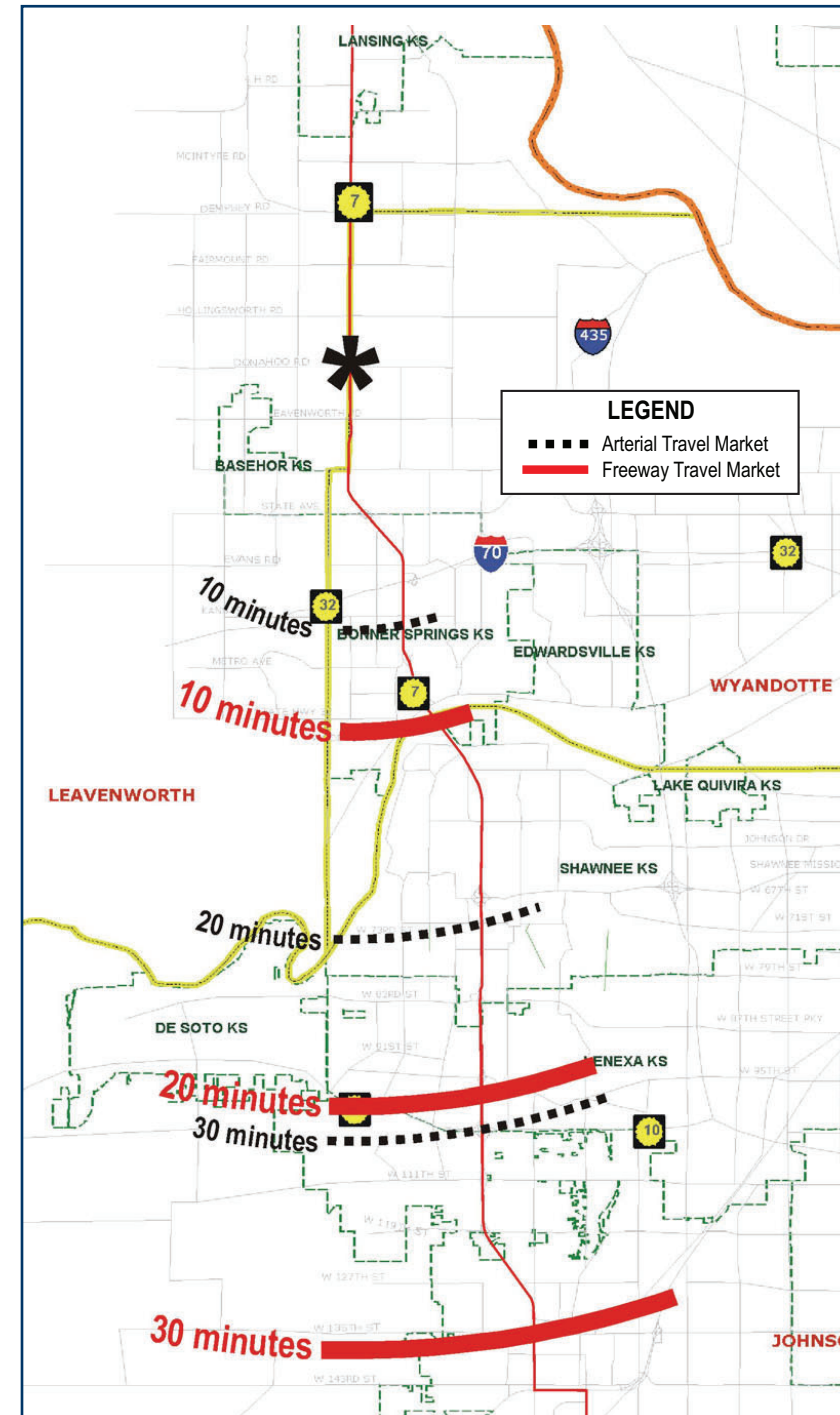


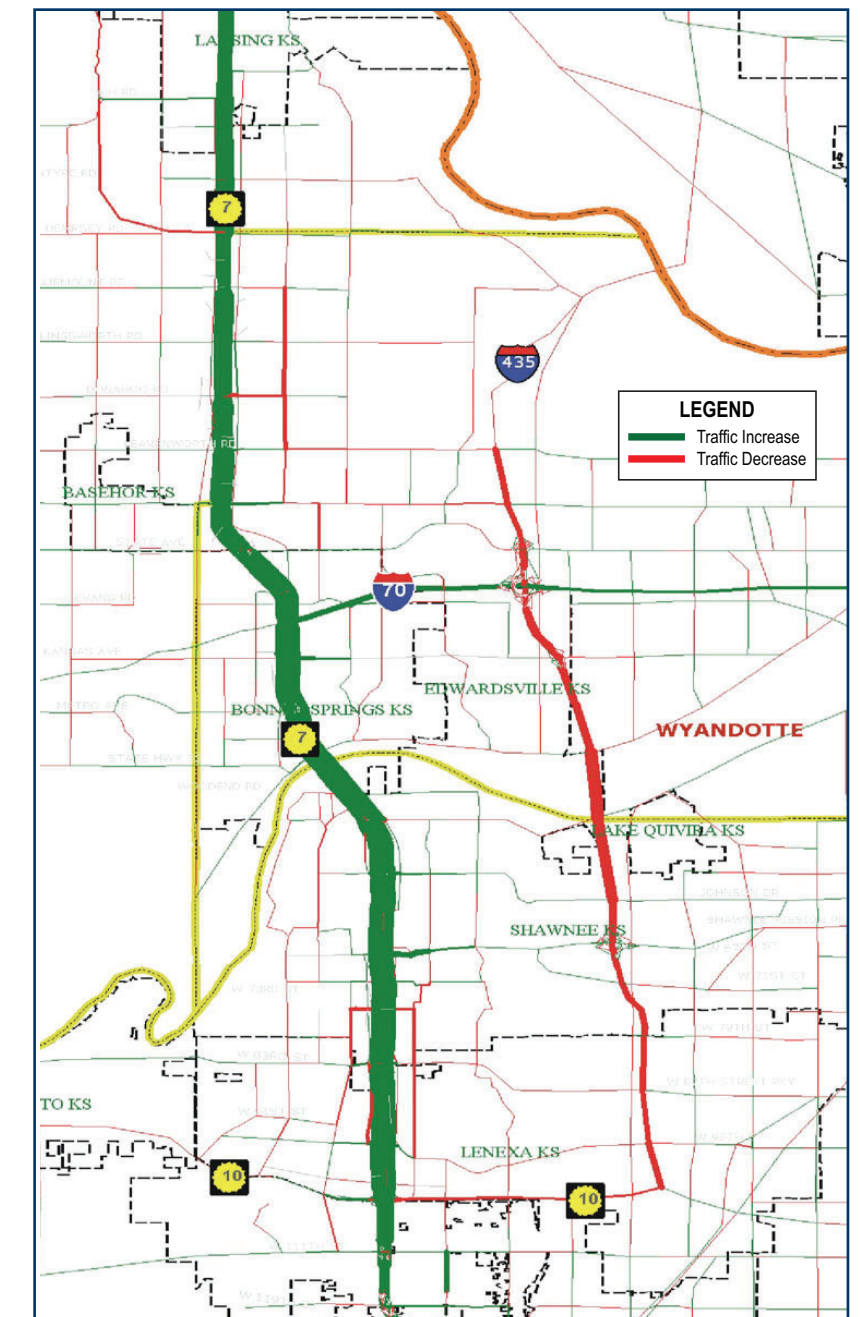
Traffic Analysis

Reductions in travel time for motorists means that motorists will be able to travel further with a freeway than an arterial. Figure 9 shows how the travel demand market expands with a freeway compared to an arterial.

Since motorist travel time improves along K-7 for a freeway compared to an arterial, more vehicles are expected to use K-7 as an improved means of driving between their origin and destination. As a result, traffic volumes are expected to increase in the K-7 corridor with the freeway facility type. Figure 10 shows how travel patterns would change for a freeway along K-7 compared to an arterial. Green indicates an increase in traffic and red indicates a decrease in traffic when a freeway is planned for K-7. Model data also indicated that higher traffic volumes would use the local street network when K-7 is an arterial than when it is a freeway (i.e. there is a greater demand on the local network).



