Missouri Valley Section - Institute of Transportation Engineers

ITE District 4 Board Members

Dear Fellow Board Members:

Below is a listing of 2000 ITE District 4 Board Members with addresses. I will be forwarding the Chairman's notebook, which has all correspondence by the Chairman for the last 2 years to Stephen Corcoran. Tom Campbell will be getting in touch with each of you to provide continuity in for the change in District leadership. Please let me know if you have any questions that I might help with.

Chairman
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We look forward to another active year for the District. See you in Chicago.

Sincerely,

William J. Henry

MOVITE President Report, Fall 2000

Fall 2000 MOVITE Meeting Report

- The meeting committee is as follows:

General Chairman:	Mark Stuecheli, City of Overland Park
Technical Program:	Tom Swenson, TranSystems Corporation
Technical Workshop:	Mike Malone, Olsson Associates
Registration:	Alonzo Linan and Don Dye, City of Olathe
Hotel Arrangements:	Steve Schooley, City of Lenexa
Finance:	Charlie Schwinger, Bucher, Willis & Ratliff
Publicity:	Janelle Campbell, George Butler Assoc.
Golf Tournament:	Paul Plotas, Larkin Group and Ralph Lewis, City of O.P.
Audio-Visual:	Kip Strauss, HNTB Corporation
Photographer:	Matt Selinger, HDR Engineering, Inc.
Suppliers:	Dan Wright, Mid American Signal, Inc.
Spouse Program:	Katie Marlo, Traffic Midwest

Transportation Awards Committee

- Transportation Achievement Award: Yaggy Colby Associates of Mason City, Iowa for the "Highway 18 Traffic Safety Improvements Project"
- Young Transportation Professional of the Year Award: Guy Alon, "Application of the 85th Percentile Theory on Kansas Roads"
- Transportation Professional of the Year Award: Tom Swenson, TranSystems Corporation

MOVITE Journal

- Reimbursement to HWS for reformatting
- Recognition to Lisa Richardson for excellent effort and commitment for next two years

MOVITE Web Page

- Brief demonstration of web page by Matt Selinger
- Job postings on the web – process and payment discussion
- Establishment of a formal Web Page Administrator as a standing committee
- Reimbursement to HDR for reformatting (Handout)

Life Membership Presentations

- Life Members
  - Arlen F. Tappan (Not able to attend – mailed out earlier)
  - James A. Thompson
  - John T. Bates

- Affiliate Life Members
  James Barrett

MOVITE Historian Recognition

- John Rothrock – appreciation certificate (1980 to 2000)
- Tom Swenson – introduction as new MOVITE Historian

Policy 45 (Technical Research Scholarship)

- Clearance from Pete Frentz, ITE under current scholarship guidelines
- Review revised policy
- Review revised notice and application form

ITE Newsletter Award

- Lost the ITE Newsletter Award for Circulation over 500 to Western ITE (District 6)

Officer Handbook Revisions

- Over 200 exhibits
- Expanded duties to be reviewed at the fall retreat
- CD format with links to exhibits
- Vice President's duty for maintenance
- Submit copies of all correspondence to Vice President as well as updated forms, etc.

MOVITE Section Administrator

- Similar to the District IV Administrator position
- Appointed position by majority board approval
- Provides continuity and history to the executive board
- Available at all board meetings to assist in policy and by-law matters, rules of order and administrative decisions
- Steve Hofener as possible candidate upon his approval
- Draft duties and candidate confirmation at Spring Meeting 2001

Contribution to ITE Millenium Fund

- Propose a contribution of $1000 for Section Recognition
- ITE is recommending that each section contribute at least $250

Scholarship / Training for Affiliate Members

- Targeted at affiliate members currently in the profession who are pursuing engineering degrees
- Under guidelines of current scholarship fund
- Establish a new policy
- Establish a new scholarship notice and application
- Under the jurisdiction of the Transportation Award Committee

- Host IMSA training or other training targeted at Affiliate members sometime during the next year. – Budget Item already

MOVITE Tax Exempt Status

- January 20, 1984, IRS approved MOVITE as a tax-exempt organization under Section 509 (c)(6) of the IRS Code as a non-profit organization
- Meant that interest earnings on deposits/investments would not be subject to Federal Income Tax
- Did not grant MOVIE exemption from sales taxes or eligibility for special bulk mailing rates or cause donations received to be eligible for income tax deduction
- March 1, 1985, the IRS approved the Scholarship Fund as tax exempt under Section 509 (c)(3) of the IRS Code
- Allows an organization that is income tax exempt to establish a fund exclusively for educational purposes
- Contributions made to it can be deducted as provided in Section 170 of the IRS Code
- See the attached articles of organization – Scholarship Fund Constitution
- Federal Identification Number for the MOVITE Section is 43-1306703
- Federal Identification Number for the MOVITE Scholarship Fund is 43-1376860 which is opposite from a very early copy of a letter dated March 1, 1985
- The new numbers were confirmed with the IRS and stand as currently listed
- A tax return should be filed when the gross receipts each year are normally more than $25,000

2000 ITE Annual Meeting Report

- The Annual ITE Meeting was held August 5-9 at the Opryland Hotel.
- There was a workshop on the 2000 Highway Capacity Manual on Saturday. The manual is being increased from 750 pages to 1,100 pages and will come out in hard copy as well as on a CD. The CD version will contain video clips, animation of traffic concepts and tutorial sessions for the sample problems.
- There were several different tracks to choose from in the Monday, Tuesday and Wednesday sessions ranging from planning, operations, ITS, traffic calming, etc.
- The annual business meeting was held on Sunday, August 6. Jeni Grote was the winner of the International ITE Vice President election over Steve Hofener.
- Incoming President of ITE, Steve Gayle, gave a presentation regarding the focus of ITE for 2001. The focus will be on operations management; the professionals role in societal contacts; and safety.
- The affiliated government agency campaign has been successful with over 96 participating agencies accounting for 1,161 members.
- There was some lively discussion regarding the PTOE certification. A motion was made my one member to create a Transportation Professional Certification Board as a separate, independent corporation with no financial

support from the Institute in an attempt to relieve liability for certifications. ITE accepted the petition to be taken under advisement, but not as a formal motion for immediate action. A few members also expressed concern about the title. They felt that they were already “professionals” and did not need another certificate stating that they were “professional” traffic operation engineer. They offered the recommendation to drop the P from PTOE.

- President-elect Steven Gayle also presented his goals for the coming year as follows:
  - Offer a broad range of products and services to a diverse profession
  - Continue to be the source of technical knowledge in the transportation industry
  - Utilize the strength of volunteer members to produce quality materials
  - Enhance professional development in the midst of a diminishing labor force
  - Several awards were announced at the opening session on Monday as follows:
  - Section Activities Award – Wisconsin Section
  - Student Chapter Award – Montana State University
  - Student Paper Award – Florida International University “Minimum Merging Lengths for Triple Left-Turn Lanes with Downstream Lane Reductions”
  - Transportation Achievement Award – Veterans International Bridge at Los Tomates/Gral

2002 Spring Meeting Location

- Oklahoma
- Refer to meeting schedule

Fall 2000

MOVITE Vice-President Report

Program and Technical Activities:

Technical Committees:

- There are six currently active technical committees. Given the two year scope activity has been light to date with the following exceptions where listed below:
  Red Light Violation Camera Monitoring – Chair Brian Shields
  Fiber Optic Interconnect Practices – Chair Neal Hawkins
  Vehicle Detection Methods and Practices – Chairs James St.Clair, Derek Townsend
  Traffic Calming Policies and Devices – Chair Steve Schooley
  Right Turn Lane Geometric Treatment – Chairs Mike Malone, Matt Selinger. This committee has completed a survey form which was sent out during the last four months. Committee members have been recruited from each state. 39 surveys were originally sent with 22 being returned for a 55% return rate. Current activities are to evaluate the survey data with anticipation of a draft report prior to the MOVITE Spring 2001 meeting.
  Pedestrian Crossing Timings with/without Crossing Guards – Chair David Church

- I need to continue to work with each committee in updating establishing the guidelines, schedule and goals.

Proposed Technical Award Policies:

- Discussion continues within the MOVITE Board on generating more interest in the area of technical studies and submission of reports to MOVITE for the benefit of the membership at large.
- Proposed Policy 45: Technical Research Grant Competition was further discussed at the Spring 2000 Board Meeting with a decision to prepare this policy revision for the Fall 2000 meeting.
- The proposed Technical Studies in Practical Engineering Applications Competition was also discussed and a decision to discontinue discussion of this item was reached (see Board Mtg. Minutes).

Student Chapter and Awards:

Student Scholarship:

- The 1999-2000 academic school year student scholarship was awarded to Deogratias Eustace of Kansas State University, in pursuit of his PhD in Transportation Engineering. Anticipated graduation date is May of 2001.
- He has been awarded a check for $1000 from ITE out of the MOVITE scholarship fund.
- The review board consisted of: Gary Thomas of Iowa State University, Chad Smith of the Iowa DOT, Neal Hawkins, Gerry Brickell, Jon Resler, and Milly Ortiz of Howard R. Green Company.

