Approved March 15, 1989
Date

MINUTES OF THE House COMMITTEE ON Transportation.

The meeting was called to order by Rex Crowell at
Chairperson

2:50 ~~a.m.~~/p.m. on January 10, 1989 in room 519-S of the Capitol.

All members were present except: Rep. Gross

Committee staff present:
Bruce Kinzie, Revisor of Statutes
Hank Avila, Legislative Research
Donna Mulligan, Committee Secretary

Conferees appearing before the committee:

Mr. Horace B. Edwards, Secretary of Transportation
Ms. Deb Miller, Kansas Department of Transportation

The meeting was called to order by Chairman Crowell, and it was announced the main order of business was a presentation by the Kansas Department of Transportation concerning the highway and bridge needs study which had been conducted.

Mr. Horace B. Edwards, Secretary, Kansas Department of Transportation, spoke briefly and introduced Ms. Deb Miller, KDOT, who conducted a slide presentation regarding the highway and bridge needs study.

Ms. Miller explained that the study was based on the existing system based upon roadway characteristics such as shoulder width, lane width, and deficient bridges. (See Attachment 1)

Ms. Miller said Kansas has a 9,639 mile state highway system, and by law cannot exceed 10,000 miles. She reported there is a total of 5,111 bridges on the state highway system and Kansas Turnpike, and the number of these bridges considered substandard is 1,293.

She added that travel in Kansas has grown at a rate of just over 3 percent, and growth has been greatest on the Interstate System with a 4 percent annual growth rate since 1977 and a 5.5 percent growth rate since 1982. Ms. Miller said growth has been the greatest on the Interstate in the state's major urban areas of Kansas City, Wichita and Topeka.

Ms. Miller said that lane width is one of the most critical components of a highway as it has a direct effect on the ability of a highway to carry traffic safely and efficiently. She added that lane width on the state highway system generally varies from 9 feet to 12 feet, and it is desirable to have lane widths which are 11 feet or greater with 12 feet being the most desirable.

Ms. Miller said that shoulder width is another very important physical characteristic of a highway, and they generally vary from zero to 10 feet on the State Highway System.

She outlined that proper shoulder width is important in order to 1) provide a recovery area for vehicles drifting beyond the edge of the lane; 2) to provide parking during emergency stops; and 3) to provide lateral support for the pavement.

Mr. Miller reported that Kansas has a significant investment in bridges on the State Highway System, and has responsibility for over 4,700 bridges on, over, or adjacent to a state highway. She said the average age of these bridges is approximately 32 years and many were not designed for today's traffic.

The meeting was adjourned at 3:30 p.m.

Rex Crowell

Rex Crowell, Chairman

OMMITTEE: Transportation

DATE: Jan. 10 1989

PLE PRINT

NAME	ADDRESS	COMPANY/ORGANIZATION
Rich Dame	Hoisington	B. L. [illegible] E.
Rick Kready	Topeka	KPL Gas Service
Horace Edwards	TOPEKA	KDOT
Terry Heidner	Topeka	KDOT
~~Ted~~ Judy Runnels	"	Economic Lifelines
Ed DeSoignie	TOPEKA	KS CONTRACTORS Assoc.
Tom Whitaker	Topeka	Ks Motor Carriers Assn
Don Lindsey	OSAWATOMIE,	UNITED TRANS UNION
Mike Grogan	Topeka	KDOT

1-10-89

PRESENTATION TO THE 1988 SPECIAL COMMITTEE ON TRANSPORTATION

KANSAS DEPARTMENT OF TRANSPORTATION REPORT ON HIGHWAY NEEDS

AUGUST 22, 1988

Attach. 1

TABLE OF CONTENTS

BACKGROUND

The State of Kansas has a 9,639-mile State Highway System. By law, the State Highway System cannot exceed 10,000 miles. Total public road mileage in Kansas is 132,641 miles. Kansas is near the middle of all states in miles under state jurisdiction, but we have the 5th largest system of public roads in the nation; Texas, California, Illinois and Minnesota all have greater public road mileage.

In Kansas, there is a total of 5,111 bridges on the State Highway System and the Kansas Turnpike. The number of these bridges that are considered substandard is 1,293. In total, there are just over 25,700 public road bridges in the State, of which more than 13,000 are substandard.

In 1987, there were more than 31 million daily vehicle miles traveled on the State Highway System. This figure represents almost 56 percent of all of the daily vehicle miles driven in the State of Kansas, even though the State Highway System comprises only 7 percent of the public road miles in the State.

The Kansas Interstate System contains 870 miles, making up less than 1 percent of all public road miles in the State, yet it carries 19 percent of all the travel in the State, a percentage which grows yearly.

Over all, travel in the State has been growing, but at a modest annual rate of less than 2 percent since 1977. In the last five years, travel has grown at a rate of just over 3 percent. Growth has been greatest on the Interstate System with a 4 percent annual growth rate since 1977 and a 5.5 percent growth rate since 1982. Growth has been the greatest on the Interstate in the State's major urban areas of Kansas City, Wichita and Topeka. Since 1977, Wichita has led the growth with a rate of just over 7 percent, Kansas City was second at just under 7 percent and Topeka showed a growth rate of 6 percent on the Interstate System. When the focus is narrowed to the past 5 years, however, Kansas City leads with an 11.7 percent growth rate followed by Topeka with a 7.6 percent growth rate and Wichita drops to a growth rate of just over 5 percent.

The accident rate and the fatal accident rate on the State Highway System has declined in the ten year period of 1978 to 1987. In 1978, the accident rate for the State Highway System was 2.59 accidents per million vehicle miles, while in 1987 it was 1.88 accidents per million vehicle miles. In 1978, the fatal accident rate was 2.80 per 100 million vehicle miles and in 1987 it was 1.94 per 100 million vehicle miles.

SCOPE OF STUDY

The following information represents highway and bridge needs as they exist today.[1] In order to properly use this information, it is important to understand not only what the information represents, but also, what it does not represent.

This study is presented as a traditional highway needs study in that it looks at highway needs on the existing system based upon roadway characteristics such as shoulder width, lane width, deficient bridges, etc. This study, however, differs from a classic needs study in that the time consuming step of determining the improvement necessary to correct each deficiency and the cost estimate to make the improvement has not been taken.

This study also differs from traditional needs studies in that the needs are represented in a more realistic manner than has been done previously. Recent changes in national standards, which are applied to construction work in Kansas, allow more flexibility. We have taken advantage of that flexibility and as a consequence, we believe the needs which are presented within this document are a realistic representation of improvements which are most needed.

This study is not a study of all of the road, street and bridge needs in the State. It is a study of the needs only on the State Highway System, and does not address the needs of local governments. Also, this study does not take into consideration the expansion or economic development needs of the system. While these are also legitimate needs, they are not addressed in this presentation.

In the following sections, detailed information will be supplied on each of the highway characteristics which have been highlighted in this report.

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1 NOTE: Roadway sections which are under contract or scheduled to be let to contract in fiscal year 1989 are not shown as a need.

LANE WIDTH

Lane width is one of the most critical components of a highway. It has a direct effect on the ability of a highway to carry traffic safely and efficiently. Lane width on the State Highway System generally varies from 9 feet to 12 feet. It is desirable to have lane widths which are 11 feet or greater with 12 feet being the most desirable and the standard to which we build and reconstruct. The importance of lane width depends on a number of factors including the amount of traffic, shoulder width, prevailing speeds, the number of trucks and whether it is a divided or undivided facility.

Studies indicate that the safety of a road can be related to its lane width. Generally, traffic accident types described as "run off the road" and "opposite direction" decrease with increasing lane width. Other accident types such as rear-end and angle accidents are not directly affected by improvements in lane width.

Additional lane width is particularly desirable on roads with large numbers of commercial vehicles. This is especially true on undivided highways where wider lanes give drivers more of a sense of security and improved safety when meeting large trucks. Further increasing the importance of lane width, the 1982 Federal Surface Transportation Assistance Act increased the allowable width of trucks resulting in an increase in the number of wider vehicles traveling Kansas roads. The movement of overwidth farm vehicles between fields also makes the case for wider lanes.

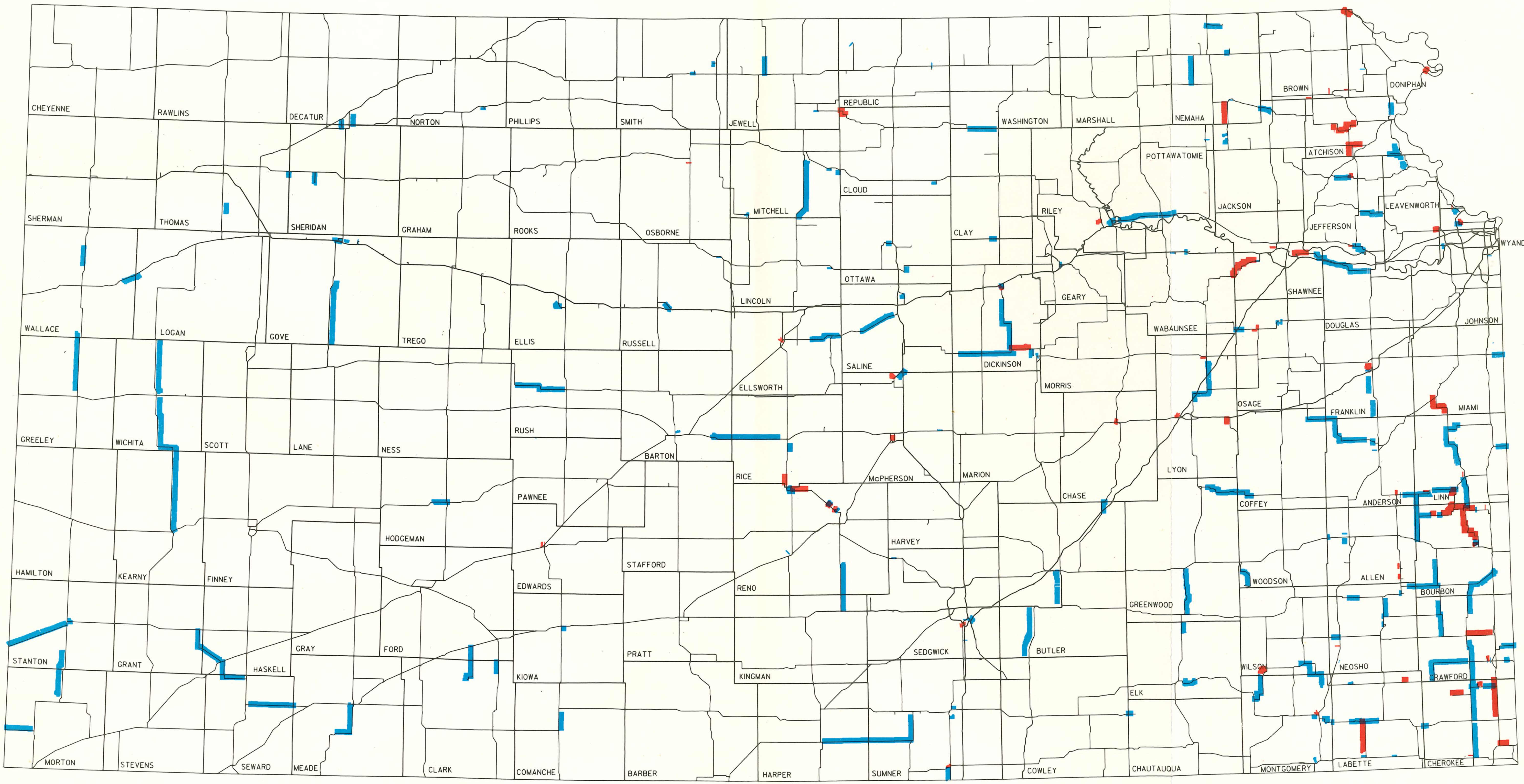
Roads with wider lanes require less shoulder maintenance. Additional lane width provides more room for vehicles to remain in the traffic lane and off the shoulder area. Those roads with narrow lanes generally require additional shoulder maintenance caused by vehicles driving on the shoulder.

