

BUREAU of MATERIALS and RESEARCH

GEOTECHNICAL UNIT
GEOLOGY SECTION

BRIDGE FOUNDATION GEOLOGY REPORT
24-75 K 0671-01
BIG BLUE RIVER BRIDGE NO. 1.34 E.B.
AND 1.35 W.B.
POTTAWATOMIE COUNTY

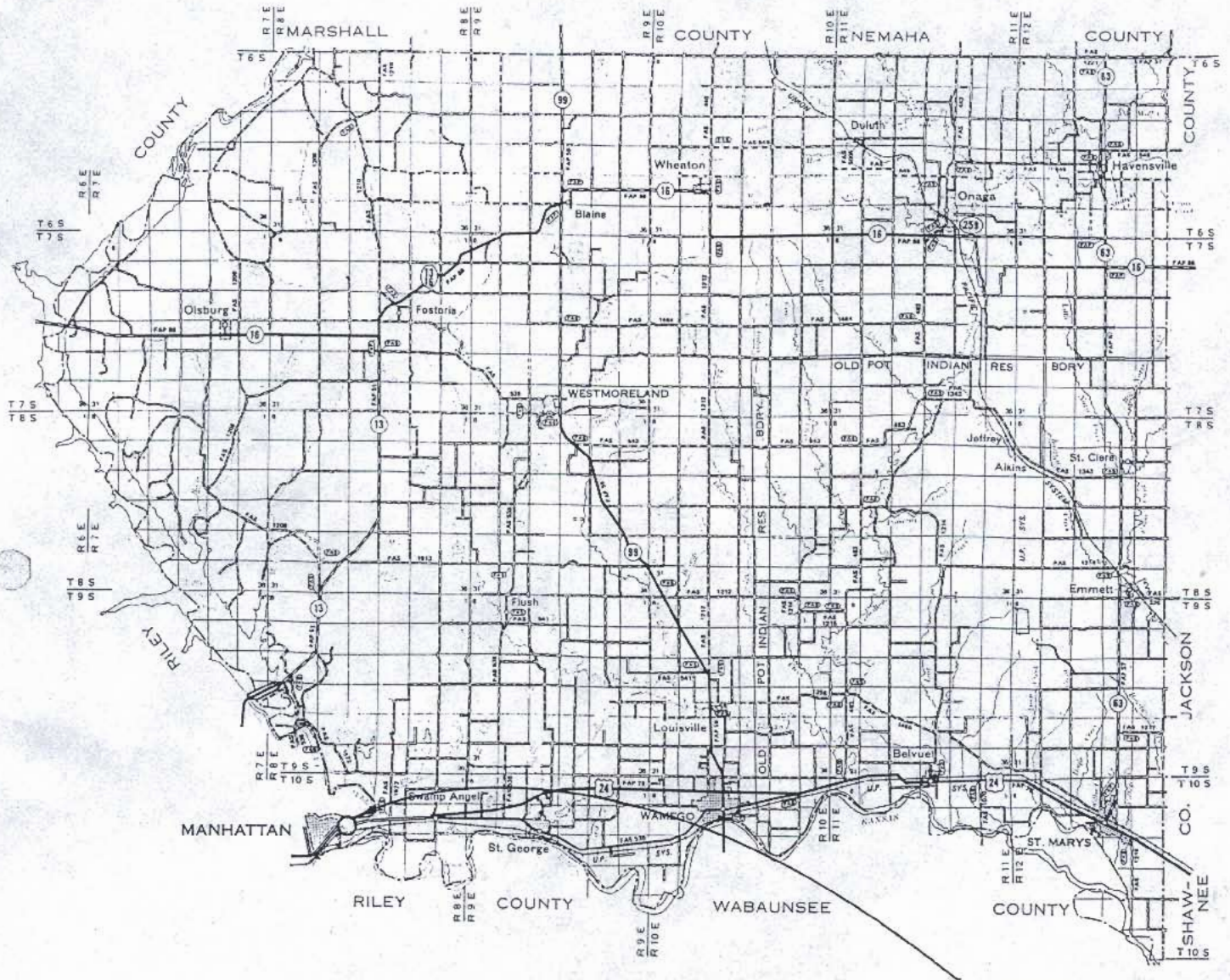


LAWRENCE A. ROCKERS
CHIEF GEOLOGIST

BY

ALEX A. KOTOYANTZ, GEOLOGIST
WALLACE K. TAYLOR, REGIONAL GEOLOGIST

February 1989



LEGEND

ROADS AND ROADWAY FEATURES		ROAD SYSTEM DESIGNATION	
PRIMITIVE ROAD	-----	FEDERAL AID INTERSTATE HIGHWAY SYSTEM	==
GRAVEL AND DRAINED ROAD	-----	FEDERAL AID PRIMARY HIGHWAY SYSTEM	==
SOIL SURFACED ROAD	-----	FEDERAL AID SECONDARY HIGHWAY SYSTEM	==
GRAVEL ON STONE ROAD	-----	INTERSTATE NUMBERED HIGHWAY	==
NOT GRADED OR GRAINED	-----	STATE NUMBERED HIGHWAY	==
GRAVEL ON STONE ROAD	-----	STATE HIGHWAY (UNPAVED OR	==
GRADED AND DRAINED	-----	STATE NUMBERED HIGHWAY	==
GRAVEL ON STONE ROAD WITH	-----	END OF DESIGNATED SYSTEM OR	==
STABILIZED SURFACE	-----	MARKED ROUTE	==
BITUMINOUS ROAD-LOW TYPE	-----		
PAVED ROAD	-----		
DIVIDED HIGHWAY	-----		
HIGHWAY WITH FULL CONTROL OF	-----		
ACCESS AND INTERCHANGE	-----		



BRIDGE FOUNDATION GEOLOGY REPORT

24-75 K-0671-01
 US-24 over Big Blue River
 Br. No. 1.34 & 1.35
 Sta 87+54 (EB) & 87+45 (WB)
 Pottawatomie County

FOUNDATION GEOLOGIC MATERIAL

The alluvium material consists predominantly of fine to coarse sand with silt, clay, and gravel lenses. The maximum thickness of the alluvium is approximately 64.0 feet.

The bedrock, which may be encountered in the footings of the proposed structures, are in the Hamlin Shale Member, the Five Point Limestone Member, and the West Branch Shale Member. The Hamlin Shale Member is composed of clayey and micaceous shale zones that break down when in contact with water. It also includes a sandstone layer that is fine grained and for the most part loosely cemented. The Five Point Limestone Member varies in thickness from 0.7 to 1.2 feet. The West Branch Shale Member is composed of a dark gray, clayey shale that contains a thin coal bed and is very unstable when in contact with water.

FIELD TEST PROCEDURES

The footing material was subjected to field and laboratory testing. Three casing drives and an Air Hammer drive were made at this bridge site. Numerous unconfined compression tests were run on the proposed footing material. All of the casing drives and the Air Hammer drive stopped in clayey shale just below the mantle-bedrock contact. Penetration varies from 0.4 to 1.3 feet.

FOOTING RECOMMENDATIONS

