

BUREAU of MATERIALS and RESEARCH

**GEOTECHNICAL UNIT
GEOLOGY SECTION**

GEOLOGY REPORT

Project 99-75 K-6421-01

**Bridge Replacement Project
Bridge Approaches for K-99 over Rock Creek (037)
and Rock Creek Drainage (038)
21.98 km North of US-24 and 0.19 km North of State Street (Westmoreland)**

Pottawatomie County



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BY

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July 2002

Kansas Department of Transportation

MEMO TO: Jim L. Kowach, P.E., Chief, Bureau of Design

ATTENTION: James O. Brewer, P.E., Engineering Manager, State Road Office

FROM: Delmar Thompson, P.G., Regional Geologist, Lawrence

DATE: July 10, 2002

SUBJECT: Geology Report

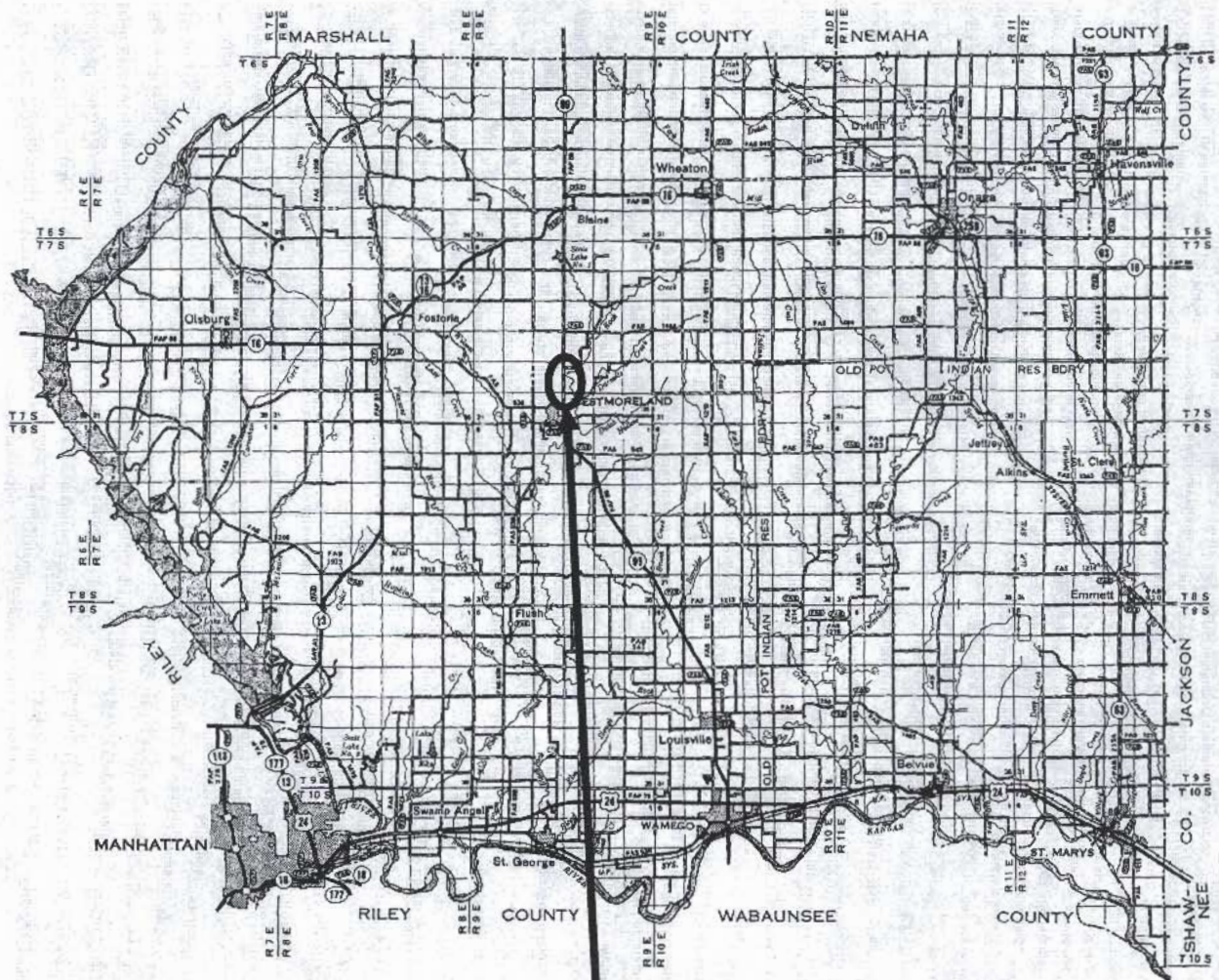
RE: Project 99-75 K-6421-01
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Pottawatomie County

