a stratigraphic position for below the Bethany Falls. Access is therefore available through the shaft.

#### REFERENCES

Haworth, Erasmus (1902) Mineral resources of Kansas 1900 and 1901: Kansas Geol. Survey.

Peele, Robert (1941) Mining Engineer's Handbook, John Wiley and Sons, New York.

Young, George J. (1946) Elements of mining: McGraw-Hills Book Co., New York and London.

Table 1. -- Description of outcropping rocks in the vicinity of Kerford Quarries.

	Thickness, feet
24. Limestone, dark blue, dense, abundant fusulinids (Avoca)	1.5
23. Shale, gray, partly covered	8.5
22. Limestone, yellow, brown, interbedded with shaly limestone and calcareous shale. Fusulinids common, brachiopods etc. (Beil)	5.0
21. Shale, gray green, clay on upper part, black fissile below	4.0
20. Limestone, blue gray, fine, dense, single massive layer filled with fusulinids (Big Springs)	2.3
19. Shale and covered bank, clay soft -- light-gray clay below	3.7
18. Limestone, brown, massive, fusulinids (?) (Spring Branch)	5.0
17. Shale and cover	19.0
16. Sandstone, soft brown	1.0
15. Shale and cover	17.0
14. Limestone, blue, weather light---, hard, dense, numerous fossils, fusulinids, gastropods, a single massive bed with vertical joints	2.8
13. Shale, black, with thin brown clay streaks	9.9
12. Limestone, dove gray, very hard, dense, massive, even, weathers ---, beds 1-2 ft. except top 3 inches which is in thin hard layers partly oolitic. Few or no fossils (Kerford <sup>3</sup> )	4.8
11. Shale, blue, hard, thinly laminated, unfossiliferous	6.1
10. Limestone, light dove gray, hard, dense, fine with thin wavy beds 1.5 ft. to 3 inches, a prominent thin shale parting 6.5 ft. above base. Shale partings 6.5 ft. above base. Shale partings are dark black with numerous fossils. Quarry face, 18.7 ft. (Plattsmouth) 20 inches of limestone below quarry floor	20.4

- |   |     |
|---|-----|
| 9. Shale, shelly, lower .4 contains nice large Chonetes, Ambo-coelia, Derby   | 0.7 |
| 8. Shale, dark  | 4.7 |
| 7. Shale, dark, blocky, carbonaceous material   | 1.7 |
| 6. Clay, yellow, diagonal jointing  | 4.5 |
| 5. Limestone and shale, calcareous, fossiliferous nodules in shale  | 0.8 |
| 4. Limestone, brown, earthy, irregular beds, glauconite   | 2.3 |
| 3. Limestone, weathers light chocolate brown, blue gray when fresh, dense, hard, smooth fracture, fusulinids in lower part  | 1.5 |
| 2. Shale, rubbly limestone, badly weathered, upper half foot unfossiliferous and silty, lower part contains fusulinids, <u>Chonetes</u> , <u>Marginifera</u> , <u>Composita</u> , and <u>Derbya</u> | 4.2 |
| 1. Shale, sandstone, and siltstone, base not well exposed   | 22  |

Table 2. -- Log of Atchison deep well, with notes on same (by L. N. Morscher)

No. of stratum	Kind of stratum	Depth of stratum ft. in.	Total depth ft. in.
1	Clay and loose rock	18----0	18----0
2	Clay, shale	6----0	24----0
3	Sandstone, very shaly, of thin, uneven laminae, alternating between light gray and very dark gray	7----0	31----0
4	Shale, light in color, with many sandstone streaks in it	33----0	64----0
5	Sandstone, very calcareous, being almost a limestone in places, with many small fossils	1----2	65----2
6	Shale, blue, with streaks of sandstone and limestone; a heavy laminae of sandstone occurring at 103; merges into next; some pyrite-covered fossils occur at 100-6 and 101	39---10	105----0
7	Limestone, nodular, with some shale and fossils	2----0	107----0
8	Shale, sandy	53----0	160----0
9	Sandstone, with many pyrite nodules, especially at 163	7----0	167----0
10	Shale, dark blue, rather sandy	9----0	176----0
11	Sandstone, of light color, fine grain, firm texture	3----0	179----0
12	Shale, sandy, very streaked, a soft place occurring from 183 to 183-6; the shale merges into sandstone	11----0	190----0

13	Sandstone, shaly, which by an uneven surface joins onto the limestone beneath	34----0	224----0
14	Limestone, hard, dark blue	2----0	226----0
15	Shale, blue, with much contorted, wavy layers; some nodular pyrite occurs in upper portion	8----0	234----0
16	Sandstone, shaly	2----0	236----0
17	Shale, sandy, merging into sandstone, with very uneven grains and lenticular layers	3----0	239----0
18	Sandstone, uneven-grained, and lenticular layers of light and dark colors; very soft at 243 and merges into limestone below	5----0	244----0
19	Limestone, the first foot buff, somewhat brec- ciated, then two feet dense, smooth, and of blue color, then rock hardens, with many lighter and cherty patches; contains many small fossils; shale partings occur--about two inches at 251, four inches at 257, two inches at 258, and three inches at 261; stone very silicious at 263, and at 264 it merges into blue sandstone	20----0	264----0
20	Sandstone, blue, merging into sandy shale	3---10	267---10
21	Shale, sandy, parted by slickensides from the limestone beneath	0----2	268----0
22	Limestone, shading from light blue to buff, merging into shaly sandstone	1----0	269----0
23	Sandstone, shaly, with lenticular-shaped layers; a 5-inch layer of breccia and slickensides occurring at 271	12----0	281----0