2030 K-7 Travel Market - Figure 9



2030 K-7 Change in Travel Demand - Figure 10

Traffic Analysis

What-If travel model scenarios are changes to either land use or the roadway network from the base condition. Phase I What-If scenario results were:

- 6-lane freeway – Previous estimates of a 4-lane freeway in the K-7 Technical Report were proven inadequate by the results of the 6-lane freeway What-If scenario. In Phase I, a minimum of 6-lanes was shown to be needed in much of the corridor north of I-35 by 2030.
- Full build out land use – Full build out land use represents additional land use and traffic growth beyond the 2030 design year. Additional land use and traffic growth beyond 2030 was high at both ends of the study corridor and lower in the middle. Results indicated that traffic volumes increased by a significant amount from 2030 to Full Build Out conditions to warrant additional capacity.
- Northern Connector between K-7 and I-435 – A four lane freeway between K-7 and I-435 was analyzed with no improvements to K-7 between I-70 and Mary Street. Traffic demand results indicated that the majority of the motorists continued to use K-7 and only a few vehicles were diverted to a new east/west route.

Safety Analysis

The K-7 Corridor Technical Report, 2002, performed a crash analysis of the corridor. The purpose was to analyze the corridors current safety. Five years of crash data was provided by KDOT from 1995 through 1999. The purpose of the safety analysis in this study was to review the more recent crash data to see if any trends had changed since the Technical Report. Crash data was provided by KDOT for years 2000, 2001 and 2002.

Table 4 shows the crash data provided by KDOT for years 2000, 2001 and 2002. As shown in the table, there were a significant number of crashes in the study corridor. In the last three years of available data, there were 1,167 total accidents for an average of 389 accidents per year. Previously, between 1995 and 1999 there were 1,933 total accidents for an average of 387 per year, indicating that the average total accidents per year is similar to previous results. When crash rates were compared to the statewide crash rates for similar facilities, segment 1 shows a higher total crash rate than the statewide average. Other study segments show a crash rate close to the statewide average. As traffic volumes increase in the corridor, the number and crash rate is expected to exceed the statewide average for most of the study segments.

Corridor Study Segment	Technical Report Segment	PDO	Injury	Fatality	Total Crashes	Average Crash Rate [mvm]	Ave. Statewide Crash Rate [mvm]	Statewide Facility Type*
1	1	311	52	2	365	2.1	0.986	4-Partial / Rural
1	2	250	28	1	279	2.6	2.832	4-Partial / Urban
2	3	119	23	2	144	0.7	1.307	4-Full / Urban
2	4	156	26	2	184	2.0	2.832	4-Partial / Urban
3	5	162	31	2	195	1.0	0.986	4-Partial / Rural
TOTAL		998	160	9	1,167	Source: KDOT *Statewide accidents for years 1997 - 2001		

K-7 Overall Total Crashes by Segment 2000 – 2002 - Table 4

Street Network (Phase 2 Micro-Level Segment Analysis) Study Methodology

Phase 2 analysis generated a micro-level understanding of K-7 and the street network for each study segment as opposed to the macro-level corridor analysis performed in Phase I. A preliminary street network plan was developed for each study segment based on Phase I results and discussions with the study partners. The street network plan included identification of lanes and locations where access would be for K-7 and the supporting street network.

In Phase 2, the travel model was taken to a greater level of detail that included a detailed street network concept plan. Based on the revised travel model, 2030 and full build out daily forecasted volumes for each study segment were developed.

Traffic analysis tested traffic results for K-7 and the supporting roadway network. Traffic analysis utilized traffic software that used traditional Highway Capacity Manual, 2000 methods.

Roadway segment and intersection/interchange level of service analysis of the K-7 Corridor street plan was performed for 2030 and full build out conditions. Design level of service D was used for 2030 conditions and design level of service E was used for full build out. Traffic assumptions provided by KDOT for the K-7 Corridor Technical Report, 2002 were also used in this study:

- DHV = 11%
- Directional Distribution = 55/45
- Truck 11% mainline, 3%-5% urban streets

In order to convert daily volumes to a design hour volume, complimentary movements were added together and then multiplied by the 0.55 directional split and 0.11 design hour volume factors. This approach provides a balanced volume that peaks in both the AM and PM directions at the same time, which provides a conservative analysis result.