Thomas J. Seburn Student Paper Awards:

- First place winner of the student paper contest is Stacy Williams of the University of Arkansas for her paper entitled, “Flexible Pavement Design Considerations for

Subdivisions". Stacy will receive a check for $500 and expenses not to exceed $250 to attend the 2000 Spring meeting.

- Second place winner of the student paper contest is Deogratias Eustace of Kansas State University for his paper entitled, "Performance Comparison of a Roundabout Versus Two-Way Stop Intersection". Deogratias will receive a check for $200.
- Third place winner of the student paper contest is Douglas Maaske of the University of Nebraska at Lincoln for his paper entitled, "Continuing the Metro Area Motorists Assist Program". Douglas will receive a check for $100.
- Fourth place winner of the student paper contest is Avijit Mukherjee of Kansas State University for his paper entitled, "Motorists Understanding of few Standard Traffic Signs and their Alternative Designs". Although no monetary award was received, MOVITE sent Avijit a letter expressing appreciation for submitting and encouraged future participation in this competition.
- The review board consisted of: Gary Thomas of Iowa State University, Chad Smith of the Iowa DOT, Neal Hawkins, Gerry Brickell, Jon Resler, and Milly Ortiz of Howard R. Green Company.
- The MOVITE Board is modifying submission dates of all awards and further detail on each will be presented at the Fall Meeting.

Student Chapter Award:

- The Student Chapter Award went to Iowa State University who also won the award for District 4.

Flexible Pavement Design Considerations for Subdivisions

by
Stacy G. Williams, E. I.

Summary of Paper
Prepared for:
2000 Movite Student Paper Competition
Thomas J. Seburn Award

June 21, 2000

Flexible Pavement Design Considerations for Subdivisions

By Stacy G. Williams, E.I.

INTRODUCTION. Streets are usually one of the first features to be constructed in a subdivision. A phenomenon that plagues developments all over America is that often these well-paved streets deteriorate significantly by the time the subdivision is filled with completed homes. How does this happen? Subdivisions usually have very low traffic volumes consisting primarily of passenger cars. Therefore, a minimal pavement structure is enough to support such expected traffic. However, the heavy traffic during home construction imposes substantially higher loadings, which often results in cracking and rutting of asphalt pavements. Early failure of such streets is often interpreted by the public as poor construction; but in reality it is simply a failure to design for all applicable loadings.

DESIGN CONSIDERATIONS. There are many factors to consider when designing a pavement. One factor, of course, is the structure of the pavement. Pavement layers are constructed upon a subgrade, which supports the pavement structure. Depending on the stiffness of the materials used in each layer, the presence and thickness of each layer will vary in order to provide adequate support. The subgrade is the foundation of the pavement structure and is therefore critical to the success of subsequent pavement layers. If it contains weaknesses, those weaknesses may be transferred through the other pavement layers over time, regardless of the strength of other layers.

A good subgrade should consist of a well-graded soil that drains well, such as clean sands and gravels with no appreciable amount of fines. *(Eason and Shook 1997)* In cases of questionable or unacceptable soil strength, the subgrade may be stabilized with strength increasing additives such as lime, cement, fly ash, or even emulsified asphalt.

After the subgrade and drainage needs have been considered, the base course must be planned. An untreated base course is a granular material, typically composed of crushed stone or crushed gravel. The angular faces interlock, providing a very stiff layer on which to support the pavement surface. Treated base materials are usually one of two basic types. As defined by the National Asphalt Paving Association (NAPA), *Class I* treated bases are asphalt bases that meet appropriate asphalt mixture design criteria. Because asphalt provides more support than an equal amount of both treated or untreated granular bases, a full depth asphalt design will require a smaller total pavement thickness than that of a granular base. *Class II* treated bases include granular base materials treated with cement, emulsified asphalt, lime, or fly ash.

The surface layer is the layer with which the public is most familiar. An asphalt surface course usually contains relatively small aggregate particles that create a tight, smooth surface. The goal is to produce a mix with the appropriate volumetric properties such that the end product will be a smooth pavement with resistance to failure by rutting and cracking.

Apart from the structural design aspect, the other critical consideration is to determine the traffic loading that the pavement structure is expected to support. The type and amount of traffic should be estimated for the design life of the pavement. Most subdivision pavements experience very light traffic comprised almost entirely of passenger cars, which exert minor forces on a road as compared to heavy trucks. Therefore, a very "light" pavement design may be used for a street that may carry only one percent trucks over its twenty-year design life. The fallacy of this philosophy is that during the early stages of development, a subdivision may see a large percentage of trucks. Typical construction traffic may include concrete trucks, dump trucks, and construction material delivery trucks. During design, vehicle loads must be converted to equivalent single axle loads (ESALs) according to weight and axle configuration. The load exerted by the trucks far exceeds that of passenger cars.

POSSIBLE SOLUTIONS. There are several possible methods of designing a pavement for residential use. One solution might be to wait until the subdivision construction is complete before constructing the street. This is undesirable to the developer since the lack of a paved street might deter home buyers or even decrease property values. Another solution might be to include an intermediate, or binder, layer in the overall design, using it as the initial driving surface. The final surface layer would be placed after the construction phase is complete. *(ASCE et al. 1990)* While this is a valid solution, it could prove cost prohibitive. It may also be resisted by contractors who prefer not to divide phases of work over such a long and unpredictable span of time. Still another option, which is often used, would be to simply "copy" designs published for a previous similar job.

PAVEMENT DESIGN PROCEDURES. Formal pavement design procedures have been defined by AASHTO and by the Asphalt Institute. The AASHTO method utilizes a series of input values in order to graphically determine a value known as structural number (SN). The structural number is then used to arrive at required layer thicknesses.

The Asphalt Institute's method employs a mechanistic-empirical methodology in order to determine a required minimum pavement thickness. Additional criteria are used for the failure modes of fatigue and permanent deformation, or rutting. *(Huang 1993)*

The problem with these design methods is that they are primarily intended to be used for roads and highways with high traffic volumes. For example, a two-lane subdivision street might have only 6500 ESALs. The smallest traffic level used in the AASHTO method is 50,000 ESALs, so it is obviously intended for greater traffic levels. The Asphalt Institute thickness design method does allow for residential street design, but usually defaults to minimum design values.

THE NAPA METHOD. An apparent extension of an Asphalt Institute method has been developed by NAPA. Traffic classes are divided as shown in Table 1, based on the type of facility and the maximum number of trucks per month per lane.

Type of Facility and Vehicls Types	Maximum Trucks per Month (one lane)	Traffic Class
Residential driveways, parking stalls, parking lots for autos and pickup trucks	<1	Class 1
Residential streets without regular truck traffic or city buses; traffic consisting of autos, home delivery trucks, trash pickup, etc.	60	Class 2
Collector streets, shopping center delivery lanes	250	Class 3
Heavy trucks; up to 75 fully loaded semi-trailer trucks per day	2200	Class 4

Table 1. Traffic Classes

After the traffic class is determined, the design class of the subgrade must be determined. A comprehensive table provides a variety of soil characteristics in order to choose the correct design class (see Table 2). Finally, the pavement thickness is chosen from a table based on traffic class, design period, design ESALs, type of base, and type of subgrade. *(Eason and Shook 1997)* A subset of these tables applicable to the design procedure recommended in this paper is shown in Table 3, Table 4, and Table 5.

Soil Type	Unified Soil Class	Percent Finer than 0.02mm	Permeability	Frost Potential	Typical CBR	Typical MR, psi	Design Class
Gravels, crushed stone Little or no fines <0.02mm	GW, GP	0 - 1.5	Excellent	NFS	17	20,000	Very Good
Sands, sand-gravel mix Little or no fines <0.02mm	SW, SP	0 - 3	Excellent	NFS	17	20,000	Very Good
Gravels, crushed stone Some fines <0.02mm	GW, GP	1.5 - 3	Good	PFS	17	20,000	Very Good
Sands, sand-gravel mix Some fines <0.02mm	SW, SP	1.5 - 3	Good	PFS	17	20,000	Very Good
Gravelly soils Medium fines <0.02mm	GW, GP, GM	3 - 6	Fair	Low	8	12,000	Good
Sandy soils Medium fines <0.02mm	SW, SP, SM	3 - 6	Fair	Low	8	12,000	Good
Silty gravel soils High fines <0.02mm	GM GW-GM, GP-GM	6 - 10 10 - 20	Fair to Low	Medium	8	12,000	Good
Silty sand soils High fines <0.02mm	SM SW-SM, SP-SM	6 - 15	Fair to Low	Medium	8	12,000	Good
Clayey gravel soils High fines <0.02mm	GM, GC	Over 20	Fair to Low	Medium to High	5	7500	Medium
Clayey sand soils High fines <0.02mm	SM, SC	Over 20	Low to Very Low	Medium to High	5	7500	Medium
Very fine silty sands	SM	Over 15	Low	High to Very High	5 Replace in severe frost areas	7500	Poor
Clays PI > 12	CL, CH		Very Low	High	3 Replace in severe frost areas	4500	Poor
All silt soils	ML, MH		Very Low	High to Very High	3 Replace in severe frost areas	4500	Poor
Clays PI < 12	CL, CL-CM		Very Low	High to Very High	3 Replace in severe frost areas	4500	Poor
Other fine-grained soils	OL		Very Low	High to Very High	<3 Replace in severe frost areas	3000	Very Poor
Highly organic soils	OH		Very Low	High to Very High	Replace		

Notes: NFS = not frost susceptible
PFS = possible frost susceptible
CBR = California Bearing Ratios
MR = Resilient Modulus
CBR and MR values are minimum values expected for each subgrade class.