Finally, lane width has an effect on the capacity of a road to carry traffic. Wider roads generally have the ability to carry more traffic and therefore relieve congestion. Narrow two lane roads cause motorists to drive closer to vehicles in the opposing lane which causes drivers to slow down and allow larger headways between vehicles in the same lane. As lanes get wider, drivers are less concerned about adjacent vehicles and other obstructions and tend to increase their speeds to a normal operating level.

For safety and maintenance reasons, it is important to widen lanes on all state highways with lane widths less than 11 feet. These roads, with pavements less than 22 feet, need to be widened without regard to the traffic or class of road involved. For roads which carry more traffic and are more important to the transportation network, all pavements less than 24 feet (12 feet lanes) should be widened to 24 feet.

The following map depicts lane width needs. Identified are 140 miles which have lane widths less than 11 feet and 870 miles which have lane widths equal to 11 feet.

LANE WIDTH NEEDS



10 0 10 20 30 MILES

LANE WIDTH LESS THAN 11 FEET

LANE WIDTH - 11 FEET

PREPARED BY THE
KANSAS DEPARTMENT OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING
JULY 26,1988
USING CANSYS DATABASE 7/13/88

1-5a

SHOULDER WIDTH

Shoulder width is another important physical characteristic of a highway. Shoulder width, like lane width, has a direct effect on the ability of a highway to carry traffic safely and efficiently. Shoulder widths on the State Highway System generally vary from zero to 10 feet. The relative importance of shoulder width depends on a number of factors including volume of traffic, lane width, terrain, prevailing speeds, number of trucks and whether the facility is divided or undivided.

Studies have also indicated that the safety of a road can be related to its shoulder width. "Run off the Road" and "Opposite Direction" accidents decrease with increases in shoulder width.

Additional shoulder width is particularly important on roads with large numbers of trucks. The shoulder offers a recovery area for vehicles traveling on the road which have drifted beyond the edge of the lane. This drifting effect occurs more often when vehicles shy away from wider vehicles on undivided facilities.

Shoulder width is also important to provide for parking during emergency stops. The importance of this need depends on factors such as the traffic carried by the road, the number of hills where visibility is restricted and the pavement width. A desirable shoulder width for emergency stops allows a vehicle to pull completely off the pavement and have room to change a tire on the drivers side without entering the traffic lane.

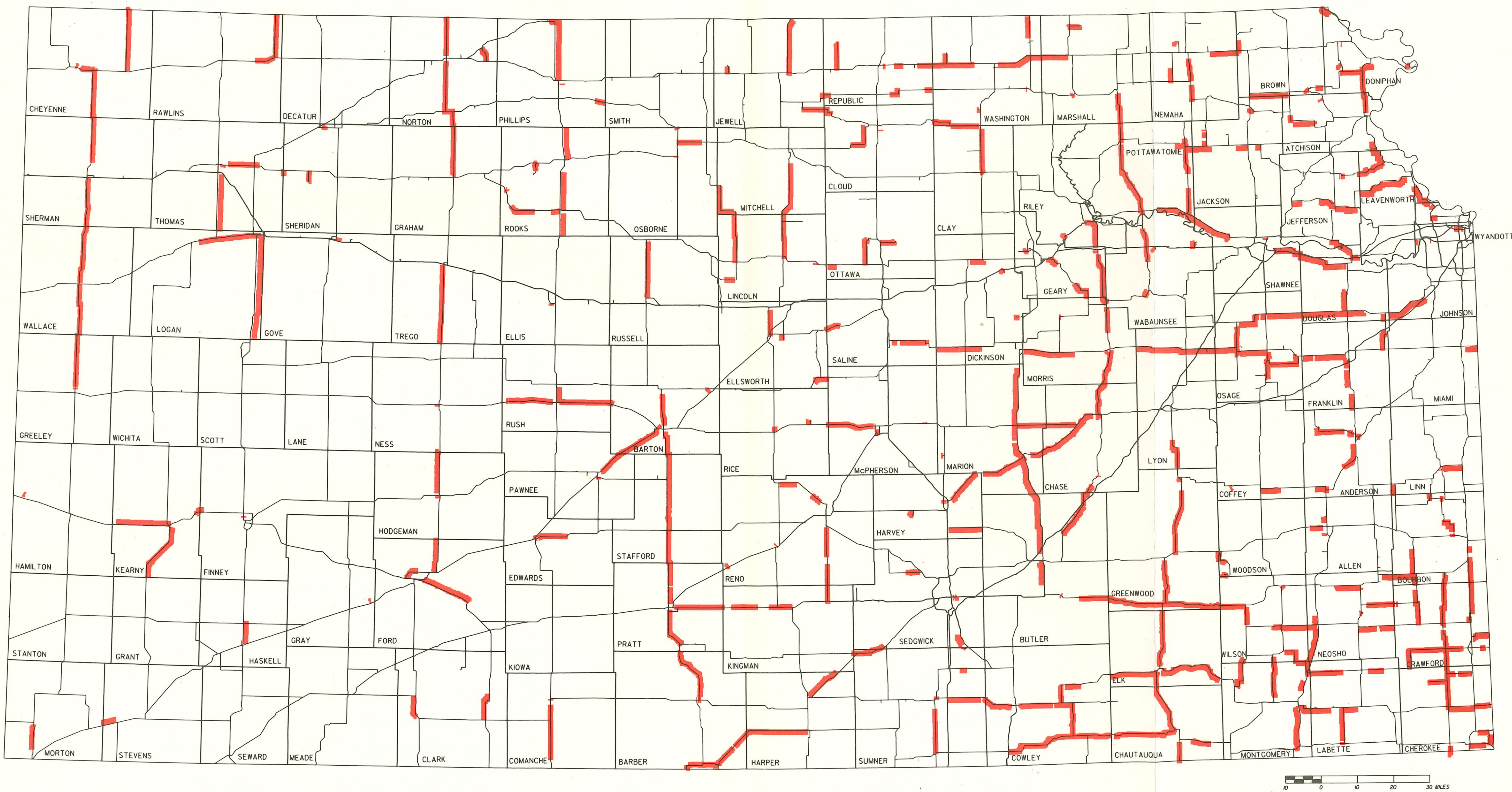
Shoulders also provide lateral support for the pavement. This lateral support provides additional strength to the pavement and tends to reduce maintenance on the pavement. The added strength depends on both the width and type of shoulder.

Shoulder width also has somewhat of an effect on the capacity of a road to carry traffic. Narrow shoulders have much the same effect as narrow lanes, although to a lesser extent, of causing drivers to slow down and thus reduce the ability of the road to carry larger numbers of vehicles.

From a cost effective viewpoint it is most desirable to widen shoulders which are significantly more narrow than the prevailing design standards. Projects to widen shoulders at these locations would yield the greatest improvements in safety and performance. For this study, those roads which have shoulders which are more than 2 feet less than design width have been identified as having shoulder width needs.

The following map depicts shoulder width needs. Identified are 2075 miles which need shoulder widening.

SHOULDER WIDTH NEEDS



SECTIONS WITH SHOULDER WIDTH NEEDS - ALL ROUTES

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I-7a

SHOULDER TYPE

The way a shoulder functions depends on its surface type as well as its width. There are two broad categories of shoulder types, stabilized and unstabilized. A shoulder is classified as being stabilized or unstabilized by its material composition and its strength. Shoulders which are classified as stabilized include concrete, asphalt and rock shoulders mixed with calcium chloride. These shoulders are constructed with sufficient strength to carry occasional traffic loads. Shoulders which are classified as unstabilized are turf or rock without calcium chloride. These unstabilized shoulders do not generally have the strength to effectively carry occasional traffic loads.

Shoulder width was discussed previously as being important primarily for safety reasons. In order to function properly, a shoulder has to maintain its shape and carry occasional traffic despite the effects of traffic and the environment. Stabilized shoulders are preferred to unstabilized because they have the ability to maintain their shape and carry occasional traffic with less maintenance than unstabilized shoulders.

A weak unstabilized shoulder may function satisfactorily during fair weather if it is regularly maintained by mowing and/or blading. This same shoulder, however, may not function as desired during wet weather or under heavy loads. The weak unstabilized shoulder may not be able to safely redirect vehicles which have strayed from the traffic lanes or provide a safe area to park during emergencies.

A problem which is of particular concern when maintaining shoulders is the problem of edge drop-off. This refers to a vertical drop which occurs at the point where the pavement and shoulder meet. Edge drop-offs can exist for a short distance or can, if uncorrected, occur over great distances. These drop-offs can be caused by traffic driving on a weak shoulder, settlement of the shoulder material or by swirling winds caused by trucks. The latter occurs most often on roads that carry large numbers of trucks traveling at highway speeds.