K-7 mainline and local street network capacity was analyzed using urban arterial and freeway level of service capacity thresholds from Table 5 (below) and Table 6 (on the following page).

Lanes	LOS-A	LOS-B	LOS-C	LOS-D	LOS-E
2	NA	NA	10,800	13,700	14,300
4	NA	NA	23,700	27,400	28,700
6	NA	NA	36,800	41,200	43,100
8	NA	NA	49,900	54,900	57,500

Source: HCM 2000, Class II

Urban Arterial Thresholds Daily Volumes Two-Way (vehicles/day) - Table 5

Traffic Analysis

Lanes	LOS-A	LOS-B	LOS-C	LOS-D	LOS-E
2	19,700	32,200	46,500	62,700	80,600
4	30,400	49,800	71,900	96,800	124,500
6	41,700	68,300	98,600	132,800	170,800
8	53,600	87,800	132,800	170,700	219,500

Source: HCM 2000, Class II

**Freeway Thresholds
Daily Volumes Two-Way (vehicles/day) - Table 6**

TRAFFIC ANALYSIS

Phase 2 traffic analysis used a more detailed K-7 travel demand model to analyze traffic demand and traffic operations for the K-7 corridor and supporting street network. Results from this analysis were used to identify the necessary estimated right of way needs along K-7 as well as the supporting local street network.

Traffic Demand

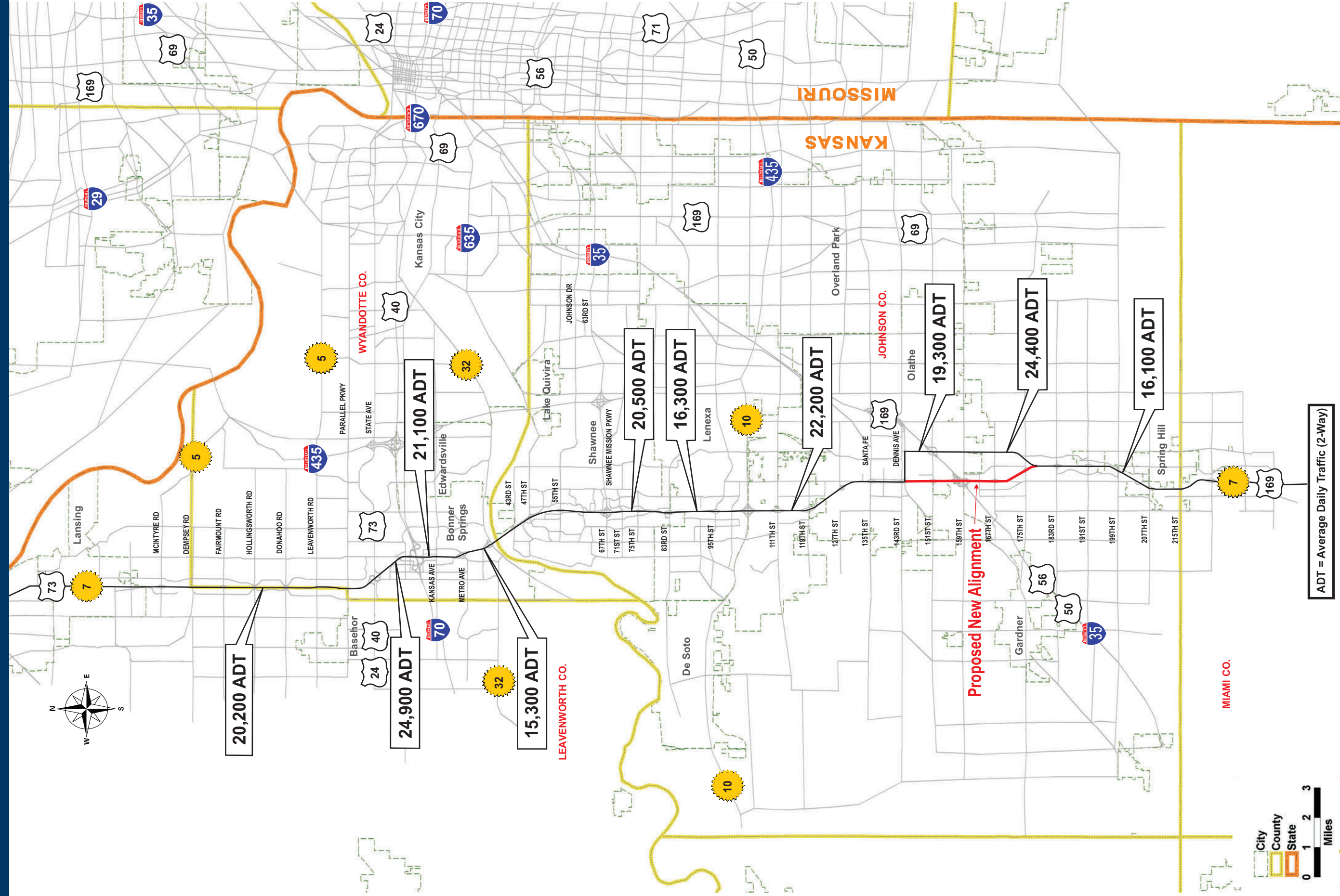
Existing, 2030 and full build out traffic demand is shown on Figures 11 through 13. Traffic forecasts represent Phase 2 model refinements. (Note: Phase 1 assumed that K-7 between I-35 and K-10 remained in its current configuration, whereas, Phase 2 assumed that K-7 between I-35 and K-10 was upgraded to a freeway.) The number of planned lanes for 2030 and full build out conditions are also shown.