Three copies of the above report are attached to this memorandum. A Geologic Stratigraphic Section will be drawn on the Microstation Workstation and will be placed on the Design file server under the filename 64210125.dgn.

If questions arise over the contents of this report or if further assistance is required, please contact the Lawrence Regional Geology Office.

LSI:GNC:RWH:DLT: jmc

c: Bureau of Construction and Maintenance
District I
Regional Geology Offices
Project File



Project 99-75 K-6421-01

**Bridge Approaches for K-99 over Rock Creek (037)
and Rock Creek Drainage (038)**

Pottawatomie County

INTRODUCTION

This report presents geological information obtained by the Kansas Department of Transportation through field and laboratory studies and is submitted for use in the design and construction of the project. This report is best utilized in conjunction with the plan-profile and cross-section sheets for the project.

This project involves the reconstruction and grading of the bridge approaches for the proposed bridge replacements of K-99 over Rock Creek and K-99 over Rock Creek Drainage. We do not expect any bedrock to be encountered in the reconstruction of the bridge approaches, however, minor amounts of bedrock will be encountered during the construction of the channel change at Rock Creek Drainage. Design recommendations for each location is detailed in this report.

The report is divided into three sections. Section I is a generalized stratigraphic illustration and brief description of the geologic units occurring within the project construction limits. Section II contains a discussion of the structure and physical characteristics of the strata that will be encountered in the project limits. Section III details specific information and recommendations pertaining to the design and construction of the project.

CONTENTS

SECTION I	General Geologic Section and Description
SECTION II	Geology of the Project
SECTION III	Engineering Geology Recommendations

Section II

GEOLOGY OF THE PROJECT

Topography of the project area consists of the narrow flood plain of Rock Creek and Rock Creek Drainage flanked by the "Flint Hills" of the region. The project construction limits are confined to the flood plain.

Soil Mantle

The soil mantle varies in thickness from approximately 3.0 to 4.0 m thick at the north and south ends of the project and near Rock Creek Drainage to approximately 9.5 m thick at the Rock Creek Bridge location. Over all, the soil mantle consists of rich dark brown silty clay with some small and scattered light gravel. Near the creek locations heavier amounts of gravel and thin buried gravel bars are present.

Council Grove Group Speiser Shale Formation

Only minor amounts of the upper Speiser Shale Formation will be encountered during the channel change on Rock Creek Drainage. The upper Speiser Shale consists of dark gray to blue gray shale with a few thin limestone beds. Due to the thin nature of the limestone beds differentiating the limestone from shale on the cross-sections is not possible. The total thickness of the Speiser Shale Formation is over 7.5 meters.

Additional bedrock units will be encountered during the proposed bridge replacements. These units will be detailed in the Geology Bridge Replacement reports.

Section III

ENGINEERING GEOLOGY RECOMMENDATIONS

Geologic bedrock formations and members have been plotted on the plan-profile and cross-section sheets. All bedrock excavation within the geologic units will be considered rock excavation.

ICES ROADS GEOLOGY ABBREVIATIONS

Following is a list of the ICES code abbreviations used on this project.

Soil Mantle	Mantle
Common Excavation	(C)
Rock Excavation	(R)
Speiser Shale Formation	SPSR
Shale	SH

K-99 Mainline At Rock Creek

Station 22+175 to 22+575 (Bridge Approaches to Rock Creek)

Construction through this area will involve the reconstruction of the bridge approaches to the Rock Creek Bridge. No bedrock will be encountered and all backslopes should be placed at a 1:3 or flatter slope.