Edge drop-offs are of particular concern because of the effect they can have on a vehicle which strays from the traffic lane. Where an edge drop-off exists, the possibility of the vehicle going out of control, perhaps into opposing traffic, is greatly increased. For this reason, a significant maintenance effort is expended to reduce the existence of these hazards.

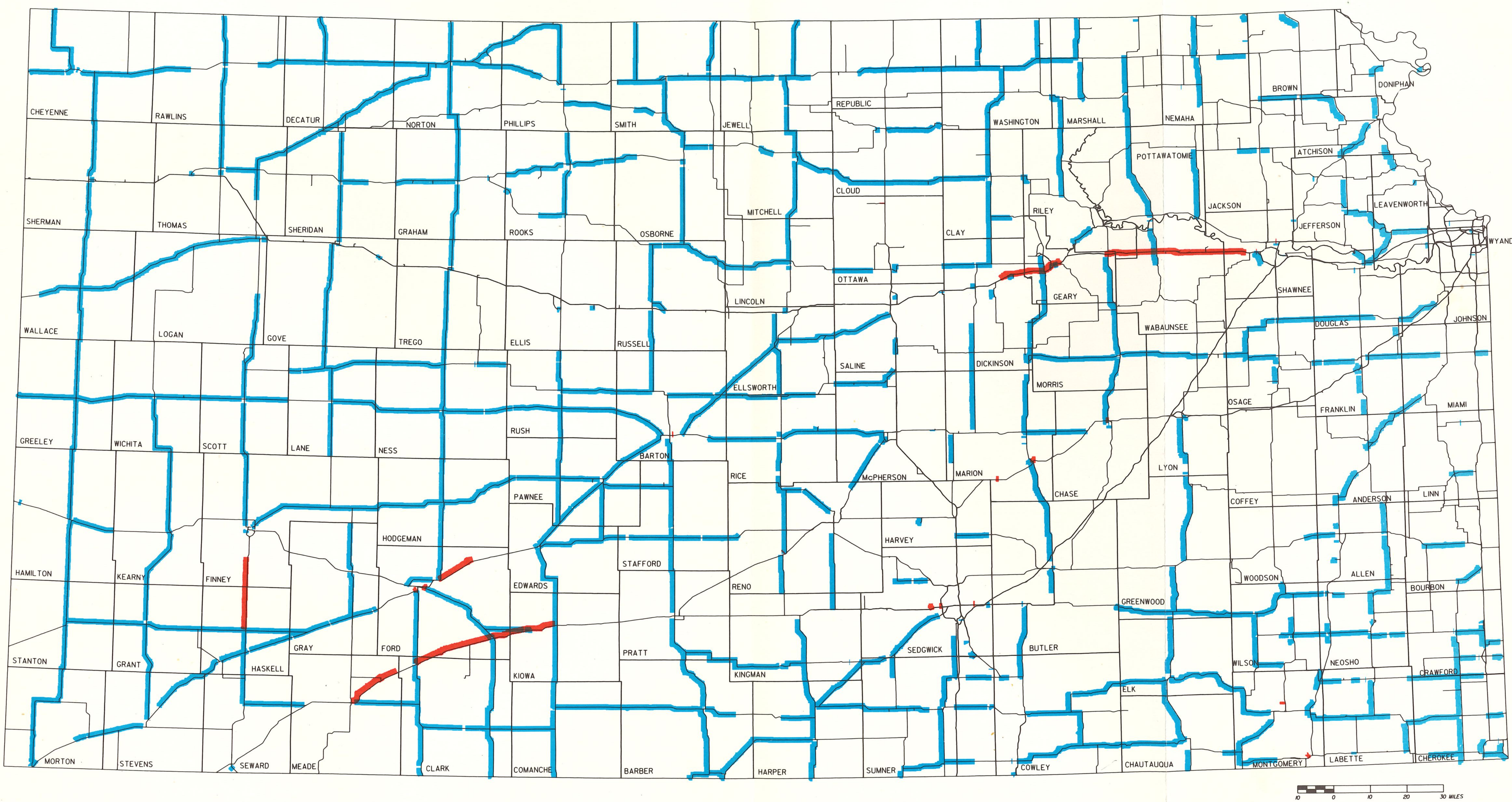
Not all stabilized shoulders effectively eliminate the edge drop-off problem. Rock stabilized shoulders have the strength to support most normal highway loads even in wet weather but are susceptible to swirling wind erosion from truck traffic. Partial depth paved shoulders can withstand the swirling wind from traffic but will settle under loading from heavy vehicles traveling along the edge of the lane. To reduce the possibility of edge drop-offs and the need for continued maintenance full depth paved shoulders are needed.

One way KDOT has addressed this problem of edge drop-offs economically is to construct composite shoulders. These composite shoulders consist of approximately 3 feet of paved shoulder adjacent to the lane with the remainder of the shoulder being stabilized rock or unstabilized turf shoulder. This 3 foot strip of paved shoulder provides suitable strength to support traffic driving on the edge of the lane and is not susceptible to the effects of swirling wind from adjacent traffic. The remainder of the shoulder can then be constructed of lower cost materials.

The need for adequate shoulder type is reflected in the shoulder policy adopted by the Kansas Department of Transportation. The policy recognizes, that to be adequate, a shoulder not only needs to be of some minimum width but also should be of a type which is consistent with the importance of the road and the volume of traffic. For this study roads which have a shoulder type not meeting KDOT's shoulder policy for type are identified as having shoulder type needs.

The following map depicts shoulder type needs. Identified are 160 miles of shoulders which need full width pavement and 5100 miles which need composite shoulders consistent with KDOT's shoulder policy.

SHOULDER TYPE NEEDS



SHOULDERS NEEDING FULL WIDTH PAVING

SHOULDERS NEEDING 3 FT. ASPHALT STRIP

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1-9a

VERTICAL ALIGNMENT

Vertical alignment needs are caused by a lack of adequate stopping sight distance on hills. Stopping Sight Distance (SSD) refers to the distance that drivers can see objects in their path. SSD is determined by the geometry of vertical and horizontal curves and can also be affected by sight obstructions such as vegetation, embankments, and intersections. Inadequate sight distance on horizontal curves and at intersections on the State Highway System occur less frequently than for hills and will not be discussed in this needs study. SSD as presented in this study refers to the more frequently occurring limited sight distance caused by hills.

Stopping sight distance is the sum of two distances. The first is the distance a vehicle travels from the time a driver first sees an object to the time the brakes are applied. This distance is dependent on the speed the vehicle is traveling and on the vision, perception and reaction time of the driver. The second distance is the distance a vehicle travels from the time the brakes are applied to the point when the vehicle has stopped. This distance is dependent on the vehicle speed, the braking ability of the vehicle, and the friction between the highway surface and the vehicle's tires. The braking abilities of vehicles vary a great deal as does the frictional characteristics of the road depending on surface texture and weather conditions. KDOT uses figures for SSD which are recommended by the American Association of State Highway and Transportation Officials (AASHTO).

Although the relationship between inadequate SSD and highway safety seems obvious, literature on the relationship between SSD and accidents is limited. The available literature does draw some conclusions, however, and directs one to be aware of several points which relate SSD to highway safety.

First, it is important to understand that accidents caused or contributed to by limited SSD are event orientated. The mere presence of a highway with limited SSD's does not create an accident. Accidents only occur after an event(s) creates a critical situation. Example of event(s) are: conflicting vehicles, objects on the road, poor visibility or poor road surface conditions. The combination of these events with limited SSD then can cause a critical situation and creates the potential for an accident.

Secondly, the chance that a critical event will occur within the limited SSD segment defines the relative hazard. Factors which affect the probability include traffic volume, intersections and other conflicts. Numerous uncontrollable factors also contribute to accident causation. These factors include such things as driver reaction time, vehicle characteristics and the driver's state of mind.

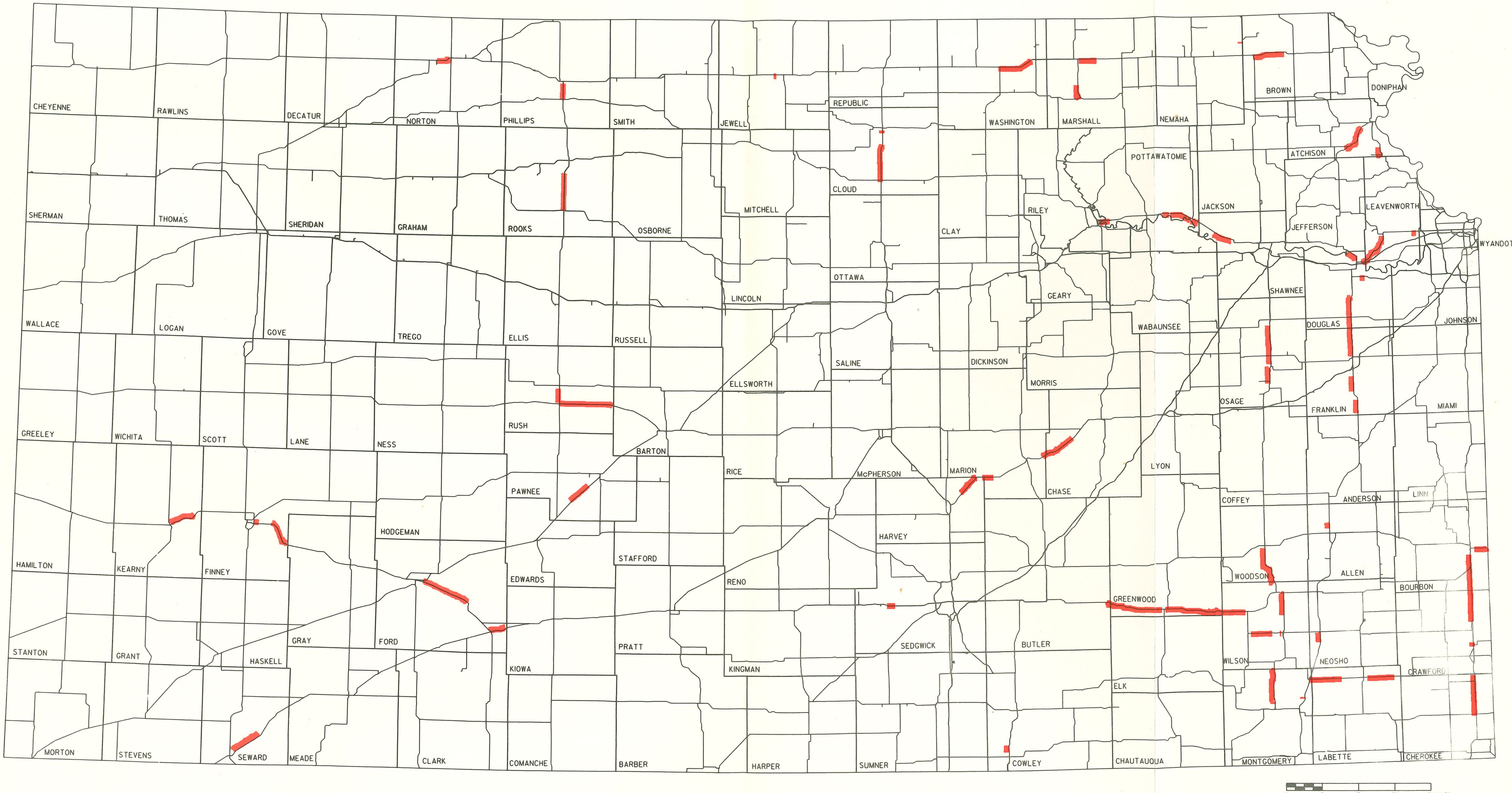
Improving limited stopping sight distance locations caused by hills involves major construction and is expensive. The work requires major grading and surfacing and possibly the expense of detours. It is therefore important to determine where these improvements would be cost effective. Two criteria were used to determine locations where improvements to SSD were warranted and cost effective on the State Highway System.