We recommend that H-pile be used on the abutments of proposed piling bridge structures to insure penetration of the alluvial deposits and sufficient penetration into the bedrock. The piling will penetrate the alluvium and attain point bearing in the sandstone zone of the Hamlin Member near the pile tip elevations listed below.

H-PILE FOOTINGS FOR BR. NO.'S 1.34 AND 1.35

<u>Location</u>	<u>Design H-Pile Tip Elevation</u>	<u>Approximate Mantle-Bedrock Elev.</u>
Abutment One		
Station 85+56, E.B.	942.0	947.3
Station 85+37, W.B.	942.0	947.3
Abutment Two		
Station 89+72, E.B.	941.0	947.0
Station 89+52, W.B.	941.0	947.0

The following note should be placed on the construction plans.

"If sufficient bearing and penetration into the bedrock are achieved before the design pile tip elevation is reached, piling should be cut off to avoid damage to the pile by overdriving."

SPREAD FOOTINGS FOR BR. NO.'S 1.34 AND 1.35

We recommend spread footings for the pier foundations. A maximum footing pressure of 10 tsf is appropriate for the sandstone zone in the Hamlin Member. Spread footings should be placed a minimum of 3.0 feet into the sandstone zone.

<u>Location</u>	<u>Spread Footing Elev.</u>	<u>Approximate Mantle-Bedrock Elev.</u>
Pier One		
Station 86+84, E.B.	941.0	947.3
Station 86+65, W.B.	941.0	947.3
Pier Two		
Station 88+44, E.B.	941.0	947.0
Station 88+25, W.B.	941.0	947.0

We recommend that the following note be placed on the bridge sheet.

"Excavations for spread footing shall be cut to exact dimensions and footings poured to neat lines within the bedrock."

DRILLED SHAFTS FOR BR. NO.'S 1.34 AND 1.35

We do not recommend drilled shaft footings for the bridge replacement and widening because site conditions are not favorable. The shale directly below the sandstone is not very competent. It has a relatively low unconfined strength and slakes badly when in contact with air and water. The first 10 to 15 feet of socket could not be included in side friction bearing and would result in a very deep, large diameter shaft, to be constructed under difficult conditions.

HYDROLOGY

The groundwater level in Core Drill No. 1 at Station 85+80, right 25 feet, was at an elevation of 992.7. In Core Drill No. 2 at Station 89+71, right 17 feet, the groundwater elevation was 988.8. The water level in the stream bed was at an elevation of 987.7 on 5/22/89. Groundwater will be present during excavation in the pier locations and sheeting with pumping equipment will be required. Sheet pile can be expected to penetrate to approximately elevation 945.0

STREAM BED PROFILE

A stream bed profile was taken along the north edge of the west bound bridge on 5/22/89. The water level was at an elevation of 987.7. The profile is included in this report.