Roadway Network

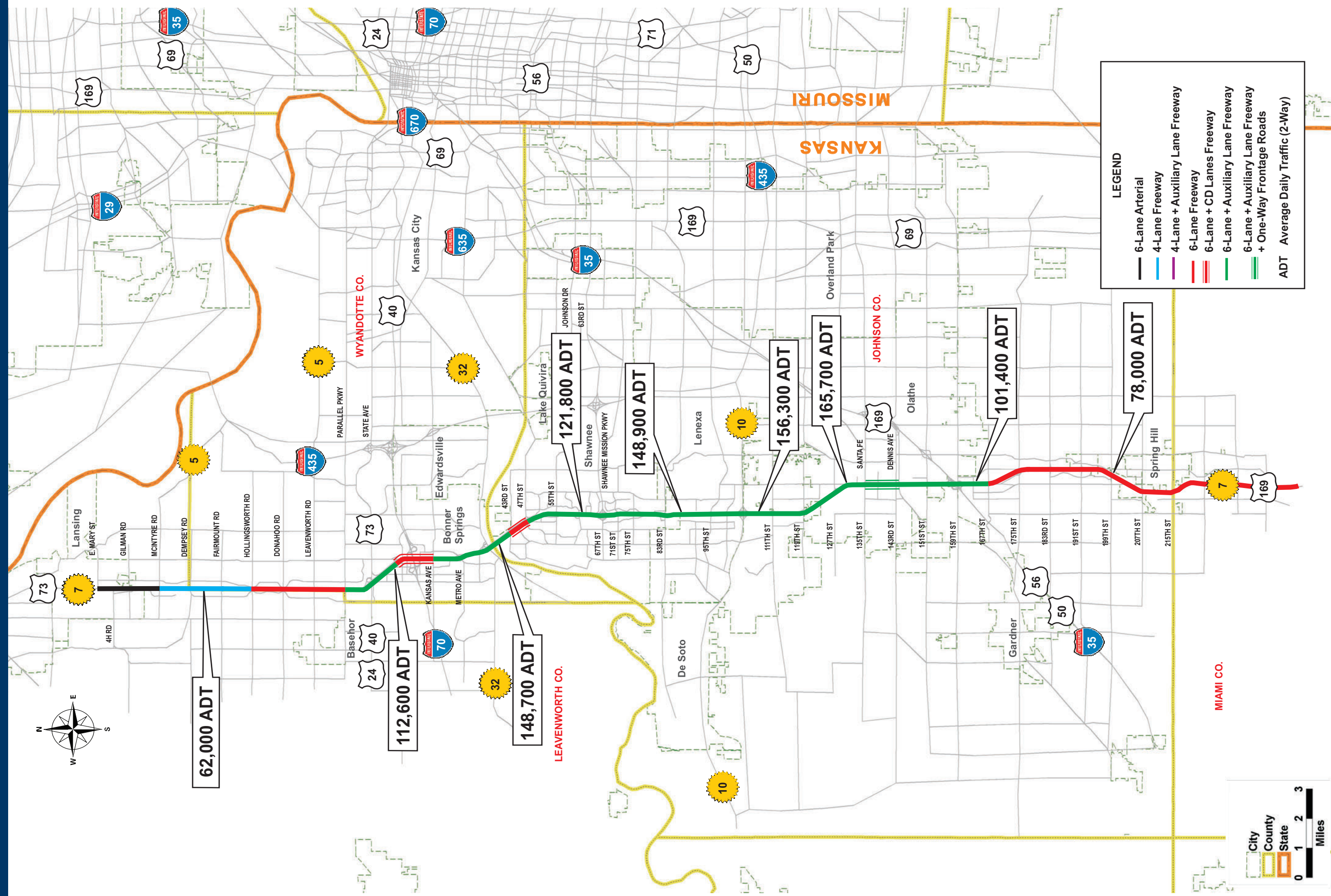
A large portion of land adjacent to K-7 is undeveloped. This is especially true north of I-70 and south of I-35. Consequently, a plan for the K-7 corridor and supporting roadway network was essential for the entire system to function together. The key features of the comprehensive roadway system are:

- **Mainline Facility Type:** Based on 2030 and full build out traffic demand, the necessary K-7 freeway through and auxiliary lanes were developed to achieve a reasonable level of service in the respective design years. The number and type of K-7 mainline lanes are shown in Figure 12 and 13 for 2030 and full build out conditions.
- **Interchanges:** While KDOT prefers two-mile spacing for interchanges, K-7 interchanges would be located at a minimum of one-mile spacing. Most interchanges were initially laid out as typical diamond configurations, with signalized ramp terminals anticipated. However, due to existing or anticipated physical constraints, interchange configurations were modified. Interchange layouts are shown in plan plates located in Appendix B.
- **Frontage Roads:** To effectively serve properties adjacent to K-7 in the future, and to conform to access management principles, a network of frontage roads was developed on both sides of K-7 in most areas. An effort was made to offset the frontage roads roughly one-quarter mile from the center line of K-7, in order to maintain adequate spacing between ramp terminals and adjacent intersections. Thus, these parallel facilities would serve as “reverse frontage” roads, with access to properties coming from the “rear”. The quarter-mile offset was used as a guide; existing topography, land use, and other features further guided the conceptual horizontal layout. The frontage roads are shown continuous when possible, not only to serve for local/regional circulation needs but to serve as relievers for K-7, reducing the need for short-trip local traffic to use the freeway and providing potential diversion routes during freeway incidents. Frontage road layouts are shown in plan plates located in Appendix A.
- **Supporting Local Arterials:** Within the K-7 corridor, future major east-west arterials would fall at approximately one-mile intervals. It is envisioned that the major north-south facilities would be located approximately one mile on either side of K-7. Supporting local arterials are shown in plan plates located in Appendix A.
- **Property Access:** Many properties currently have direct access to K-7 at points that would need to be closed to convert the facility to a freeway in the future. Therefore, the supporting network concept included access provisions to serve these properties, largely via connections to the frontage roads. The current concept illustrates potential ways to serve these properties if they remain in their current state. As anticipated development/redevelopment occurs along the corridor, these access considerations should be revisited to determine the best configuration for individual developments and the system as a whole.

Existing Traffic (2002-2004) - Figure 11



Full Build Out Traffic and Lanes - Figure 13



Traffic Analysis

Operational Analysis

Based on the Phase 2 forecasted traffic demand from the K-7 travel model, traffic operations analysis was performed. Roadway capacity analysis was performed as described in the study methodology Section. This analysis was used to determine the number of future lanes on the K-7 mainline and supporting roadway network. Intersection level of service and queue analysis was performed to evaluate the number of lanes and operational characteristics for each interchange. Table 7 shows the K-7 Interchange ramp intersection level of service results for full build out conditions at ramp terminal intersections.

Because of their complexity, more detailed analysis was performed at the system to system interchanges of I-70, Shawnee Mission Parkway, K-10 and I-35.

Unique Areas

Based on the operational analysis performed, problem areas were identified. These areas should be analyzed in greater detail as the planning and design process continues.