First, it was determined that vertical alignment needs would only be identified where traffic volume is at least 1500 vehicles per day. This criteria is based on the increased probability of a critical event occurring where traffic is the heaviest.

The second criteria has to do with the severity of the restriction to SSD. Only those hills which have an SSD which corresponds to a speed greater than 20 mph below the design speed for the highway would be identified as having a vertical alignment need.

The following map depicts 410 miles of roadway sections having vertical alignment needs.

VERTICAL ALIGNMENT NEEDS



SECTIONS WITH TRAFFIC VOLUME ABOVE 1,500
AND POOR VERTICAL ALIGNMENT

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1-11a

SERVICE/CONGESTION

Service/congestion refers to the need for improvements of some highways to provide a smoother flow of traffic while allowing more freedom of movement for users. More specifically, service means "Level of Service," a qualitative measure used by highway engineers to describe the operational conditions encountered by drivers within a traffic stream.

Level of service is described in terms such as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience and safety. There are six levels of service from A to F with A being the best and F being the worst. Level A is free flowing traffic where users are unaffected by the presence of others in the traffic stream. The level of comfort to the user with Level A is excellent. Level F is stop and go traffic. The comfort to the user for Level F is extremely poor.

The capacity of a highway is the number or volume of vehicles which can be expected to be able to use a highway at a given level of service in a period of time. Capacity is not a static number but is determined by several factors.

Factors which affect the capacity of a road are divided into two major categories. The first are factors which describe the roadway characteristics. These factors include whether its divided or undivided, access control, surrounding development, lane width, shoulder width, design speed and hills.

The second category of factors are those which describe traffic characteristics. Some of these factors include the distribution of vehicle types (cars and trucks) within the traffic stream, the distribution of vehicles in the lanes of a multi-lane road and the directional split (the percent of vehicles traveling in each direction).

The capacity of a road is calculated using extremely complicated formulas. The resulting capacity can be computed for a day, an hour, or a fraction of an hour. For this study and for most KDOT publications, all figures for capacity are in terms of a daily rate.

The capacity of a highway is directly related to its level of service. For example, the higher the level of service being considered for a road, the lower will be the capacity and conversely the lower the level of service the higher its capacity. This simply means that a road on which the traffic is free flowing, with users being unaffected by other drivers, will not carry as much traffic as the same road when the level of service has deteriorated. For this study and for most KDOT publications, capacities are computed assuming a Level of Service D. Level D represents a high density of traffic with a stable flow.

In Kansas, congestion is more of a problem in urbanized areas than on rural highways. Urban congestion is discussed in a following section.

Service/congestion needs on the rural State Highway System are different from those in the urbanized areas. Capacity on the rural State Highway System is affected more by the geometry, type of facility and types of vehicles using the roadway than by surrounding development and interruptions caused by signalization and intersections.

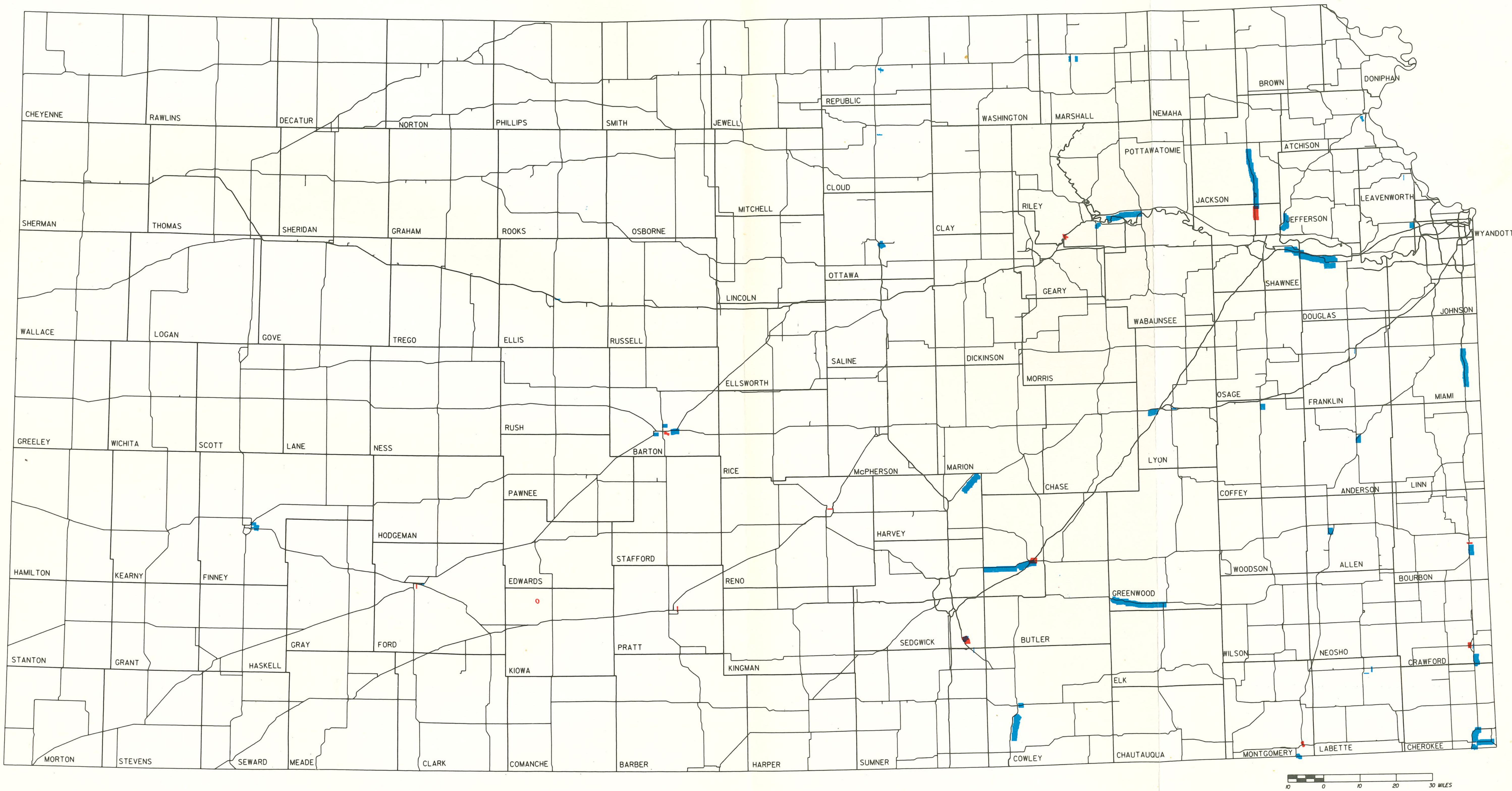
KDOT's computerized data files compute the capacity of all sections of the rural State Highway System. Roads where the ratio of traffic volume to capacity exceed 0.75 have been noted on the map to identify those sections of highway where the greatest needs due to service/congestion occur. These roads have the most serious congestion problems on the rural State Highway System and operate at a Level of Service D.

Another group of roads, where the ratio of volume to capacity is greater than 0.50 and less than 0.75, is also shown on the map. This can be equated to a Level of Service C. These are the locations where many drivers become impatient as traffic moves slower than desirable and passing opportunities are limited. Capacity on a number of these roads is reduced by factors including passing sight restrictions and lane and shoulder width.

It is important to keep in mind that in many parts of the country drivers are more comfortable or are at least used to increased congestion and reduced levels of service. Most DOT's now consider Level of Service D tolerable, but not desirable.

The following map depicts service/congestion needs on the rural State Highway System. Identified are 22 miles of roads which are at 75 percent of their capacity and 175 miles of roads which are at 50 percent of their capacity.

SERVICE/CONGESTION NEEDS



TRAFFIC VOLUME, 50% TO 75% OF CAPACITY

TRAFFIC VOLUME OVER 75% OF CAPACITY

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1-13a

PAVEMENT

Pavements are a very important and complex part of the highway structure. The condition is noticeable to the driver both by observation and rideability. Pavements, unlike other elements, such as lane width or vertical curves, deteriorate with use. Lack of proper maintenance will greatly increase the cost of repair or replacement at a later date. The condition of the pavement also affects the cost of operating a vehicle in several ways. These include fuel, repair, and time costs. It also affects safety and driver comfort.

Pavements are divided into two basic types, flexible and rigid. Flexible pavements are better known as asphalt or bituminous roads in which the pavement actually bends as the load goes over it. Portland Cement Concrete roads are rigid and do not bend under a load. The rate at which a road wears out is influenced by three external factors, the base under the pavement, the weather, and the number and size of the loads on the road. Each of these two types of road react differently to these factors.