In addition to the reconstruction of the bridge approaches, the left backslope is being extended to accommodate the construction of a paved walkway leading into the Oregon Trail Crossing Historical Park. This nature trail walkway will connect with the proposed pedestrian walkway, to be constructed on the west side of the new bridge, and curve to the left and wrap back under the new bridge where it will connect with the existing historical hiking trail.

HYDROLOGY

Hydrology problems are not anticipated for the reconstruction and grading of the bridge approaches for proposed bridge replacement. Underdrains will not be required through this area.

A hand dug water well is present in the vicinity of Station 22+205, 20 m left. At last check with the design staff, plans were being drawn to change the backslope and construction limits in this area to avoid the well. If the backslope is designed at a steeper slope to avoid this well, no further action will be required in and around the well.

If the design plans are not modified and the current backslope design is utilized, this well will require plugging and an underdrain or blanket drain will need to be designed to outlet the flow of spring water in this area.

GRAVE SITE MARKER

A grave site marker is in place at Station 22+235, 15 m left. Plans indicate that this marker is not to be disturbed. However, during the on location Field Check Meeting, this marker was discussed and the suggestion was made to move the marker closer to the proposed new walkway, as this marker is not actually on the grave site. The actual grave site is north of the marker, under the roadway. Plans are being made to relocate the marker next to the walkway, along with a newly erected sign explaining the history of the marker and the location of the actual grave. Representatives of KDOT as well as owners and caretakers of the Historical Park were in agreement of relocating the marker. Final details as to the possibility of relocating the marker should be obtained by the contractor before construction begins or before the grave marker is disturbed.

K-99 Mainline At Rock Creek Drainage

Minor amounts of bedrock will be encountered during the construction of the channel change on Rock Creek Drainage Structure. The upper portion of the Speiser Shale Formation will be cut near the designed flow line of the proposed channel change. The Speiser Shale Formation consists mainly of firm, clayey to limy shale, but contains several thin limestone and very limy shale zones. One of these thin limestone beds is visible in the existing creek bottom. In much of the area, this limestone bed is approximately .35 to .50 m thick and is serving as the flow line for the existing creek. At most locations along the proposed channel change stationing, this limestone bed will act as the mantle/bedrock interface, and excavation through this limestone will occur. Full depth overbreakage of the thin limestones should be expected. Note that all bedrock excavation will be rock excavation, and will involve the excavation of minor amounts of both limestone and shale.

Station 23+200 to 23+325

Construction through this area will involve the reconstruction of the bridge approaches to the Rock Creek Drainage Bridge, construction of a temporary Shoo Fly Detour to the right side of the project, and construction of a channel change of Rock Creek Drainage. No bedrock will be encountered and all excavation is expected to be in the soil mantle. All backslopes should be constructed at a 1:3 or flatter slope.

Station 23+325 to 23+475

Construction through this area will involve the reconstruction of the bridge approaches to the Rock Creek Drainage Bridge, construction of a temporary Shoo Fly Detour to the right side of the project, and construction of a channel change of Rock Creek Drainage.

Only minor amounts of soil mantle will be excavated to the left of centerline for the re-grading of the left ditch. To the right of centerline, a large amount of fill will be placed to construct the temporary Shoo Fly Detour, with minor to moderate amounts of soil mantle excavated to construct the new right ditch.

The construction of the Rock Creek Drainage channel change through this area will encounter soil mantle as well as minor amounts of rock excavation into bedrock of the upper Speiser Shale Formation. Due to the minor amounts of bedrock that will be excavated, we recommend that all backslopes cut into the bedrock through this area be placed at a matching slope to the overlying soil mantle. All slopes should be constructed at 1:3 or flatter.

<u>UNIT</u>	<u>VMF</u>	<u>EXCAVATION</u>	<u>BACKSLOPES</u>
Mantle	----	(C)	1:3 or flatter
Speiser Shale Formation SPSR1SHR	1.10	(R)	1:3 or flatter

Station 23+475 to 23+700

This is a cut and fill area for the reconstruction of the bridge approaches to the Rock Creek Drainage Bridge and construction of the temporary Shoo Fly Detour to the right side of the project. All excavation will be common in the soil mantle and all backslopes should be constructed at a 1:3 or flatter slope.