Table 2. Subgrade Soil Classification Guide

This method appears to be a valid pavement design method, however the traffic class criteria should be examined more closely. The residential traffic class (class 2) specifies a maximum of 60 trucks per month. During the early life of a subdivision, the truck traffic is likely to be considerably higher. For this reason, the traffic class for a new subdivision should be increased to a class 3, which allows up to 250 trucks per month. The soil classification system shown in Table 2 should be used to classify the subgrade, and design ESALs should be estimated. Next, a design period should be chosen. Because the truck traffic requiring traffic class 3 only lasts for the construction phase, the design period should be chosen accordingly. For example, if home construction is expected to be complete within the first 5 years, choose a design life of 5 years. If construction may take longer, choose a design period of 10 years. In most cases, 10 years should be sufficient as a design period unless there are extenuating circumstances. It is also interesting to note that in all cases, the NAPA recommended pavement thicknesses for traffic class 3 with a design period of 5 or 10 years meets or exceeds the thickness requirements for traffic class 2 with a design period of 20 years. Therefore, the design life of 5 to 10 years of construction truck traffic will also be adequate for 20 years of passenger car traffic. For example, a traffic class 2 with a 20 year design period, and good subgrade, a 3.0 inch (75mm) full-depth asphalt thickness is required. For the same subgrade, a traffic class 3 with 5 year design period also requires a 3.0 inch (75mm) full-depth asphalt thickness, meaning that this thickness is adequate for 5 years of class 3 traffic as well as 20 years of class 2 traffic.

After the input values for design have been determined, the design thickness values are determined from one of three tables. These tables (Table 3, Table 4, and Table 5) are comprised of the portions applicable to traffic class 3 for 5 and 10 year design periods of the NAPA pavement design guide. *(Eason and Shook 1997)*

Design Period Years	Design ESAL	Full Depth Asphalt Thickness, inches				
		Very Poor Subgrade	Poor Subgrade	Medium Subgrade	Good Subgrade	Very Good Subgrade
5	27,000	6.5	6.0	4.5	3.0	3.0
10	54,000	7.0	6.5	5.5	4.0	3.0

Table 3. Full Depth Hot Mix Asphalt Thickness Selection for Traffic Class 3.

		Very Poor Subgrade		Poor Subgrade		Medium Subgrade		Good Subgrade		Very Good Subgrade	
Design Period Years	Design ESAL	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base
5	27,000	3.0	6.0	3.0	5.0	4.5	-	3.0	-	3.0	-
10	54,000	3.0	7.0	3.0	6.0	3.0	4.5	4.0	-	3.0	-

Table 4. Thickness Selection Using Class II Treated Base for Traffic Class 3.

		Very Poor Subgrade		Poor Subgrade		Medium Subgrade		Good Subgrade		Very Good Subgrade	
Design Period Years	Design ESAL	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base	Asphalt Surface & Base	Minimum Granular Base
5	27,000	4.5	6.0	3.5	6.0	4.5	-	3.0	-	3.0	-
10	54,000	5.0	6.0	4.0	6.0	5.5	-	4.0	-	3.0	-

Table 5. Thickness Selection Using Class II Untreated Granular Base for Traffic Class 3.

CONCLUSION. In conclusion, many resources are available to aid in the planning, design, construction, and maintenance of a residential pavement. The most important thing to remember is that when a new subdivision is built, the initial construction traffic must not be forgotten. It is a very real and substantial load for which a stable pavement structure must be provided. A pavement design procedure, such as that provided by the Asphalt Institute or the National Asphalt Pavement Association, is an appropriate design method *if* the traffic class and design period are adjusted according to actual truck loads.

REFERENCES

American Society of Civil Engineers (ASCE), National Association of Home Builders, and the Urban Land Institute (ULI), (1990). "Residential Streets." Second Edition, Washington, D.C.

Eason, J.R., and Shook, J.F. (1997). "Design of Hot Mix Asphalt Pavements for Commercial, Industrial, and Residential Areas." National Asphalt Pavement Association, Information Series 109, Lanham, Maryland.

Huang, Y. H. (1993). "Pavement Analysis and Design." Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

Missouri Valley Section - Institute of Transportation Engineers

2000 MOVITE Spring Business Meeting

Tuesday, May 16, 2000
12:00 Noon
102 Scheman Continuing Education Building
Ames, Iowa

I. Call to Order

Bruce Wacker, President

A. Welcome and Introductions
B. Address to MOVITE from ITE, Steve VanWinkle, District IV Director
C. International ITE Vice-Presidential Candidate Addresses
   1. Steve Hofener, District IV
   2. Jenny Grote, District VI

II. Business Meeting Minutes: Tulsa, Oklahoma, September 16, 1999

Mike Gorman, Secretary

III. Treasurer's Report

A. Treasurers Statement, Jay Wynn, Treasurer
B. Scholarship Statement from ITE, Jay Wynn, Treasurer

IV. Committee Reports

A. Host Committee – Neal Hawkins
B. 2000 Fall MOVITE Meeting, Excelsior Springs – Mark Stuecheli
C. MOVITE Journal - Lisa Richardson
D. Transportation Achievement Awards Presentations – Bruce Wacker
E. Program and Technical Activities – Neal Hawkins
F. Student Chapter and Awards Presentations– Neal Hawkins
G. Membership – Steve Schooley
H. MOVITE Webpage – Steve Schooley
I. Life Membership – Bruce Wacker
J. By-Laws and Policy – Nicci Tiner
K. Finance Committee – Todd Butler
L. Audit Committee – Todd Butler
M. Affiliate Members – Jon Fischer and Vern Marlo
N. Nominating Committee (Iowa)– Ken Morris

V. Old Business

A. New Policy 44 Proposal (Technical Research Grant) – Bruce Wacker
B. Revisions to Policy 41 (Transportation Achievement Award) – Bruce Wacker
C. New Policy 45 Proposal (Technical Studies in Practical Engineering Applications) – Bruce Wacker
D. Contributions to Steve Hofener's Int'l Vice Presidential Campaign – Bruce Wacker
E. District IV Director Nominations from MOVITE – Bruce Wacker
F. Technical Society Fair Report – Jay Wynn
G. ITE Newsletter Award Competition – Bruce Wacker
H. Revised ITE Submission Dates for Student Papers and Student Chapter Award – Neal Hawkins
I. MOVITE Membership Certificates – Mike Gorman

sda

J. 1998 District IV surplus of $445.09 check to MOVITE – Mike Gorman
K. Unagended old Business

VI. New Business

A. Submission and Award Dates for All MOVITE Awards – Bruce Wacker
B. Revised Election Process for District Director & MOVITE impact – Bruce Wacker
C. MOVITE Historian (John Rothrock/Tom Swenson) Digital Storage of Information – Bruce Wacker
D. Letter of Support for Steve Hofener to Membership
E. 2000 Transportation Professional of the Year – Nominations
F. 2001 Spring Meeting – St. Louis
G. Officer Handbook Revisions – Bruce Wacker
H. Membership Handbook Update – Nicci Tiner
I. Amendments to By-laws – Nicci Tiner
J. Amendments to Policies – Nicci Tiner
K. Amendments to ITE District IV Charter – Nicci Tiner
L. Membership Issues – Neal Hawkins
   1. Explore Possible Elimination of Membership Database
   2. Require Section Affiliates to join ITE as Institute Affiliates
   3. Require Students to join ITE
M. MOVITE Membership Brochure Revisions – Mike Gorman
N. MOVITE Journal – proposal for 3 editions and webpage publishing (Software purchase and duties) – Lisa Richardson
O. MOVITE 50th Anniversary Celebration Suggestions/Brainstorming
P. 2000 Fall Officer's Retreat
Q. Semi-Annual Report to ITE – Information Required by May 23
R. Traffic Bowl – Duty of Board Representatives – Bruce Wacker
S. Unagended New Business:

VII. Future Meetings

A. 2000 MOVITE Spring – Ames, IA, May 15 - 16
B. 2000 MOVITE Fall – Excelsior Springs, MO, September 27 - 29
C. 2000 District IV - Chicago, IL, July 5 - 7
D. 2000 ITE Annual – Nashville, TN, August 6 – 9
E. 2000 MOVITE Officer's Retreat - Fall
F. 2001 MOVITE Spring – St. Louis, MO
G. 2001 ITE Annual – Chicago, IL, August 19 – 22
H. 2001 MOVITE Fall - Iowa
I. 2002 ITE Annual – Philadelphia, PA, August 4 - 7
J. 2003 ITE Annual – Seattle, WA, August 22 - 28
K. 2004 ITE Annual – Orlando, FL, August 1 - 4
L. 2005 ITE International – Melbourne, Australia
M. 2006 ITE International – Milwaukee, Wisconsin

VIII. Adjournment

2000 MOVITE TRANSPORTATION ACHIEVEMENT AWARD

NOMINATION

KAWConnects Transportation Study

Submitted By

HDR Engineering, Inc.
Kansas Department of Transportation
Kansas Turnpike Authority

January 31, 2000

Introduction

Project Web Site.