Segment I

I-35 Interchange – The conceptual layout of the I-35 Interchange is shown in plan plate B-7 in Appendix B. The I-35 Interchange mainline, ramps, ramp junctions, and weaves were analyzed using Highway Capacity Software; preliminary analysis indicates that operations during 2030 are anticipated to be at LOS D or better and during full build out anticipated to be at LOS E or better. More detailed analysis of the interchange should be performed during design.

Intersection	Southbound K-7 Ramp Intersection		Northbound K-7 Ramp Intersection	
	LOS	Delay	LOS	Delay
Segment 3 - State Avenue to E. Mary Street				
McIntyre Road	A	9.0	B	11.3
Fairmount Road/Polfer Road	B	13.2	B	12.3
Donahoo Road	B	19.0	B	12.5
Hollingsworth Road	B	14.9	B	11.1
Leavenworth Road	B	14.6	C	23.9
Parallel Parkway	B	13.1	B	16.3
Segment 2 - K-10 to State Avenue				
US-24	A	3.9	C	33.4
I 30th Street	C	22.5	-	-
I-70	-	-	-	-
Kansas Avenue	C	31.4	-	-
Nettleton	D	40.3	D	36.8
K-32	D	42.4	D	35.6
43rd Street	B	11.4	B	11.2
47th Street	D	41.6	C	21.8
Johnson Drive	B	12.9	B	12.0
Shawnee Mission Parkway	-	-	-	-
75th Street	C	23.4	C	31.6
83rd Street	C	34.8	D	53.6
Prairie Star Parkway	C	36.3	D	46.2
Segment I - Miami/Johnson County Line to K-10				
K-10	-	-	-	-
College Boulevard (I 11th Street)	B	11.9	A	6.7
I 19th Street	A	8.1	B	11.4
Harold (I 27th Street)	B	31.5	A	0.8
Santa Fe (I 35th Street)	F	>80	F	>80
Dennis Avenue (I 43rd Street)	E	70.6	E	56.7
Old Highway 56	B	14.8	C	21.9
I 51st Street	C	27.4	B	12.6
I 59th Street	C	23.8	C	22.1
I-35	-	-	-	-
I 67th Street	B	11.5	B	12.24
I 75th Street	B	12.2	A	6.9
I 83rd Street	B	7.4	A	8.6
I 91st Street	B	12.7	A	3.5
I 99th Street	A	9.0	B	13.9
I 207th Street	A	7.8	A	7.8
I 223rd Street	B	15.5	B	5.2

Full Build Out K-7 Interchange Ramp Intersection Level of Service - Table 7

Traffic Analysis

Old 56 Highway to Santa Fe (135th Street) – The conceptual design of the freeway system between US 56 and Santa Fe is shown in plan plates B-8 and B-9 in Appendix B. K-7 between US 56 and Santa Fe is proposed to have 6 lanes plus auxiliary lanes in each direction with slip ramps to and from one-way frontage roads. Both the northbound and southbound frontage roads will have two lanes in each direction and provide access to property and local streets. The area that presented the greatest traffic operational problems in the K-7 corridor was the K-7 and Santa Fe northbound and southbound intersections. These two intersections were the only locations in the K-7 corridor that had level of service below the desired level for 2030 and full build out conditions.

Level of service problems are a direct result of the high traffic forecasts around the intersections. K-7 model volume indicate 65,000 daily vehicles east of the intersection in 2030 and 84,000 daily vehicles east of the intersection in full build out.

Considering the planning level of this study, caution should be exercised with using the raw model volume output. Using the regional model at the intersection turning level may present some forecasting problems. Although the K-7 model refined the regional model by adding more model detail within the study corridor, limitations in the travel model may present inflated traffic volumes within this section of the study corridor. Some of the model limitations that may have contributed to the higher forecasts along Santa Fe include:

- Turning movements represent both AM and PM peaks occurring at the same time to be conservative, as described in the Study Methodology Section.
- K-7 model is a daily model. Post processing using a uniform peak hour percent (K factor) was used to develop design hour volumes.
- The regional model may not be reflecting true corridor capacity constraints along Santa Fe.
- Caution should be presented when using a regional model to extract turning movements.