Main Street

Station 4+970 to 5+000

The intersection of Main Street and K-99 is being reconstructed and improved. No bedrock will be encountered and all backslopes should be placed at 1:3 or flatter. Excavation for the cross pipe at Station 4+985 will be in the soil mantle.

Buried Fuel Tanks

There are several buried fuel tanks in the vicinity of Station 23+255, 18 m right. Ventilation risers and piping are visible above the ground. At this time, no details are available as to how many tanks are buried at this location or the condition of the tanks. It is believed there are at least two tanks in place.

Aluminized Pipe Investigation

Pottawatomie County has been determined to be a county where specific tests on pH and electrical resistivity of soil and water samples at probable corrugated metal pipe (CMP) locations should be conducted. Three locations in the Rock Creek Drainage portion of the project were investigated. Results at two locations indicated that it is suitable to use aluminized pipe. Results from the third location indicate that this is a Class III classification with a medium risk usage rating for aluminized pipe. The three locations are detailed below.

Station 23+244, K-99 Mainline

This location is suitable for the use of aluminized pipe. Soil pH readings were 8.5 and soil resistivity readings were 5652 Ohms/cm³. The classification rating for this location is a

Class I (no risk) category. The estimated service life rating for aluminized pipe at this location is approximately 83 years.

Station 23+325.875, K-99 Mainline

This location is suitable for the use of aluminized pipe. Soil pH readings were 8.5 and soil resistivity readings were 1884 Ohms/cm³. The classification rating for this location is a Class I (no risk) category. The estimated service life rating for aluminized pipe at this location is approximately 60 years.

Station 4+982, Main Street

This location does not appear to be suitable for the use of aluminized pipe. Soil pH readings were 9.0 and soil resistivity readings were 754 Ohms/cm³. The classification rating for this location is a Class III (medium risk) category. The estimated service life rating for aluminized pipe at this location is approximately 12 to 15 years. We recommend not using aluminized pipe at this location.

HYDROLOGY

Hydrology problems are not anticipated for the reconstruction and re-grading of the bridge approaches for the Rock Creek Drainage bridge replacement. Underdrains will not be required through this area.

FINAL DESIGN GEOLOGY REPORT

A Final Design Geology Report will not be required for this project. This report will conclude the Geology Sections involvement in the preliminary design phase of the surface and grading portion of this bridge replacement project. Separate bridge reports will be compiled for the proposed replacements of K-99 over Rock Creek and Rock Creek Drainage.

ACKNOWLEDGEMENTS

The following individuals should be recognized for their help in conducting the geological field investigation for this project: Rob Vervynck, ET. Senior; and Ryan Salber, ET.



KANSAS DEPARTMENT OF TRANSPORTATION

RTE./CO. 99-75	SOUNDING NO. CD #1	SHEET OF 1 of 3
BRIDGE STA. 23+72	PROJ. NO. 99-75 K6421-01	BRIDGE NO. 99-75-15.20(638)
SITE NAME K-99 over Rock Creek Drainage		HOLE STA. 23+4 1/2, 9 m RT
GEOLOGIST Randy Billinger	SCALE: 1:100 (10mm = 1 Meter)	DATE 6-21-02
DRILLER Rob Verwynck	RIG TYPE Mobil B-31	TOP HOLE ELEV. 352.09
GROUNDWATER ELEV 350.41	TOTAL DEPTH 18.74	M/B ELEV. 349.05