The Kansas Department of Transportation (KDOT) and the Kansas Turnpike Authority (KTA) have both recognized the need to plan for the future transportation demands in the region between Topeka and Kansas City. To develop this plan, the two agencies initiated a Major Corridor Study (MCS) to identify and evaluate a wide variety of transportation investment alternatives. The impetus for this joint study was twofold. First, both agencies are keenly aware of significant traffic increases in the study area and the need to provide their customers with adequate transportation facilities now and in the future. Second, any improvements made by one agency will have direct impacts on the other and need to be studied in a comprehensive manner.

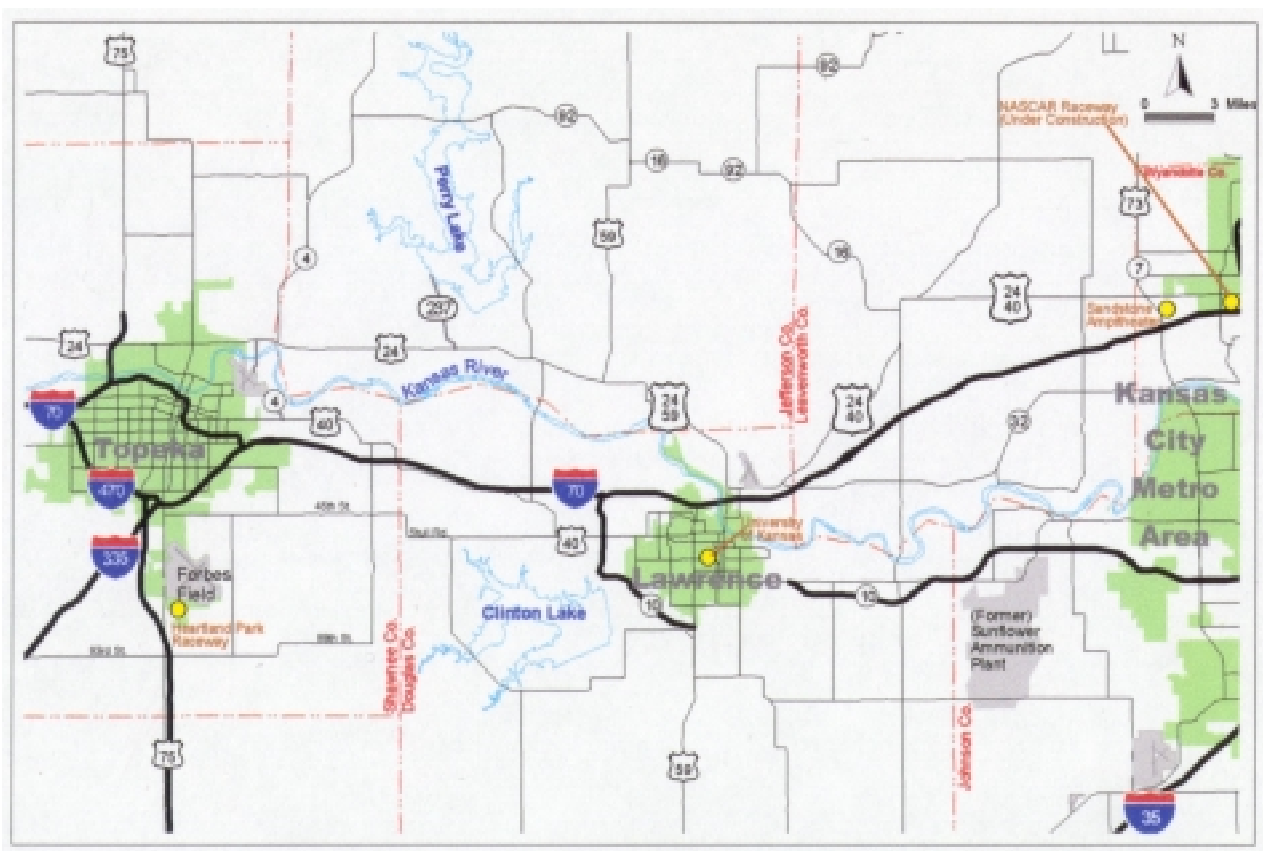
Study Quick Facts

- The study area contains over one-third of the population of the State of Kansas.
- The study team collaborated with representatives of six counties and at least 14 cities in Kansas.
- The corridor-wide origin-destination (O-D) study collected license-plate data from 170,000 vehicles at 26 locations throughout the study area.
- Construction of computerized environ-mental constraint maps involved encoding 36 layers of geographical data, each covering the 725,000-acre study area.
- A corridor-wide telephone survey sampled opinions of over 400 road users.
- Six “open house”-style public meetings were attended by nearly 1,300 people.

Study Area

As shown below, the study encompassed an area of approximately 50 miles by 26 miles and included portions of six counties in northeast Kansas: Johnson, Wyandotte, Leavenworth, Douglas, Jefferson, and Shawnee. Many communities within the study area rely on the existing transportation system for commuting and for goods movement. Major activity centers in the study area include the City of Topeka, City of Lawrence, and the Kansas City metropolitan area. The study area also contains several sizeable recreational areas and special event venues, including Perry Lake, Clinton Lake, Heartland Park Raceway, Sandstone Amphitheater, and the University of Kansas. In addition, a NASCAR speedway is under construction in Wyandotte County, and a "Land of Oz" theme park is being proposed in Johnson County (on the former Sunflower Ammunition Plant site).

Study Area



Study Process

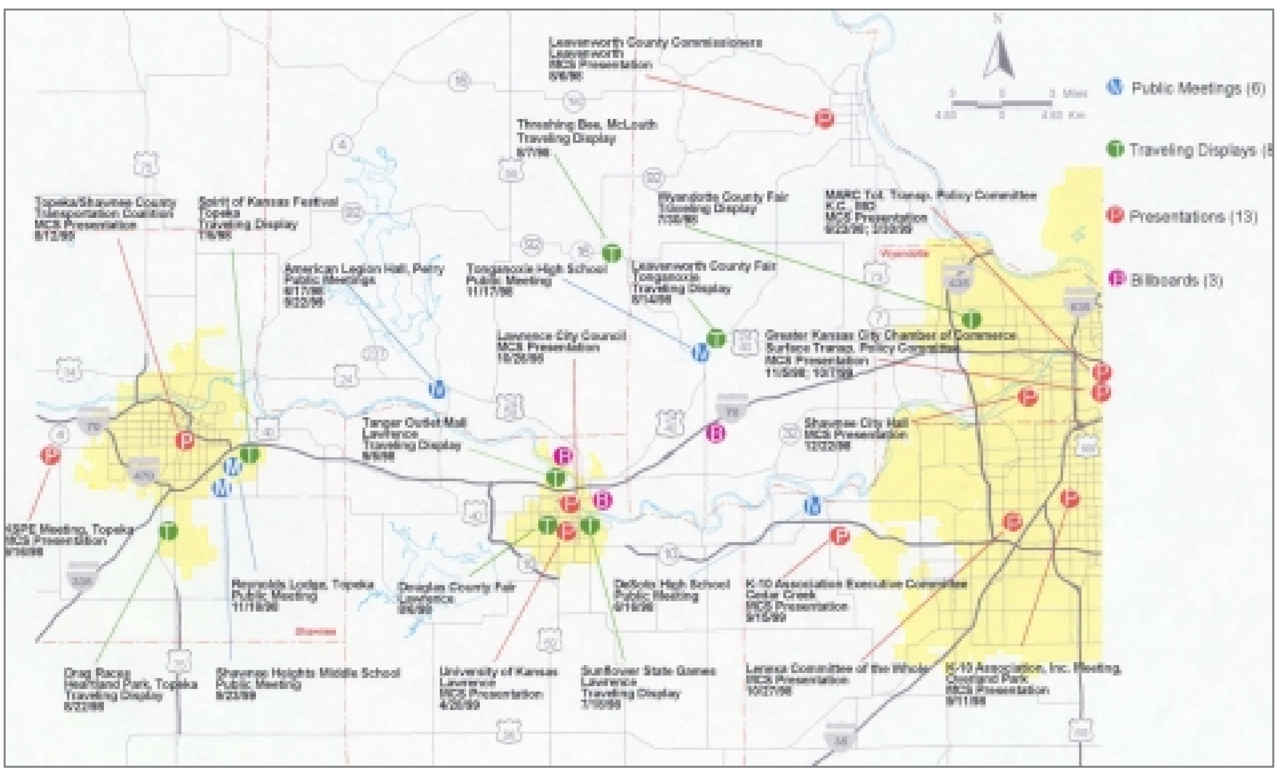
The purpose of the Major Corridor Study was to provide the Kansas Department of Transportation, the Kansas Turnpike Authority, and the citizens of Kansas with a transportation planning tool that addresses the future travel needs between Topeka and Kansas City. To meet the intended purpose of the study, seven study goals were established; these goals are listed at right.