Each new section of pavement is designed for the soil and base material on which it is layed and for the size and number of loads that will be applied within its expected life. Currently, the design life for asphalt is ten years and twenty years for Portland Cement Concrete. Many of the roads in Kansas evolved from gravel roads under the jurisdiction of the counties and have never had a design surface. They are made up of a series of overlays, seals and patches. Many of these surfaces function quite well if not subjected to heavy loads.

Pavement maintenance can be compared to that of the family car. Failure to change the oil can result in costly repairs at a later date. Similarly, KDOT performs routine maintenance such as crack repair and patching to avoid costly repairs at a later date. Even with regular oil changes, however, certain parts of the car wear out which requires a mechanic with special tools. So too does our pavement require KDOT's Substantial Maintenance Program. Finally, no matter how well a person has taken care of their car, it reaches the point where it is more costly to maintain than to replace. This is also true of pavement. At this point, the most cost effective action is rehabilitation or replacement. Observation of the type of failure and the frequency of repair indicates when replacement is the preferred alternative.

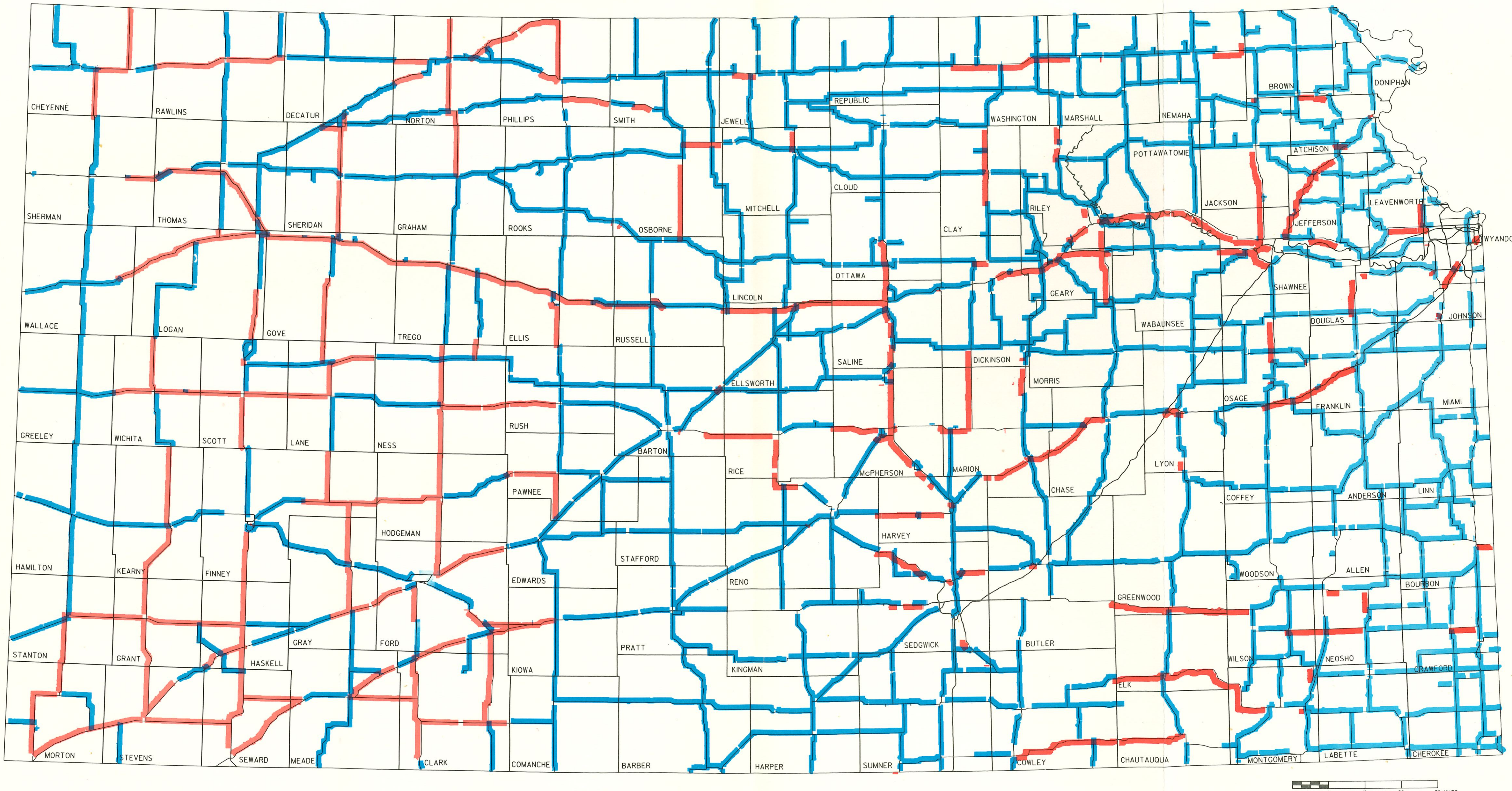
For this report, pavement needs were divided into two categories:

1. Pavement having a structural problem that requires reconstruction or heavy rehabilitation.
2. All sections requiring an overlay within the next ten years.

Those sections not identified do not require any attention beyond routine maintenance in the next ten years. This includes Portland Cement Concrete built since 1977.

The following map depicts pavement needs. Identified are approximately 2300 miles which require reconstruction or heavy rehabilitation and approximately 7300 miles which will require an overlay.

PAVEMENT NEEDS
WITHIN THE NEXT TEN YEARS



SECTIONS REQUIRING RESURFACING

SECTIONS REQUIRING MAJOR PAVEMENT REHABILITATION OR REPLACEMENT

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BUREAU OF TRANSPORTATION PLANNING
JULY 26,1988
USING CANSYS DATABASE 7/13/88

1-15a

BRIDGES

Kansas has a significant investment in bridges on the State Highway System. The Kansas Department of Transportation has responsibility for over 4700 bridges on, over, or adjacent to a state highway. These bridges have been constructed from near the turn of the century to the present. The average age of these bridges is approximately 32 years. As one might expect, these structures are of vastly differing designs and in varying states of repair. Many of these bridges were designed and built in the 1930's and earlier and were not designed for todays traffic.

KDOT expends significant time and resources maintaining these structures with its own personnel and by private contractors. Routine maintenance such as cleaning bridge decks and drains and removing brush and brush piles is regularly performed by district personnel. The districts also have crews which are responsible for minor repair and patching on these structures. More extensive repairs such as deck overlays, girder repairs and backwall repairs are normally let for contract to private contractors. Bridges needing this type of extensive repair have not been identified in this study.

The needs identified in this study are other than routine or even contract maintenance. The needs referred to in this study are for the widening and replacement of bridges on the State Highway System. The need to widen and replace bridges goes beyond routine or contract maintenance to questions of the functional obsolescence and the structural adequacy of bridges.

The Federal Highway Administration (FHWA) defines a bridge as being functionally obsolete if, although structurally sound, it is no longer adequate for the road it is on and the traffic it bears. Bridges are normally considered to be functionally obsolete if the bridge is narrower than the road it is on, including shoulders.

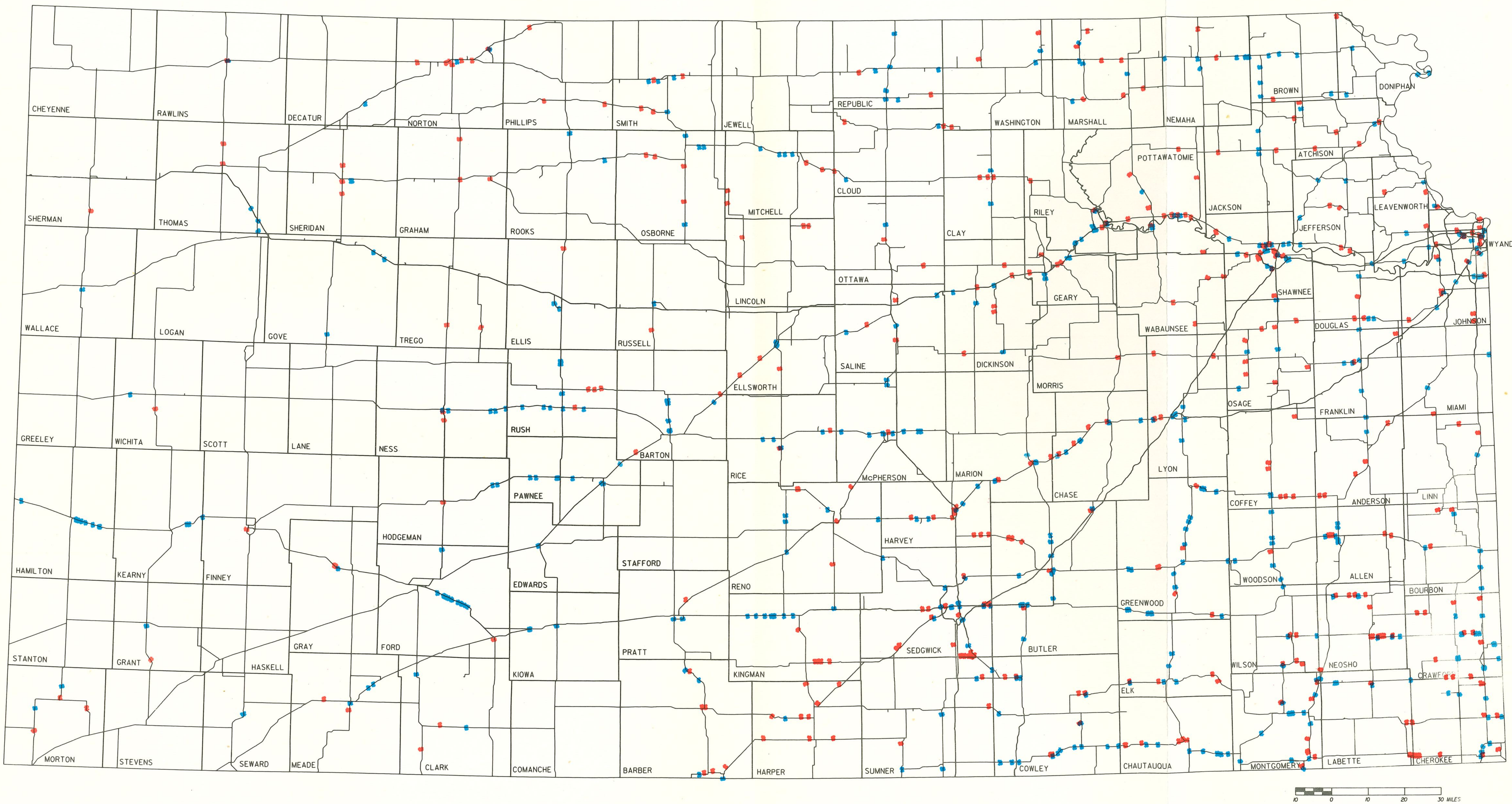
Many of the bridges on the State Highway System which are narrower than the roadway could be widened to address the problem of functional obsolescence. Some bridges, however, cannot economically be widened, such as a steel truss, or ones which have serious structural deficiencies.