A hand auger was used to obtain the elevation of the top of the pier cap at Pier No. 1 on the north side. We found 13.0 feet of water and 1.9 feet of clay over the pier cap. The top of the pier cap is at an elevation of 972.8 feet. As can be seen from the attached profile, the stream flowline is below the top of the pile cap. Foundation pile at this footing average 25 feet in length and are point bearing on the hard sandstone of the Hamlin Member. They have little or no lateral support in the bedrock. Because of this, consideration should be given to controlling the scour around this pier and possibly on Pier No. 2, if any reconstruction or potential erosion would move the channel further to the east. Maximum discharge rates for Tuttle Creek Reservoir will provide design criteria for erosion control design.

INVESTIGATION PROCEDURES

Information from seven Core Drill Soundings, an Air Hammer Sounding, and "as built" information was used to develop the foundation geology at the bridge site.

KANSAS DEPARTMENT OF TRANSPORTATION
 REPORT OF SAMPLE OF Geology Cores

Laboratory No. 89- 542
March 13 19 89
 Received March 10 19 89

Specification No. ----- Quantity Represented -----
 Source of material Project
 Sample from Project
 Submitted by A. Kotoyantz; Manhattan Regional Geology Office
 Identification marks Tags with samples
 Project or POV 24-75 K 0671-01 Pottawatomie County Dist. #1
 Type of Construction Br. No. 24-75-1.34 Replacement
 Contractor -----

TEST RESULTS

Sample No.	Station	Dist. ft.	Depth ft.	Description	Qu. t.s.f.	Sample p.c.f.by Dry wt.	Moisture (% of Dry wt.)
1	89+71	17' Rt.	68 ⁹ -69 ⁹		5.08	123.2	15.2
2	89+71	17' Rt.	72 ⁶ -73 ⁵		15.38	129.3	13.7
3	89+71	17' Rt.	74 ² -75 ⁸		12.15	129.8	13.3
4	89+71	17' Rt.	79 ⁷ -80 ⁴		21.3	130.6	10.8
5	89+71	17' Rt.	85 ² -86 ⁰		27.3	134.2	10.5
6	89+71	17' Rt.	90 ⁰ -90 ⁸		28.3	132.9	9.9

cc: D. L. Jarboe
 L. A. Rockers ✓
 W. K. Taylor
 J. A. Frantzen
 Soil Section
 File

Reported by James J. Brennan for
 File Jeff Frantzen, Soils Engineer

KS-1076

D. O. T. FORM No. 623

KANSAS DEPARTMENT OF TRANSPORTATION

GEOLOGY SECTION

DATE 8-31-83
 WEATHER Hot
 COUNTY Pott.
 BR. NO. 1.34

PARTY
Tearley
Standt
Ashren

DIV. ___ ROUTE 24 SEC 25 CL K PROJ. 0671 SEC. ___ AGR 01 CL. ___

14' R.H.

T.H. EL. 1002.43 STA. 89+70⁵ SDG. NO. 1

DEPTH	0-1	1-2	2-3	3-4	4-5
0-5	1 10	2 12	2 14	3 17	3 20
5-10					1 3
10-15	1 2	1 3	3 6	11 17	13 30
15-20	1 4	3 7	2 9	6 15	5 20
20-25	1 5	4 9	4 13	7 20	7 27
25-30	1 5	6 11	6 17	6 23	11 34
30-35	1 7	4 11	8 19	6 25	9 34
35-40	1 9	5 24	6 30	8 38	18 56
40-45	1 15	10 25	12 37	12 49	24 73
45-50	1 10	17 27	18 45	19 64	20 84
50-55	1 12	12 24	14 38	16 54	21 75
55-60	1 548				
60-65					
65-70					
70-75					
75-80					
80-85					
85-90					
90-95					
95-100					
100-105					
105-110					
110-115					
115-120					
120-125					

Refusal
 @
 55⁶
946.83

NO. 2 McK. & T. AIR HAMMER TIMED AT SECONDS PER FT.

REMARKS: Harder 55² Vary hard 55³ (3 mi. X 38 sec. for the last teeth

COMPRESSOR TIME - BEGINNING _____ COMPLETION 1756³

KANSAS DEPARTMENT OF TRANSPORTATION
 REPORT OF SAMPLE OF Geology Cores

Laboratory No. 89-452
March 13 19 89
 Received March 10 19 89

Specification No. ----- Quantity Represented -----
 Source of material Project
 Sample from Project
 Submitted by A. Kotoyantz; Manhattan Regional Geology Office
 Identification marks Tags with samples
 Project or POV 24-75 K 0671-01 Pottawatomie County Dist. #1
 Type of Construction Br. No. 24-75-1.34 Replacement
 Contractor -----

TEST RESULTS

T.H.E 1002^E

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1	89+71	17' Rt.	68 ⁹ -69 ⁹		5.08	123.2	15.2
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5	89+71	17' Rt.	85 ² -86 ⁰		27.3	134.2	10.5
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