Initial Goals

1. Identify existing mobility issues.
2. Identify current travel patterns.
3. Project future travel demands.
4. Identify future mobility needs.
5. Generate meaningful public and agency involvement.
6. Identify social, environmental, and economic issues that may impact future improvements.
7. Identify & analyze transportation improvement alternatives

A key component of the study process was public involvement. Six public meetings and other public information-gathering forums recorded over 2,500 participants and stakeholders. The project web site, traveling displays, telephone hotline, newsletters, telephone survey all afforded the public an opportunity to keep updated on study status and voice their viewpoints. The map below illustrates the range and scope of public involvement opportunities throughout the study.

Public Outreach/Involvement



Study Process (Cont'd)

The MCS incorporated an evaluation process consisting of two distinct screening activities. An evaluation methodology was developed for both screenings that included public input, engineering, mobility and environmental criteria. The first screening occurred early in the study to eliminate alternatives that did not meet with the goals and objectives developed by both public and agency input. The second screening occurred near the end of the project to select the alternatives that would best fit within a preferred strategy for the region. In both screenings, all criteria were given equal consideration in a graded evaluation.

Four study committees (listed below) provided invaluable assistance to the study team both in the technical and policy areas. These committees met at specific milestones during the course of the study to evaluate the findings and provide direction to the study team. The public was presented numerous opportunities to participate via public meetings, presentations, a corridor-wide telephone survey, a web page, a hotline and many traveling displays.

Committee	Membership	Purpose
Steering	KDOT, KTA, FHWA	Guide study development
Advisory	Local elected officials, Agency/coalition representatives, Economic Development representatives, Chamber of Commerce representatives, Other interested individuals	Provide input; Evaluate information provided by Consultant; Report study progress to member agency/group
Technical	City/County/State/MPO Staff	Provide input; Evaluate information provided by Consultant; Report study progress to member agency
Public Involvement Workgroup	Public affairs representatives from KDOT, KTA, MARC, other local agencies	Provide input and guidance to study team regarding public involvement

Once the final screening was conducted, the remaining alternatives were refined and assessed focusing on general corridor locations and estimated costs.

Existing Conditions

The existing highway system within the study area includes several facility types, ranging from urban interstate freeways to rural two-lane highways. The major east-west facility in the study area is I-70, which runs through Topeka, Lawrence, and Kansas City. In the study area, I-70 is a toll facility (Turnpike) operated and maintained by KTA. Other major east/west facilities include K-10, US-24, US-40, K-32, and 45th Street/Stull Rd. Major north/south routes in the study include US-75, US-59, K-4, and K-7. Public transportation within the study area is provided by several individual bus services. No commuter rail or light rail operations currently exist.

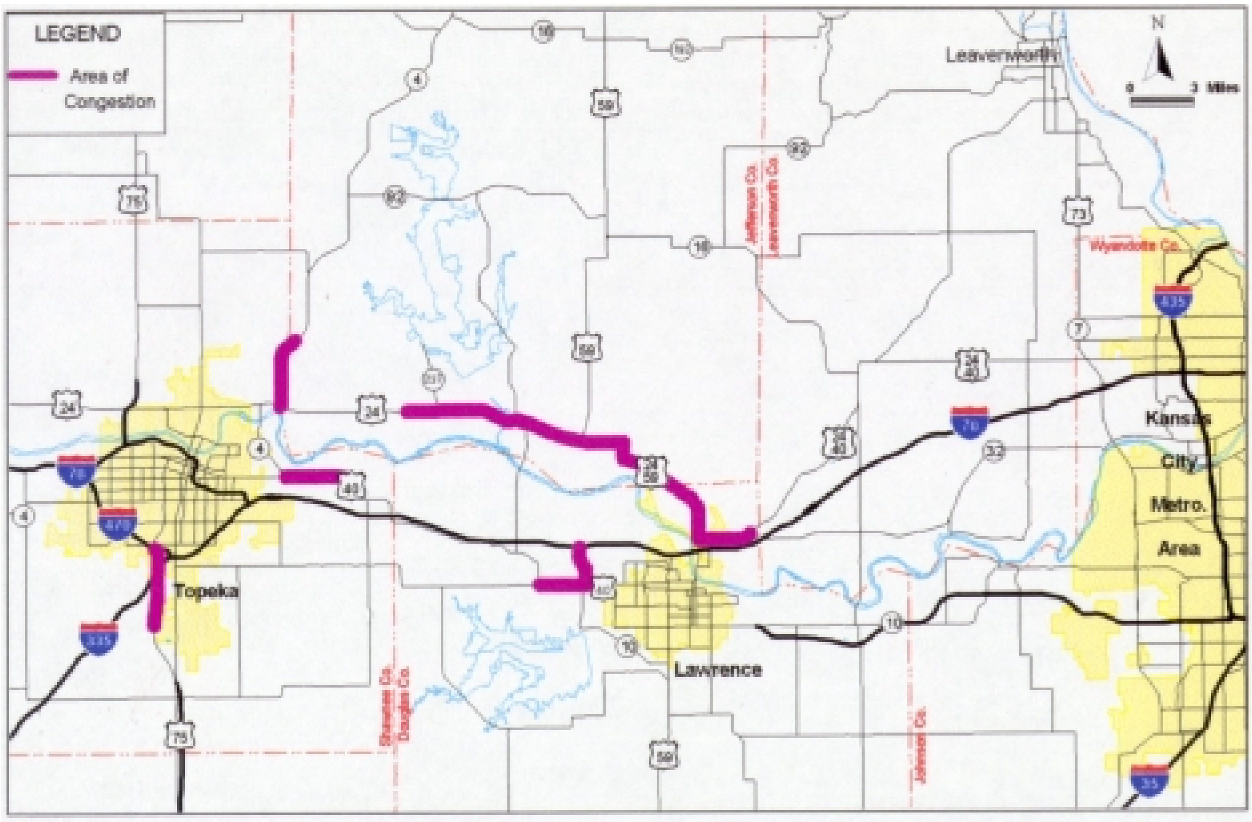
Both KDOT and KTA have experienced steady traffic growth in the study area. KDOT's priority formula has identified needs on several highways, including portions of K-4, US-24, US-40 and US-59. K-10 has also experienced rapid traffic growth. At the same time, KTA has experienced traffic increases on I-70 that are exceeding projections and could result in some segments operating at unacceptable levels of service within the next five years.

In addition to congestion, several other traffic-related issues are also of concern to the general public, including safety, Turnpike access, Kansas River crossings, and the potential effects of new or improved highways.

Existing Conditions (Cont'd)

The map below highlights current areas of congestion within the study area. Congestion was measured using the Level of Service (LOS) concept based on daily traffic volumes; facilities operating at LOS D or worse were considered congested.

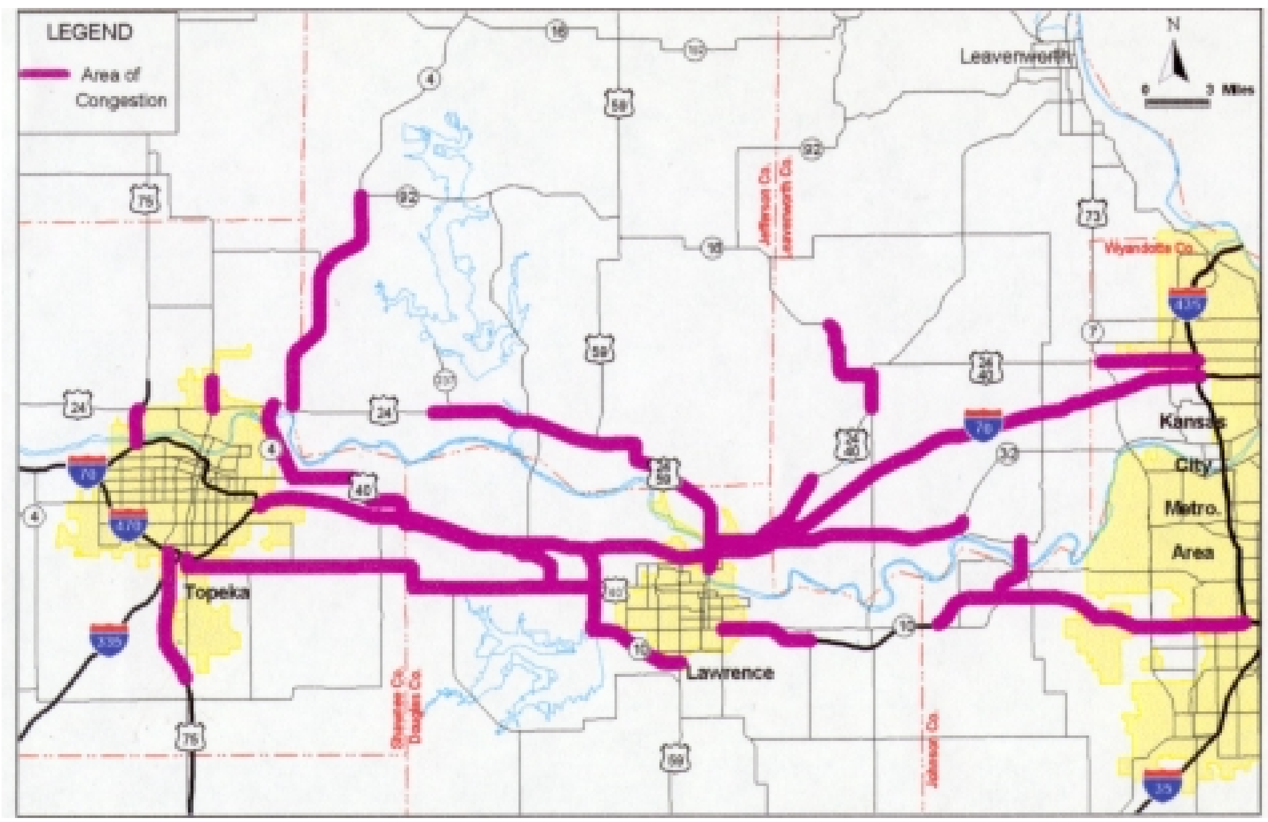
Existing Areas of Congestion



Future (Year 2025) Conditions

The study team developed a computerized transportation demand model to forecast Year 2025 conditions within the study area. The map below illustrates projected congestion in 2025 for the "Existing plus Committed" scenario, in which only currently programmed and funded highway improvements were assumed to be constructed. As the map shows, congestion is forecasted for the majority of the major east-west highways in the study area; in fact, 49 percent of the total study-area lane miles are anticipated to operate at LOS D or worse by 2025.