Bridges shown on the map as candidates for widening, are functionally obsolete bridges which can be widened and which are not structurally deficient.

FHWA defines a bridge as being structurally deficient if, it is closed because of structural inadequacies, is posted or is in immediate need of rehabilitation to remain open. Bridges on the State Highway System which are structurally deficient are considered to be candidates for replacement. Those bridges shown on the map as bridges to be replaced are structurally deficient or are functionally obsolete and cannot economically be widened.

The following map depicts bridge needs. Identified are 386 bridges to be replaced and 452 bridges to be widened.

BRIDGE NEEDS



• REPLACE

• WIDEN

PREPARED BY THE

KANSAS DEPARTMENT OF TRANSPORTATION

BUREAU OF TRANSPORTATION PLANNING

JULY 26,1988

USING CANSYS DATABASE 7/13/88

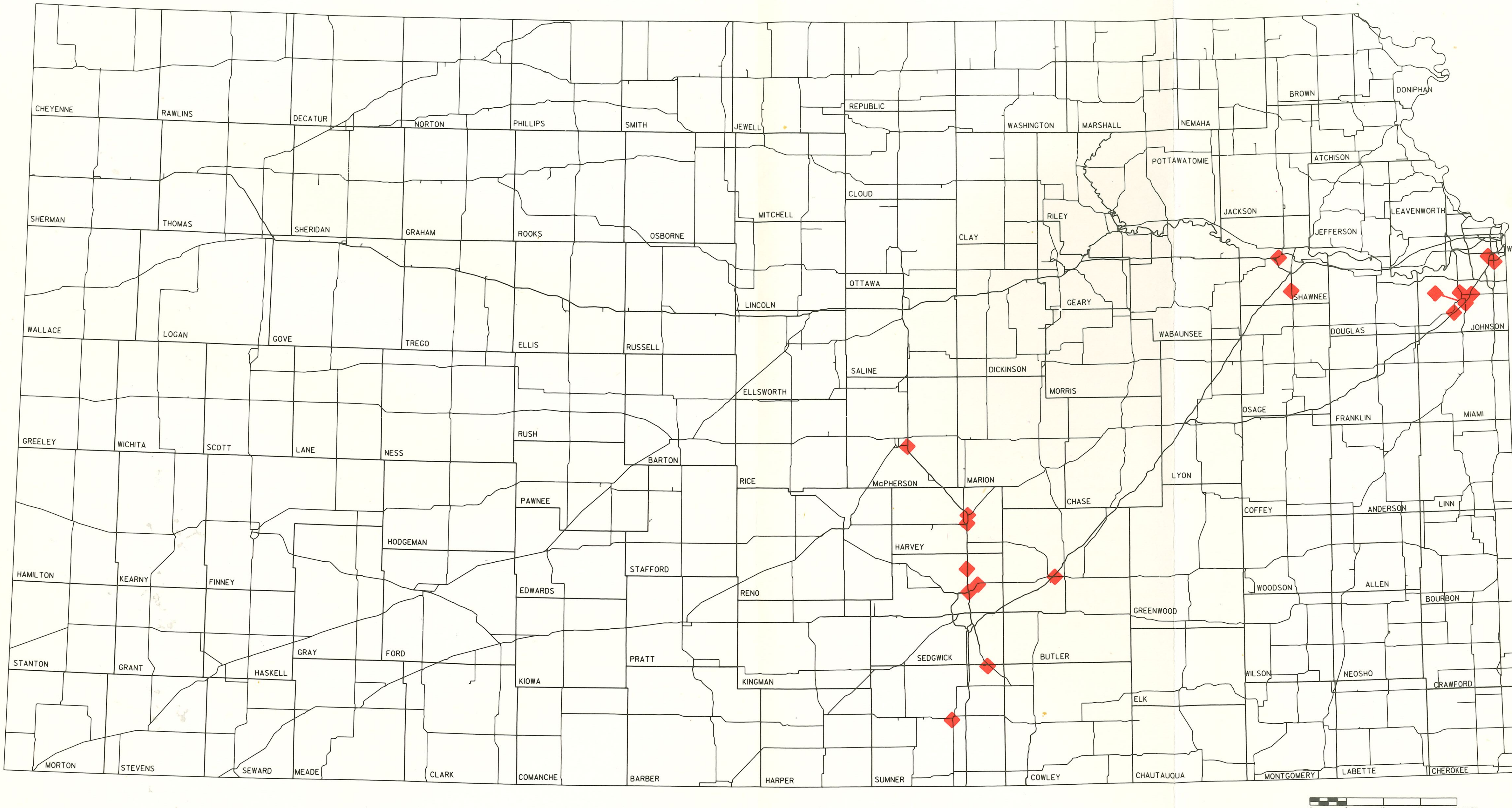
1-17a

EXISTING INTERCHANGES

There are a number of existing interchanges around the state that are in need of improvement for reasons such as inadequate capacity, inadequate geometrics or missing movements. These interchanges are an existing highway need and as such are identified in this study. The locations are listed below:

Interchange	Location
I-35/US-56/175th St.	Gardner
I-35/Antioch	Merriam
I-35/K-150	Olathe
I-35/US-169 S. Jct./151st	Olathe
I-70/I-470/Wanamaker	Topeka
I-135/I-235/K-254	Wichita
I-135/85th St.	Sedgwick County
I-135/US-50	Newton
I-135/First St.	Newton
I-135/K-61	McPherson
K-7/K-150	Olathe
Old US-56/K-7 (West Jct.)	Olathe
US-169 (Metcalf Ave.)/63rd St.	Overland Park
US-75/Old US-75	Shawnee County
US-160/US-81	Wellington
K-196/K-254/KTA	West of El Dorado
K-15/K-53	Mulvane
K-254/Oliver	Wichita

EXISTING INTERCHANGE IMPROVEMENT NEEDS



PREPARED BY THE

KANSAS DEPARTMENT OF TRANSPORTATION

BUREAU OF TRANSPORTATION PLANNING

JULY 26,1988

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1-18a

URBANIZED AREAS

Although the preceding discussion has related mainly to the rural State Highway System and has been depicted on statewide maps, this study does include needs in the urban areas if they are under the state's jurisdiction. The needs that have been identified in these areas include major service/congestion needs on the Interstate and on City Connecting Links, pavement rehabilitation or replacement needs on the Interstate system only and existing interchanges that need improvement on the Interstate and City Connecting Links.

Although the needs in urban areas represent a small number of miles, they are extremely costly to improve due to right-of-way costs, wage rates, large numbers of lanes and working under very heavy traffic conditions.

One of our greatest needs has been replacing the Interstate pavement in the urbanized areas. Most of these pavements are beyond their 20-year design life. Further, wear and tear on the urban Interstate has been greater than anticipated due to higher traffic volumes and heavier vehicle weights than projected. However, a majority of these miles have either been very recently reconstructed or are currently under contract for pavement reconstruction. Consequently many of the Interstate miles are not shown as a pavement need on the urbanized area maps.

Congestion is also a significant problem in the urbanized areas. On a number of roads traffic is operating at volumes in excess of their capacity. Some years ago many of these roads operated at or near capacity for only one or two hours a day. Presently, however, many of these roads are operating at or near capacity for most of the day. The peak traffic on these roads still remains nearly the same, but the period of time of heavy congestion has lengthened.

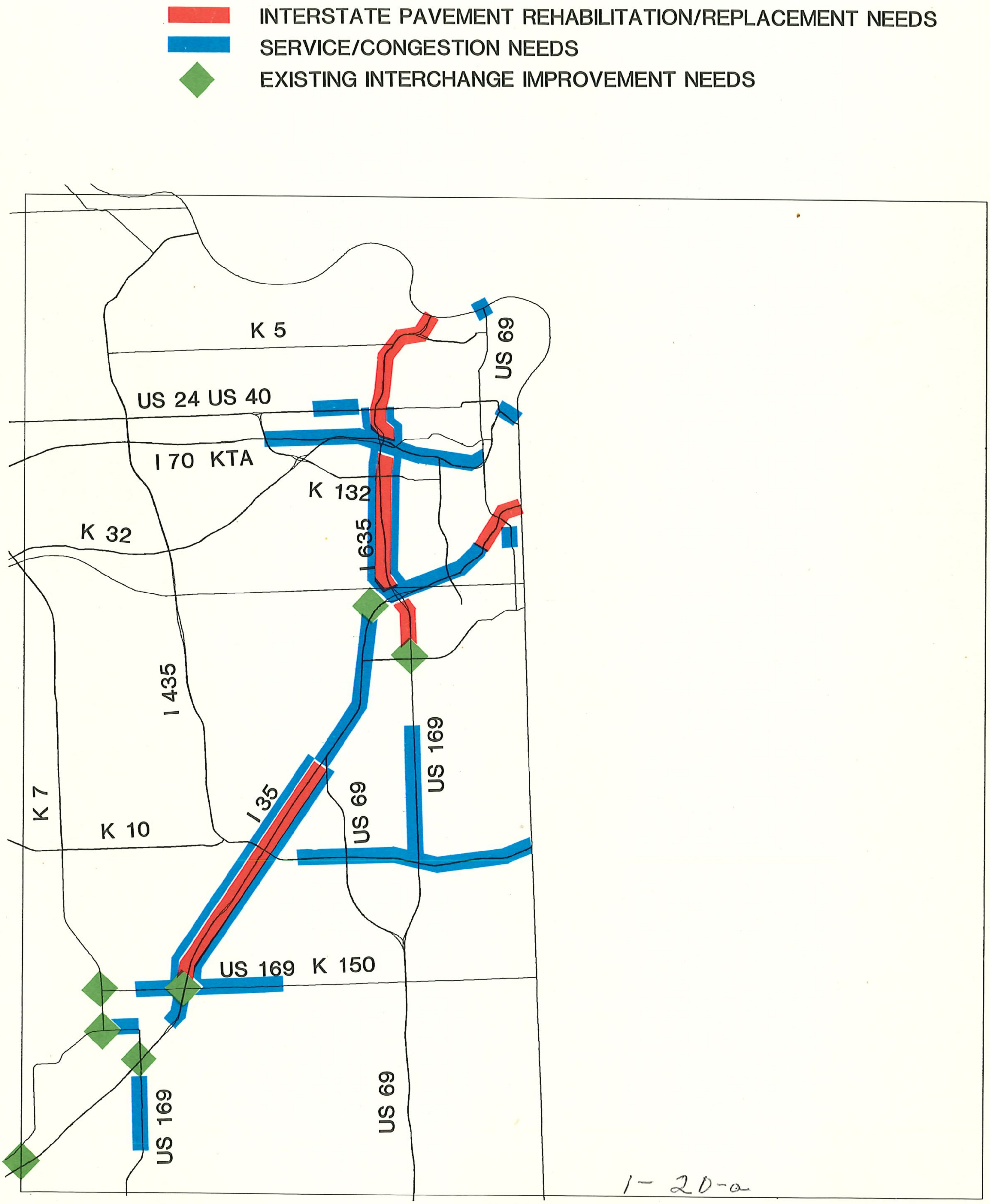
Simply adding lanes does not necessarily relieve congestion. Traffic on parallel routes shifts to the new facility causing it to be loaded to capacity the day it is opened. For the purpose of this study, roads that have a traffic volume to capacity ratio exceeding 80 percent have been noted on the map.