BIT TYPE	GEOLOGIC NAME	STRATIGRAPHIC COLUMN	DEPTH	ELEVATION	CLASSIFICATION OF MATERIALS DESCRIPTION AND REMARKS	UNCONFINED COMPRESSION kPa	STANDARD PENETRATION OR CASING DRIVE	
							BLOWS	ELEV
			0°	352.09				
				352				
				351	Silty Clay			
				350				
			2 47	349.62				
			2 89	349.20	Limestone			
				349				
			3 75	348.24	Shale, dark blue-gray	1,698	Sample 1	348.24
				348				
				347	Shale, gray firm			
			5 27	346.82				
			5 5	346.49	Shale, dark gray	410	Sample 2	346.49
			5 23	346.20	Limy shale gray			
			6 03	346	Limestone hard & gray, unit bedded	32,359	Sample 3	346.01
			6 18	345.72	Shale dark gray			
			6 4	345.09	Very limy shale gray			
				345	Shale gray-green	5,632	Sample 4	344.88

SOUNDING NO. CD1		PROJECT NO. K6421-01		SHEET OF 2 of 3					
DATE 6-21-82		RTE/CO. 99-26		TOTAL DEPTH 18.74					
BIT TYPE	GEOLOGIC NAME	STRATIGRAPHIC COLUMN	DEPTH	ELEVATION	CLASSIFICATION OF MATERIALS DESCRIPTION AND REMARKS	UNCONFINED COMPRESSION kPa	STANDARD PENETRATION OR CASING DRIVE		
							BLOWS	ELEV	
	Speiser Shale Formation	Core 4	8.22	344 343.27	Shale gray-green, very good shale				
			Core 5	9.24	343 342.25	Shale gray green, dry + sticky	365	Sample 5 342.63	
				Core 6	11.15	342 340.92	shale, gray-green, good shale ← shale, very limy	2,030	Sample 6 341.02
			Core 7		12.13	340 339.96	Shale, green, good shale	942	Sample 7 340.02
				Blue Rapids Shale Formation	12.53	339	Limestone brown this shale break near middle		
			Core 8		16.82	338 338	Shale, dark grey, good shale	1,723	Sample 8 338.5
					Core 9	15.73		337 336.2	288
			Core 10			16.82	336 335.51	Shale grey, good shale	
				16.82	335 335.27	Limy shale, dark grey			
				17.10	335 334.9	Shale limy grey			
	17.34	335 334.28		Shale Green					
	Causeway			Limestone shaly light greenish					

SOUNDING NO. <i>CD1</i>		PROJECT NO. <i>K6421-01</i>		SHEET OF <i>3 of 3</i>				
DATE <i>6-21-07</i>		RTE./CO. <i>99-75</i>		TOTAL DEPTH <i>18.74</i>				
BIT TYPE	GEOLOGIC NAME	STRATIGRAPHIC COLUMN	DEPTH	ELEVATION	CLASSIFICATION OF MATERIALS DESCRIPTION AND REMARKS	UNCONFINED COMPRESSION <i>KPa</i>	STANDARD PENETRATION OR CASING DRIVE	
							BLOWS	ELEV
<i>Crouse Ls Formation</i>		<i>Core II</i>	<i>17.8</i>	<i>334.25</i>	Limestone shaly light greenish	<i>32, 338</i>	<i>Sample 10</i>	<i>334.25</i>
			<i>18.10</i>	<i>333.15</i> - <i>334</i>	Limestone hard, gray green			
			<i>18.44</i>	<i>333.65</i>	Limestone shaly, gray green			
			<i>18.74</i>	<i>333.22</i>	Shale, greenish			
				<i>333</i>	<i>Total Depth</i>			

K-99 Over Rock Creek Drainage @ Westmoreland

Project No. 99-75 K-6421-01

	<u>Elevation</u>	<u>Depth</u>		
Core Hole #1	352.09	0.00	Silty clay.	
Sta. 23+412	349.62	2.47	Limestone.	Speiser Shale Formation
9 m Rt. C.L.	349.20	2.89	Shale.	
Water Level 1.68 m	349.05	3.04	Begin coring.	
Water Elev. 350.41				
Date Drilled 5/28/02				

Core #1	349.05	3.04	Shale, dark blue to gray, One very thin limestone stringer.
3.04 to 3.75 m	348.34	3.75	End core #1.
Cut 0.7 m			Sample #1 3.56 to 3.72 m, Shale, blue-gray.
Recovered 0.7 m			
RQD = 83%			

Core #2	348.34	3.75	Shale, gray, firm.	Speiser Shale Formation
3.75 to 5.27 m	346.82	5.27	End core #2.	
Cut 1.52 m				
Recovered 0.85 m				
RQD = NA Core slid out, lost 0.67 m down hole.				