Year 2025 Areas of Congestion

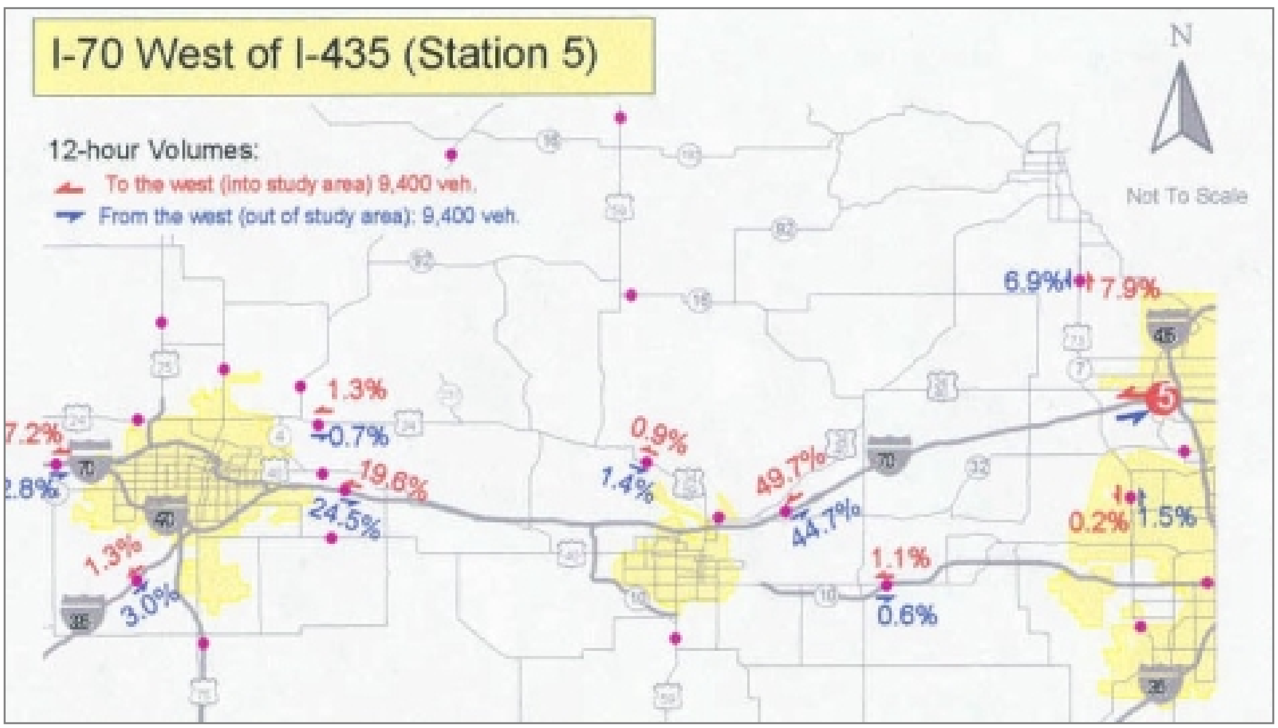


The traffic model was used to evaluate the alternatives described in the following pages. Over 40 roadway network configurations were tested, each representing a unique combination of potential improvements. The effects of individual alternatives, as well as summary measures for key "packages" of alternatives, were evaluated and compared against each other.

O-D Study

One significant data-gathering component of the traffic modeling, and a general tool for understanding traffic patterns in the study area, was the license-plate Origin-Destination (O-D) study conducted early in the process. Based on observations of over 170,000 vehicles traveling through the study area on a single day, the study team was able to generate key inputs to the traffic model related to the proportion of "through" trips. One of the findings of the O-D study was that the City of Lawrence was a primary origin and destination for trips to and from either end of the study area. Several travel pattern maps were created to illustrate the results of the O-D study; the example map below shows the distribution of trips traveling to and from I-70 west of I-435. (Each magenta dot represents a "station" at which license plates were recorded; in general, percentages less than 1.0 are not shown.)

Sample O-D Pattern Map



Initial Screening of Alternatives

The study team initially developed 12 broad categories of improvements, ranging from multi-modal enhancements to Intelligent Transportation System (ITS) strategies. Through an initial screening process involving the input of key study committees and the general public, the list of categories was narrowed and refined. The initial screening process involved rating each strategy's ability to satisfy the five evaluation criteria listed at right.

Initial Screening Criteria

1. Meet traffic demands of the region
2. Minimize engineering/ construction impacts
3. Minimize negative environmental effects
4. Minimize negative economic/ social impacts
5. Maximize cost-effectiveness

Below are listed the 12 initial strategies (plus the "No Build" option) and the results of the initial screening. Highway-related alternatives and the "No Build" option were retained for further analysis.

The phrase "dropped as 'stand-alone'" indicates that the four strategies so named were not considered strong enough to meet the study goals by themselves. The study team decided that these alternatives would be most effective in combination with other, stronger alternatives.

Results of the Initial Screening

"Carried Forward" Strategies	Strategies Dropped as "Stand-alone"	"Dropped" Strategies
No Build	Transportation Systems Management (TSM)[1]	Non-Motorized
New Local Roadways	Transportation Demand Management (TDM)[2]	Commuter Rail
Widen Existing Highways	Intelligent Transportation Systems (ITS)[3]	Light Rail
New Interchanges	Transit (Bus)	
New Toll-Supported Highways		
New State-Supported Highways		

Notes:

[1] *Transportation Systems Management (TSM)* strategies include relatively low-cost enhancements to the existing transportation network that can greatly improve operational efficiency. Examples include traffic signal improvements, geometric improvements, and pavement-marking improvements.

[2] *Transportation Demand Management (TDM)* strategies are aimed at reducing the volume (demand) of vehicles on the transportation network during peak periods. Examples include High-Occupancy-Vehicle (HOV) lanes, employee trip-reduction programs (such as telecommuting), parking management, and ridesharing.

[3] *Intelligent Transportation Systems (ITS)* can be defined as the application of technology to the transportation system to increase efficiency and reduce motorists' delays. Examples include automated incident detection/response, automated highways, and traveler information systems.

Final Screening of Alternatives

Based on the "Carried Forward" strategies, the study team developed eight "families" of roadway improvements that (in addition to the "No Build" scenario) formed the set of 26 alternatives that were to be analyzed in further detail. The table at right lists these alternatives. Initially, these alternatives were loosely and conceptually defined based on public input; subsequently, they were refined to half-mile-wide corridors (based on feasible alignments) to allow a consistent basis for comparison. The map at the bottom of this page shows the approximate locations of these corridors.

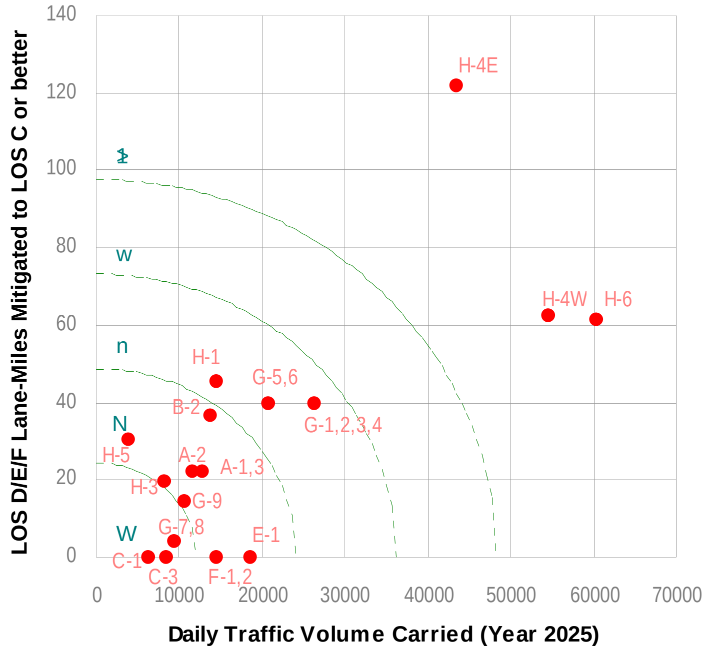
"Carried Forward" Alternatives

A	US-24 extension from Perry to Tonganoxie
B	US-24 realignment
C	US-59 extension from US-24 to I-70
E	East Lawrence bypass
F	Leavenworth-Johnson County Connector
G	Shawnee-Douglas County Connector
H	East-West capacity improvements (widening existing roads)
J	K-7 freeway upgrade

Highway Corridor Alternatives

Final Rating of Alternatives

Each alternative was subjected to a detailed evaluation with respect to each of the five evaluation criteria listed on Page 9. The evaluation process integrated all of the information developed during the study: traffic projections, environmental constraints, improvement cost estimates, inventories of existing topography and development, existing and expected growth and activity patterns, potential alignment locations, and public/ committee input.