24	Shale, blue	2----0	283----0
25	Limestone, the first 4 feet porous, of oolitic tendency, and rather dark; lower stratum lighter in color and dense in structure, rapidly merging into the shale below	8----0	291----0
26	Shale, sandy, with sandstone masses at 326; merges through coarse sand into the limestone below	35----0	326----0
27	Limestone, in alternate layers of light color and smooth grain, from 2 to 3 inches thick, and dark, sandy limestone layers, from one-half inch to 12 inches thick; layers firmly joined together by very uneven surfaces	11----0	337----0
28	Shale, blue, carrying many fossil and much pyrite, well defined from limestone below	3----0	340----0
29	Limestone, hard, blue, with upper surface covered with coal flecks; bed contains many streaks of lighter-colored limestone and patches of darker flint, some of which are 5 inches across; upperportion of bed has many vertical seams filled with white flint; also sandy patches 1 to 3 feet apart; crystalline from 343 to 345, somewhat oolitic, and contains many small fossils; 345 to 346 contains many large fossils; a 3-inch shale parting at 345 and a 6-inch dark blue shale parting at 348; sandy limestone below	9----0	349----0

30	Shale, blue, very dark at 350	2----8	351----8
31	Shale, black, one inch very dark and tarry, giving flame when ignited	1----4	353----0
32	Sandstone; dark masses of limestone nodules and coarse sand well cemented	1----0	354----0
33	Shale, blue, mortar-like, with coarse sand and grains of pyrite; slickensides at 356, 357-2, 360, 361, 361-6	9----0	363----0
34	Limestone, very porous at 363 and 364, middle portion dense, hard, and of blue color, last 2 feet streaked with dark lenticular masses, finally merging into shale	5----0	368----0
35	Shale, green, with limestone nodules at 369-6 to 371 slickensides at 373	5----0	373----0
36	Shale, blue, slickensides at 373, and last 5 inches full of limestone nodules; merges into limestone	5----0	378----0
37	Limestone, very light in color at 379, soon becomes nodular, and at 383 changes into shale mixed with limestone	5----0	383----0
38	Shale, mixed with limestone, with a 4-inch shale parting at 384-9 and a 12-inch parting at 385	4----0	387----0
39	Limestone, very white, the upper surface rough and uneven	1----0	388----0
40	Shale, blue, mixed with limestone bands	4----0	392----0
41	Limestone, dark-banded, contains many fossils	5----0	397----0

42	Shale, black	2----0	399----0
43	Shale, dark blue, containing many fossils	9----0	408----0
44	Limestone, containing much shale and many fossils; merges through fossiliferous shale containing limestone nodules into a dark shale	3----0	411----0
45	Shale, dark blue	1----0	412----0
46	Limestone; a concretionary mixture of fossil-bearing limestone and shale	5----6	417----6
47	Limestone	0----6	418----0
48	Limestone, very nodular and shaly	1----0	419----0
49	Shale, smooth, blue, with fossils	4----0	423----0
50	Shale, blue, which darkens and becomes filled with limestone nodules toward the bottom	4----0	427----0
51	Limestone, very nodular, with shale	2----6	429----6
52	Limestone, nodular	5----6	435----0
53	Limestone nodules, with shale	4----0	439----0
54	Limestone, fossil bearing, with dark streaks, containing many fossils; a shale parting at 443	9----0	448----0
55	Limestone, with last two inches nodular	6----0	454----0
56	Shale, blue, with some limestone	8----0	462----0
57	Limestone nodules, cemented with shaly material	2----0	464----0
58	Limestone, blue and fine-grained, with pyrite crystals and many horizontal seams of partings	9----0	473----0
59	Limestone, blue and fine-grained, with dark horizontal streaks every 12 or 18 inches	8----0	481----0

60	Shale, dark blue, merging into black shale, the blue containing many fossils and the black much pyrite	4----0	485----0
61	Limestone	0----6	486----0
62	Shale, black	0----6	486----0
63	Limestone	0----6	486----6
64	Limestone, dense, 2 inches fossiliferous at 497	15----0	501----6
65	Shale, blue, resting on a parting of bituminous coal too thin to measure	1----0	502----6
66	Shale, sandy	0----7	503----1
67	Coal parting, one-eighth inch		
68	Shale, sandy	0----5	503----6
69	Coal parting, one-eighth inch		
70	Shale, sandy, even-grained	4----6	508----0