Augured casing down more to get a better seat, cleaned out hole down to 5.27 m.

Core #3	346.82	5.27	Shale, dark gray.
5.27 to 6.79 m	346.48	5.61	Limy shale, gray.
Cut 1.52 m	346.30	5.79	Limestone, hard, and gray, unit bedded.
Recovered 1.40 m	346.06	6.03	Shale, dark gray.
RQD = 86 %	345.91	6.18	Very limy shale, gray.
Lost 0.03 m off top	345.69	6.40	Shale, gray-green, and gray.
and 0.09 m off	345.30	6.79	End core #3.
bottom.			Sample #2. 5.39 to 5.61 m, Shale, dark gray. Sample #3. 5.82 to 6.00 m, Limestone.

Core # 4	345.30	6.79	Shale, gray-green, very good shale.	Speiser Shale Formation
6.79 to 8.32 m	343.77	8.32	End core #4.	
Cut 1.52 m			Sample #4 7.19 to 7.41 m, Shale, gray-green.	
Recovered 1.52 m RQD = 100%				

Core # 5	343.77	8.32	Shale, gray-green, dry and sticky.
8.32 to 9.84 m	342.25	9.84	End core #5.
Cut 1.52 m			Sample #5 9.17 to 9.42 m, Shale, gray-green.
Recovered 1.52 m RQD = 88%			

K-99 Over Rock Creek Drainage @ Westmoreland

Project No. 99-75 K-6421-01

	<u>Elevation</u>	<u>Depth</u>	
Core # 6	342.25	9.84	Shale, gray-green, good shale.
9.84 to 11.25 m	340.94	11.15	Shale, limy.
Cut 1.52 m	340.84	11.25	Shale, gray-green.
Recovered 1.52 m			End core #6.
RQD=100%			Sample #6. 10.82 to 11.00 m, Shale, gray-green.

Core # 7	340.84	11.25	Shale, green, good shale.
11.25 to 12.89 m	339.96	12.13	Limestone, brown, very thin shale break in middle.
Cut 1.52 m			
Recovered 1.52 m	339.56	12.53	Shale, dark gray.
RQD=94%	339.20	12.89	End core #7.
			Sample #7 11.89 to 12.07 m, Shale, green.

**Speiser Shale
Formation**

**Funston Limestone
Formation**

**Blue Rapids
Shale Formation**

Core # 8	339.20	12.89	Shale, dark gray, good shale.
12.89 to 14.26 m	337.83	14.26	End core #8.
Cut 1.37 m			Sample #8 13.38 to 13.59 m, Shale, gray.
Recovered 1.37 m			
RQD=100%			

Core #9	337.83	14.26	Shale, dark gray, good shale.
14.26 to 15.79 m	336.30	15.79	End core #9.
Cut 1.52 m			Sample #9 15.12 to 15.33 m, Shale, dark gray.
Recovered 1.52 m			
RQD=100%			

Core #10	336.30	15.79	Shale, gray, good shale.
15.79 to 17.22 m	335.51	16.58	Limy shale, dark gray.
Cut 1.43 m	335.27	16.82	Shale, limy, gray.
Recovered 1.43 m	334.99	17.10	Shale, green, limy.
RQD=96%	334.87	17.22	End core #10.

**Blue Rapids
Shale Formation**

Core #11	334.87	17.22	Shale, green.
17.22 to 18.74 m	334.78	17.31	Limestone, shaly, light greenish-white.
Cut 1.52 m	334.29	17.80	Limestone, hard, gray-green.
Recovered 1.49 m	333.99	18.10	Limestone, shaly, gray-green.
RQD=92%	333.65	18.44	Shale, greenish, good shale.
	333.35	18.74	End core #11.
			Sample #10 17.86 to 18.04 m, Limestone.

**Crouse Limestone
Formation**