An example of the types of analysis conducted to evaluate alternatives. This graph was used to help evaluate the “Meet Traffic Demands of the Region” criteria.

The final stage of the Major Corridor study was the rating of each alternative using the five evaluation criteria listed on Page 9. The alternatives were rated on a five-tier scale based on their respective abilities to satisfy each of the criteria. The matrix on the following page summarizes the alternative ratings. Only the I-70 and K-10 widenings received five “high” ratings; these alternatives also received much positive feedback from the public.

Evaluation Criteria

			Meet Traffic Demands of the Region	Minimize Engineering/ Construction Impacts	Minimize Negative Environmental Effects	Minimize Negative Economic/ Social Impacts	Maximize Cost Effectiveness
	No Build		W	>1	n	n	W
A	US-24, Perry to Tonganoxie	A-1	N	W	n	n	n
		A-2	N	W	N	N	n
		A-3	N	W	N	N	n
B	US-24 Realignment	B-2	N	n	W	w	n
C	US-59 Extension to I-70	C-1	W	n	n	w	W
		C-3	W	n	>1	w	W
E	East Lawrence Connector		N	n	w	>1	N
F	Leavenworth-Johnson Co. Connector	F-1	N	w	n	>1	N
		F-2	N	w	w	>1	N
G	Shawnee-Douglas Co. Connector	G-1	n	W	W	W	w
		G-2	n	W	W	W	w
		G-3	n	W	W	W	w
		G-4	n	W	W	W	w
		G-5	n	W	N	N	n
		G-6	n	W	W	N	n
		G-7	W	N	w	n	N
		G-8	W	N	w	n	N
H	East-West Capacity Improvements	H-1 (US-24)	n	w	w	w	n
		H-3 (K-32)	N	w	w	n	n
		H-4 (I-70)	>1	>1	>1	>1	>1
		H-5 (US-40)	N	W	w	N	W
		H-6 (K-10)	>1	>1	>1	>1	>!
J	K-7 Freeway upgrade		N	W	>1	N	*

W = Low
N = Low to Medium
n = Medium
w = Medium to High
>! = High

Data not sufficient to provide definitive rating.

Next Steps

This study is intended to serve as a planning tool for KDOT and KTA for many years to come. It will provide the two agencies with additional information as they prioritize future travel needs, both statewide and locally. Although this study provides a planning tool, it does not provide a blueprint for construction. The study outlines each alternative's benefits and drawbacks, but stops short of ranking or prioritizing the alternatives.

Two of the alternatives emerged as beneficial to the future travel needs of the region under all improvement scenarios. The widenings of I-70 and K-10 were rated high in all evaluation categories and also enjoyed public support. The study also showed a need to complete US-24 as a four-lane divided facility.

The study identified travel demand and needs expected over the next twenty-five years. KTA will use the results of the study to plan future improvements to I-70. For KDOT, the only potential funding during the next 10 years would be the System Enhancement (SE) component of the Comprehensive Transportation Program passed by the 1999 Legislature. The SE program allows cities and counties to propose candidate improvements to the state highway system. These candidate projects are ranked by KDOT according to traffic characteristics, safety issues, and economic development potential. The MCS provides valuable supplemental information that will be useful in evaluating the study region's candidate SE projects.

Should KDOT or KTA decide to pursue any of the alternatives analyzed in the Major Corridor Study, more detailed and focused analysis, including additional opportunities for public involvement, would be necessary.

June 1, 2000

Mr. Bruce Wacker
President,
Missouri Valley Section – Institute of Transportation Engineers
8500 Santa Fe Drive
Overland Park, KS 66212

Re: 2000 MOVITE Transportation Professional Engineer of the Year

Dear Mr. Wacker:

I would like to at nominate Mr. Tom Swenson for MOVITE Transportation Professional of the Year Award. Tom has been an outstanding professional in the field of Transportation/Traffic Engineering and a strong supporter of ITE and MOVITE. His dedication to the profession and support of the organization make him an excellent candidate for the Transportation Professional of the Year.

Tom received his Bachelor of Science degree in Civil Engineering from University of Kansas in 1977. After completing his degree Tom went to work for the Kansas Department of Transportation where he worked for six years. Tom was an Assistant Urban Highways Engineer in what is now the Bureau of Traffic Engineering. While at KDOT Tom successfully passed the P.E. exam, and is now a registered professional engineer in Kansas, Missouri and Oklahoma. Two of his proudest accomplishments at KDOT include the development of a design methodology for vehicle detection on high-speed approaches to traffic signals, a concept still widely used in this region, and development of a process to identify, prioritize, and evaluate high-accident locations for the federal-aid safety program.

Then in 1984 Tom went to work for JBM (now TranSystems Corporation). Tom started at JBM as a traffic/transportation engineer and through his tenure worked his way to team leader of the traffic engineering and transportation planning team in the Kansas City Office, and is now a principal with the firm. As a professional in traffic/transportation engineering Tom has extensive experience in traffic engineering studies, transportation planning, geometric design, access management, traffic signalization, and traffic signal systems, street lighting, signing, pavement markings and work zone traffic control. He has worked on several high profile projects including the Sprint World Headquarters Campus, the rehabilitation of Union Station project, the I-35/US 69 Major Investment Study, the 119th Street and I-35 interchange reconstruction, and a comprehensive long-range transportation plan for Manhattan, Kansas. Tom also designed the first closed-loop traffic signal system using fiber optics for communication in the Kansas City metropolitan area.

Tom is not only a member of ITE and MOVITE, but is also an active member of several other professional organizations including: the American Public Works Association, the National Society of Professional Engineers, the Missouri Society of Professional Engineers, the Illuminating Engineering Society of North America, and the Transportation Research Board. For the past seven years Tom has been the MATHCOUNTS chairman of the Western Chapter of MSPE. MATHCOUNTS is an annual mathematic competition for 7th and 8th grade students. Tom has been a state director for the MSPE Western Chapter and was recently elected Secretary, beginning a progression through the chapter board of directors. He has been on the MSPE PEPP (Professionals in Private Practice) executive board for four years and will serve as chairman for the 2000-2001 program year.

Tom was on the MOVITE Board from 1991 to 1997, serving as President in 1996. The MOVITE Journal prepared during his year as president was selected as the best newsletter for its section size by ITE. MOVITE membership was expanded and all section documents were reformatted and updated, including several changes to the policies. Tom also served on the District IV Board in 1996 and 1997, serving as Secretary in the latter year, and was recently appointed to the position of MOVITE Historian. Tom achieved certification as a Professional Traffic Operations Engineer in 1999.

Tom served on a MOVITE technical committee addressing accident rates in the late 1980's and has served on several planning committees for MOVITE meetings in Kansas City and Topeka. He also served on the committees planning the District IV meetings in the MOVITE section in 1995 and 1999. Tom also represented District IV on the 1999 ITE Nominating Committee, the body that interviews and selects candidates for International Vice President.

Tom should be truly proud of his accomplishments and I think it is only fitting that MOVITE recognize him for his contributions to the profession. I send this application with my admiration and support for Mr. Swenson to be selected as MOVITE Transportation Professional of the Year.

Sincerely,

Steven R. Schooley, PE, PTOE

APPLICATION OF THE 85TH PECENTILE THEORY ON KANSAS ROADS

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INTRODUCTION

The current policy of the State of Kansas for posting speed limit gives the Secretary of Transportation the right to change the speed limit providing a speed investigation has been conducted (K.S.A 8-1558). The responsibility of conducting speed studies falls to the Kansas Department of Transportation (KDOT) Bureau of Traffic Engineering. It is the policy of the Bureau of Traffic Engineering to recommend posting speed zones based on results of vehicular speed evaluations. The recommendations are most often based on the results of the speed study utilizing the 85th percentile theory. The intention of this work is to evaluate the effectiveness of posting the speed limit on Kansas roads according to the 85th percentile theory.

This document compares speed studies that were conducted 'before' and 'after' the speed limit was changed. The 'after' study is a speed study conducted after a new speed limit was posted on the study section. The new speed was posted based on the 85th percentile speed of the 'before' speed study. The 'before' and 'after' 85th percentile speeds should be statistically equal to validate the 85th percentile theory.