There are also interchange needs in the urban areas. Most of these are due to high traffic volumes.

The following maps depict the service/congestion, pavement rehabilitation and interchange needs in the four urbanized areas of Kansas.

KANSAS CITY URBANIZED AREA

STATE HIGHWAY SYSTEM AND CITY CONNECTING LINKS



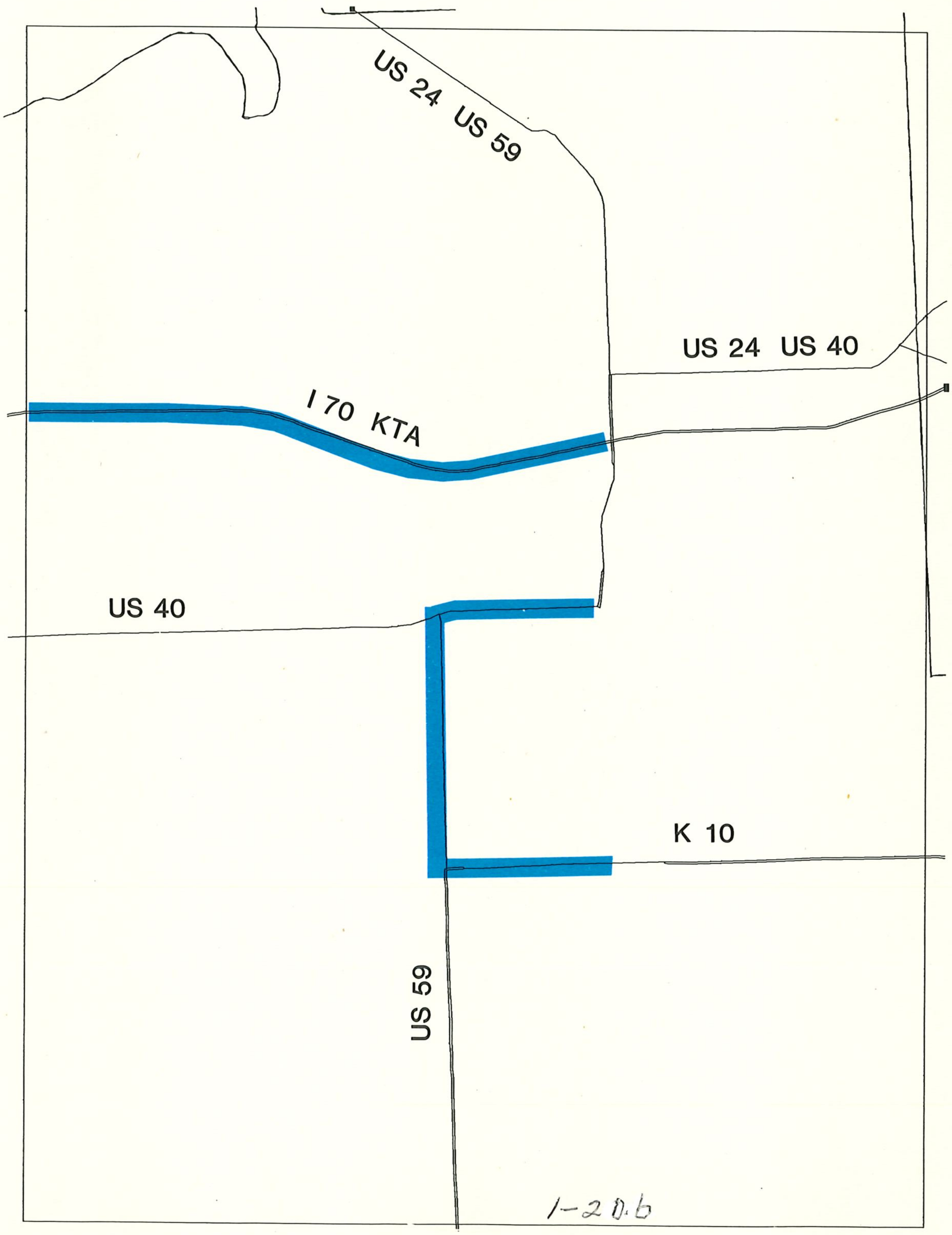
LAWRENCE URBANIZED AREA

STATE HIGHWAY SYSTEM AND CITY CONNECTING LINKS

INTERSTATE PAVEMENT REHABILITATION/REPLACEMENT NEEDS

SERVICE /CONGESTION NEEDS

EXISTING INTERCHANGE IMPROVEMENT NEEDS



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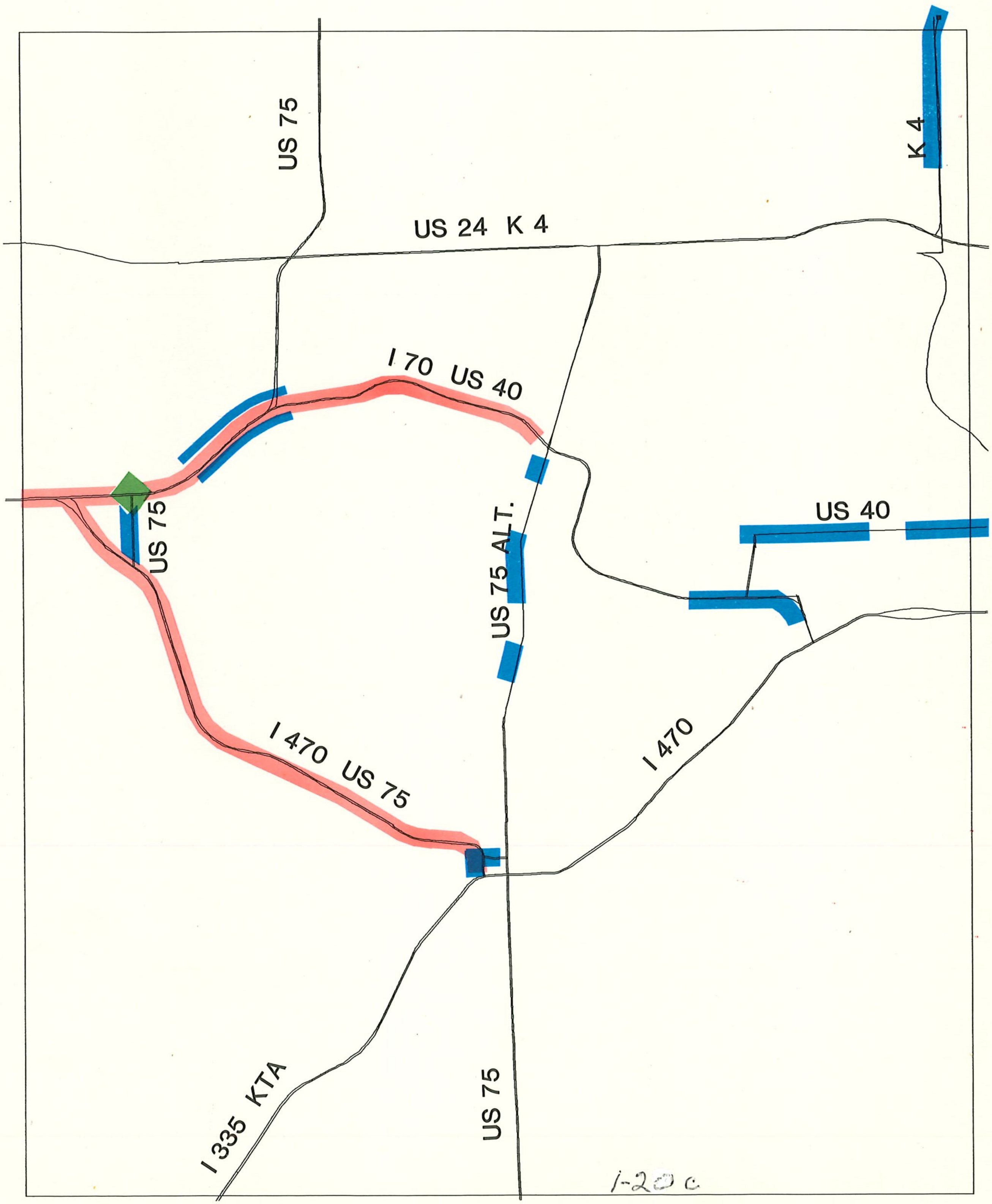
TOPEKA URBANIZED AREA