FIELD PROCEDURES

For identification of sites eligible for the study, all speed study files from 1989 to 1995 were examined. The main factor in choosing these sites was the availability of a ‘before’ study. Speed studies in which there was no recommendation for a speed limit change were first eliminated. Next to be removed were locations where the zone in which the speed was to be changed could not be pinpointed (the speed resolution could not be located to verify the zone). Next, speed studies in locations where changes were made in addition to a chance in speed, were eliminated. These changes included geometric changes, change in land development and use, and change in traffic control devices. Geometric changes included the construction of additional lanes, the addition or removal of access points, and the construction of curb and gutter. Land development and use changes include a change in pedestrian movement across and along the road, a change in the number of dwelling units along the roadway, and a change in zoning. Traffic control changes include the addition/removal of a beacon, a stop sign or yield sign, the exchange of a yield sign with a stop sign, or the construction of a traffic signal. Last to be eliminated were sites where the ‘before’ study location could not be clearly identified. For example, one location of a ‘before’ study was identified as “next to white house”. Since it was desirable to conduct the ‘after’ study at the same location as the ‘before’ study, and since many houses in the speed zone may be the “white house”, the site was disregarded from the study. In addition, zones in which the road was curved or included a school zone were not included in the study. After the above exclusions, forty-nine locations in the were chosen for this study.

WILL MORE DRIVERS OBEY THE SPEED LIMIT IF THE SPEED LIMIT IS POSTED AT THE 85^{TH} PERCENTILE SPEED?

According to theory, most drivers drive at a speed which they deem appropriate for the conditions. Thus, when drivers drive at a speed higher than the speed limit it is because they perceive that the speed limit does not correlate with the condition (i.e. the speed limit is artificially low). If the speed limit is posted at a speed that correlates to the road condition the number of drivers that drive "over" the speed limit will decrease. The analysis of the data indicate that this was true for 41 of the 49 test sites (84%). The level of significance for 39 of the 41 cases was higher than .01 ($t_{calculated}$>2.56).

IF SPEED LIMIT IS INCREASED TO THE 85^{TH} PERCENTILE SPEED WILL AVERAGE SPEED INCREASE?

A common argument, by the public, against raising the speed limit is that driver speed will increase with the increase in speed limit. According to the 85^{th} percentile theory, driver speed will not change if there is no change in conditions. At a level of significance α=0.05, forty-three of the cases (87%) indicate that the average speed will not increase proportionally to the increase in speed limit. The results, however, do indicate an increase in average speed. In 35 of the 49 cases (71%) the average speed increased. The average increase in the 85^{th} percentile speed was 2.2 mph (average increase in the posted speed limit was 9.1 mph). It is speculated that the increase in speed is attributed to the improvement of vehicle technology. Theoretically, the 'after' study sample would contain more technologically advanced vehicles. A more advanced vehicle will result in an increase in driver comfort and thus an increase in speed.

A summary of the results is provided in Table 1 and Table 2. Table 1 presents the results by speed change category (20 mph to 25 mph, 20 mph to 30 mph, etc.) Table 2 presents the results by speed change value (5 mph, 10 mph, 15mph and 25 mph).

Table 1: Tabulation of Results by Speed Change Category

Speed Change		Number in Group	Before			After			Change In		
From	To		85th %ile	Variance	% in Pace	85th %ile	Variance	% in Pace	85th %ile	Variance	% in Pace
(mph)	(mph)		(mph)		(%)	(mph)		(%)	(mph)		(%)
20	25	1	26.3	16.3	85.2	24.7	6.7	95.2	-1.6	-9.5	10.0
20	30	2	27.6	14.8	79.6	29.6	21.3	74.1	2.0	6.4	-5.5
25	35	1	32.0	13.9	80.0	34.6	13.5	86.9	2.6	-0.4	6.9
30	35	10	37.6	30.9	69.9	38.0	27.4	73.1	0.4	-3.5	3.2
30	40	5	40.4	38.7	63.1	40.1	27.1	70.3	-0.4	-11.6	7.1
30	45	3	44.7	50.1	61.9	46.3	43.8	67.2	1.7	-6.3	5.3
30	55	1	56.6	85.1	48.0	56.5	50.0	63.1	-0.1	-35.2	15.1
35	40	2	40.1	22.6	72.0	41.1	30.1	69.3	1.0	7.6	-2.7
35	45	2	49.1	31.8	66.5	44.6	28.3	63.8	-4.5	-3.5	-2.7
40	45	6	45.5	41.5	61.4	47.0	41.3	61.5	1.5	-0.2	0.1
40	55	1	53.0	45.3	54.5	54.4	71.3	48.5	1.4	26.0	-6.0
45	55	4	57.1	44.4	64.7	64.0	39.2	61.4	6.9	-5.1	-3.3
50	65	3	57.3	47.8	59.6	66.4	47.8	70.6	9.1	0.0	11.0
55	65	8	58.1	30.1	67.5	62.0	42.8	62.6	3.9	12.7	-4.9

Table 2: Tabulation of Results by Speed Change Value

Speed Change (mph)	Number in Group	Before			After			Change In		
		85th %ile (mph)	Variance	% in Pace (%)	85th %ile (mph)	Variance	% in Pace (%)	85th %ile (mph)	Variance	% in Pace (%)
5	19	42.8	32.6	68.2	44.9	31.0	70.2	2.1	-1.6	2.0
10	22	47.6	32.7	67.6	51.6	34.0	66.4	4.0	1.3	-1.2
15	7	53.4	48.4	59.9	56.1	49.4	66.0	2.7	1.0	6.1
25	1	56.6	85.1	48.0	56.5	50.0	63.1	-0.1	-35.2	15.1

WILL THE RANGE OF VEHICULAR SPEEDS DECREASE IF SPEED LIMIT IS POSTED AT THE 85^{TH} PERCENTILE SPEED?

A correlation has been shown between variance in speed and accident rate—accident rate increases as the range of speeds increases. According to the 85^{th} percentile theory, some drivers obey the speed limit regardless of the condition. These drivers will not drive at a speed which they deem reasonable for road conditions but rather at or below the posted speed. If the speed limit is raised from an artificial low, these drivers, given the option of driving at a pace which correlates with the conditions will do so (i.e. they will drive at a higher speed). As shown previously in this report, drivers who drove at a speed deemed reasonable before the speed limit was changed, will continue to do so after the change in the speed limit. Thus, it is hypothesized that the range in vehicular speed will decrease if the speed limits are posted in accordance with the 85^{th} percentile theory. And if the range of speeds is decreased, the risk of an accident would, therefore, decrease. The statistical analysis of the data fails to prove that the range of vehicular speeds decreased. A visual inspection of the data reveals that only in 19 of the 49 cases (39%) did the range decrease (Table 3). A speculation as to the lack of change in the minimum speed is that in the lower speed region vehicle characteristics and driver characteristics may have a greater influence than road characteristics. Further studies are needed to investigate this issue

Table 3: Range of Speeds

Case	Before (mph)			After (mph)			Change	Before>
	Largest	Smallest	Range	Largest	Smallest	Range	(mph)	After?
1	38	16	22	31	18	13	9	yes
2	32	17	15	39	15	24	-9	no
3	32	19	13	35	16	19	-6	no
4	35	18	17	45	24	21	-4	no
5	51	24	27	52	22	30	-3	no
6	44	20	24	48	22	26	-2	no
7	43	20	23	47	22	25	-2	no
8	43	18	25	44	22	22	3	yes
9	44	17	27	49	20	29	-2	no
10	46	16	30	38	23	15	15	yes
11	42	27	15	43	25	18	-3	no
12	45	18	27	54	22	32	-5	no
13	40	20	20	51	23	28	-8	no
14	41	20	21	42	19	23	-2	no
15	48	27	21	52	26	26	-5	no
16	47	19	28	51	23	28	0	no
17	52	26	26	45	22	23	3	yes
18	45	18	27	41	22	19	8	yes
19	48	15	33	52	21	31	2	yes
20	66	20	46	56	21	35	11	yes
21	50	28	22	58	29	29	-7	no
22	50	25	25	53	25	28	-3	no
23	67	30	37	63	30	33	4	yes
24	48	26	22	50	29	21	1	yes
25	45	27	18	49	18	31	-13	no
26	56	30	26	50	27	23	3	yes
27	55	29	26	53	29	24	2	yes
28	57	25	32	57	29	28	4	yes
29	57	19	38	55	20	35	3	yes
30	50	24	26	60	27	33	-7	no
31	55	21	34	53	32	21	13	yes
32	56	18	38	61	22	39	-1	no
33	55	27	28	53	27	26	2	yes
34	58	34	24	61	25	36	-12	no
35	64	42	22	74	48	26	-4	no
36	64	40	24	72	44	28	-4	no
37	68	33	35	72	45	27	8	yes
38	69	28	41	70	38	32	9	yes
39	65	31	34	72	35	37	-3	no
40	69	41	28	77	45	32	-4	no

41	67	42	25	72	50	22	3	yes
42	71	40	31	67	35	32	-1	no
43	65	38	27	66	39	27	0	no
44	64	43	21	69	35	34	-13	no
45	70	41	29	65	40	25	4	yes
46	71	39	32	75	34	41	-9	no
47	64	35	29	70	35	35	-6	no
48	63	41	22	70	41	29	-7	no
49	63	35	28	74	46	28	0	no
							Total	**19**

CONCLUSION AND RECOMMENDATION

It is concluded that the 85th percentile theory is applicable to Kansas roads and the continuation of the practice of setting speeds limits based on the 85th percentile speed is recommended.