STATE HIGHWAY SYSTEM AND CITY CONNECTING LINKS

INTERSTATE PAVEMENT REHABILITATION/REPLACEMENT NEEDS

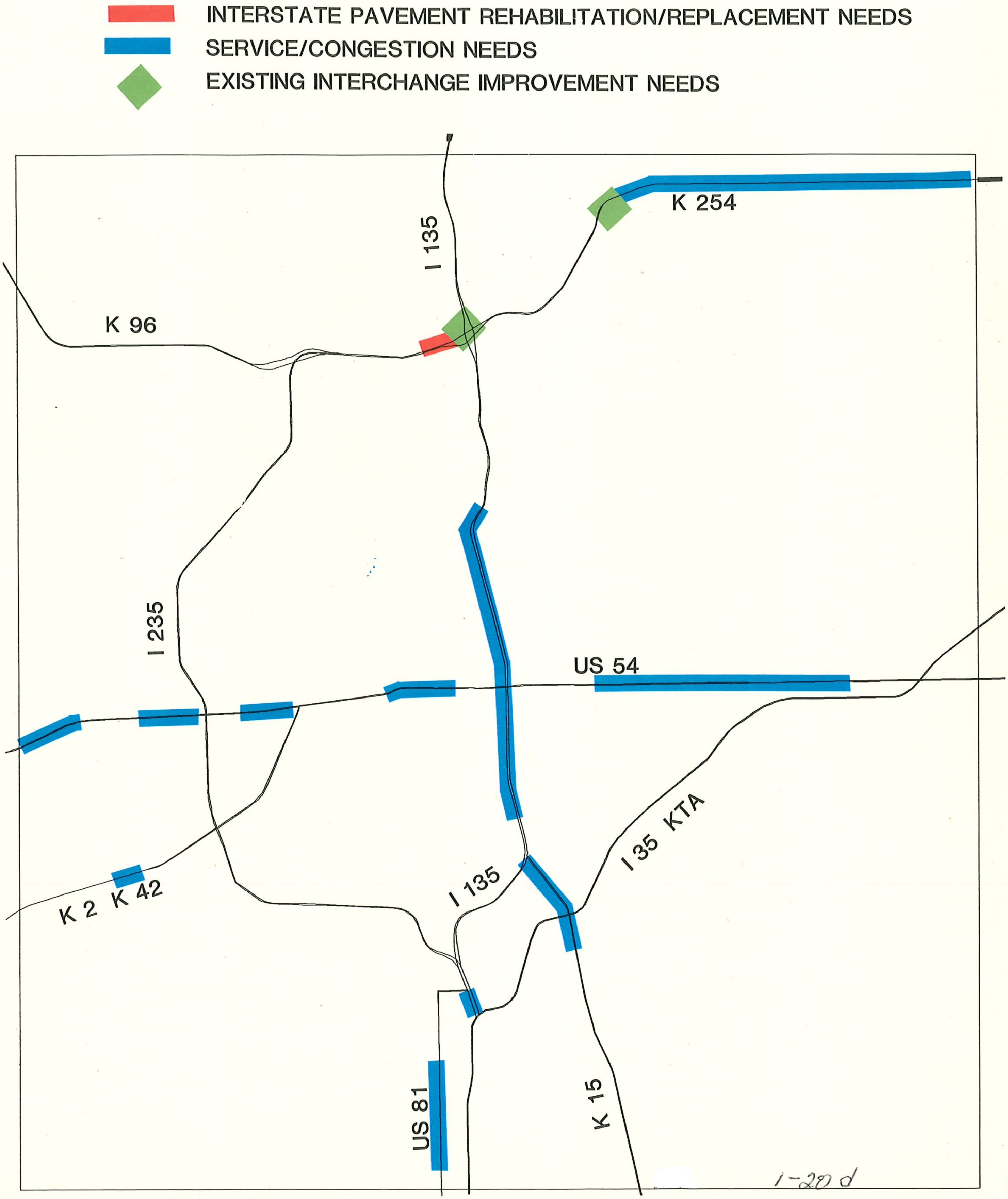
SERVICE /CONGESTION NEEDS

EXISTING INTERCHANGE IMPROVEMENT NEEDS



WICHITA URBANIZED AREA

STATE HIGHWAY SYSTEM AND CITY CONNECTING LINKS



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SUMMARY

In summary, this study indicates that the State Highway System has some type of improvement need greater than resurfacing on over one-half of the miles (approximately 5,000 miles). Of those 5,000 miles, the majority exhibit only one type of deficiency. However a substantial number of miles exhibit two or more deficiencies as can be seen on the "Composite Needs" map.

Although not a geometric deficiency, shoulder type shows the greatest number of miles needing improvement. This is due partly to the relatively recent adoption of a shoulder policy that requires at least a 3 foot asphalt strip on a majority of the miles. Since this is a recently adopted policy, relatively few miles have been improved to that standard to date. The 3 foot asphalt strip is, however, an extremely cost effective measure in that it offers a substantial long term savings in shoulder and pavement maintenance effort due to reducing shoulder edge drop-offs and providing lateral support to the pavement edge thereby extending the pavement life.

Congestion is difficult to quantify and is a very relative condition, i.e., what is considered congestion in Kansas may not be considered congestion in Los Angeles or Chicago. This study indicates that the rural State Highway System has relatively few congestion problems, though there are a number of congestion problems in the urbanized areas.

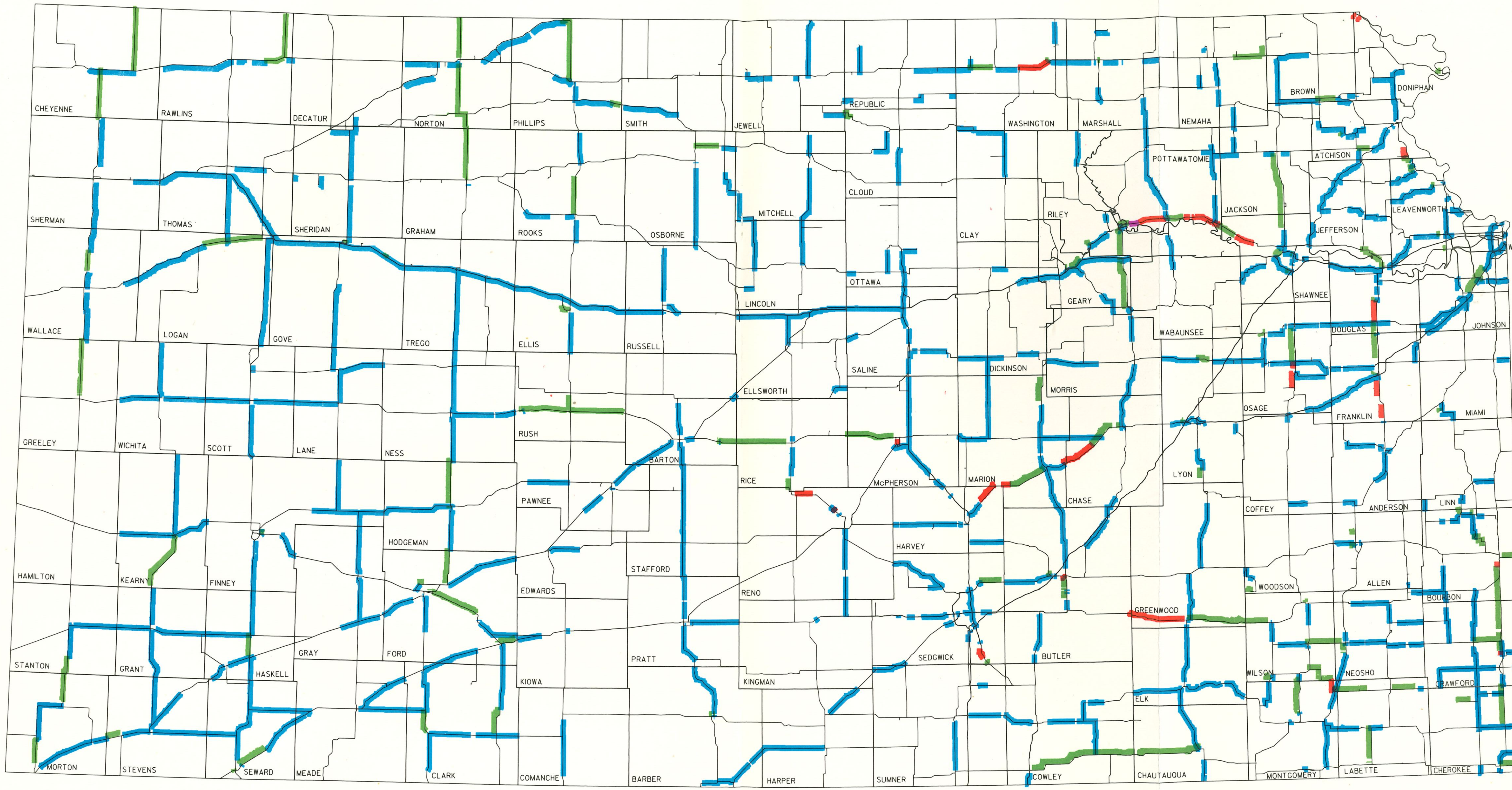
Nothing, however, stands out as being more serious than the bridge and pavement needs identified in this study. We consider these needs so serious because they indicate a wearing out of the physical facility which is not being replaced as fast as it wears out. For instance, simple arithmetic tells us we should be replacing approximately 100 bridges a year when, in fact, we are able to replace approximately one-half that number annually. A similar situation exists for pavement.

Unlike needs for other characteristics such as lane width, shoulder width and vertical alignment, needs for pavement and bridges will only continue to grow if left unmet.

SUMMARY OF STATE HIGHWAY SYSTEM NEEDS

Need	Miles/ Number
Lane Width	
Less than 11 feet	140
Equal to 11 feet	870
Shoulder Width	2,075
Shoulder Type	
Need Full Width Paving	160
Need 3 ft. Asphalt Strip	5,100
Vertical Alignment	410
Service/Congestion	
Volume over 75% of Capacity	22
Volume, 50% to 75% of Capacity	175
Pavement	
Requires Resurfacing	7,300
Requires Major Pavement Rahabilitation or Replacement	2,300
Bridges	
Replace	386
Widen	452
Existing Interchanges	18

COMPOSITE STATEWIDE NEEDS



SECTIONS WITH FOUR DEFICIENCIES

SECTIONS WITH THREE DEFICIENCIES

SECTIONS WITH TWO DEFICIENCIES

SECTIONS WITH ONE DEFICIENCY

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