In order to develop more accurate turning volumes at the K-7 and Santa Fe intersection, Olathe's new travel demand model should be used which reflects local travel conditions. External model freeway demand from the K-7 model could then be used in the Olathe model.

K-10 Interchange – The conceptual design of the K-10 Interchange is shown in plan plate A-5 in Appendix A. Detailed operational analysis of the K-10 Interchange was performed in the K-10 Interchanges Study. Travel demand for a 2030 (also considered full build out in this area) condition was correlated with the K-7 study. Study recommendations were for a system to system directional interchange and were modeled using VISSIM. Detailed operational results are found in the K-10 study. Based on the proposed design that includes braided ramps on all four segments of the interchange, no levels of service problems are anticipated.



Segment 2

I-70 Interchange – The conceptual design of the I-70 Interchange is shown in plan plate B-22 in Appendix B. The interchange at I-70 with K-7 required many design considerations. This was due to the fact that the existing interchange was designed to serve a toll plaza for the Kansas Turnpike. As such, very high turning movements were created at the intersection of K-7 with the I-70 ramps / Caanan Drive. In the previous K-7 study, a three level single point diamond interchange was recommended at this location. This design was a compromise from a fully directional Maltese cross design that is actually needed to satisfy the high existing and even higher expected movements between K-7 and I-70.

Further analysis has been completed and the results still do not favor the Maltese cross design. The right of way necessary to construct this type of interchange would require purchasing many of the businesses near the existing interchange. Also to construct this interchange, the ramps required to accommodate the projected traffic volumes would extend south past the proposed Kansas Avenue interchange and north past the proposed interchange at 130th Street. This type of interchange would eliminate an interchange at Kansas Avenue as well as at 130th Street without an extensive collector-distributor system with braided ramps to grade-separate the weaving movements. This type of system, which is very similar to what would be required at the interchange of K-7 with K-10 to accommodate the close interchanges at Prairie Star Parkway and College Boulevard, would require the acquisition of almost all existing businesses along K-7 between 130th Street and Kansas Avenue.

Therefore to serve the high turning movements to and from K-7 at the I-70 ramps intersection, a unique layout for the interchange at I-70 with K-7 was developed. The proposed intersection design allows for directional traffic movements without at grade signalized intersections. The interchanges at Kansas Avenue and at 130th Avenue could also be constructed. Finally, the right of way required to construct this interchange would not include purchasing any land currently occupied by a business.

Traffic Analysis

The ramps between I-70 and K-7 most resemble a trumpet interchange in the northeast portion of the interchange. The same idea is mirrored in the southwest portion of the interchange. The unique design of this interchange also includes single-point urban interchanges at Kansas Avenue and at I30th Avenue. A system of collector-distributor roads was utilized to separate all ramp traffic from mainline traffic between Kansas Avenue and I30th Avenue.

One advantage to this design concept is that it could be implemented in phases to address even existing congestion at the K-7 intersection with the I-70 Ramps. The existing interchange could be modified to serve only movements to and from northbound K-7. The mirrored interchange to the west could then serve the movements to and from southbound K-7.

43rd to 47th Street – The conceptual design of the K-7 collector/distributor system from 43rd Street to 47th Street is shown in plan plates B-17 and B-18 in Appendix B. It was determined that interchanges needed to be provided at both the intersections of 43rd and 47th Streets at K-7. 43rd Street serves large areas of developable non residential land that need direct highway access without traveling through residential neighborhoods to connect to 47th Street or Clare Road. 47th Street is an arterial route that connects between I-435 and K-7 and therefore also needs a direct connection to K-7. Construction of interchanges at 43rd Street and at 47th Street poses a variety of problems. Due to the existing 3250-foot spacing of the intersections, it would be very difficult to construct an interchange with direct access to K-7 at each of these locations. The short weave length between the on-ramp of one interchange and the off-ramp of the next interchange would create a safety problem for traffic attempting to enter or exit the flow of highway traffic. The terrain between these intersections also provides a design challenge due to the great elevation change between each existing location.

A split diamond interchange at each of the locations connected by a system of collector distributor roads is recommended. The collector-distributor roads allow traffic to weave between interchanges without mixing with highway traffic creating a safer highway and allowing interchanges to be constructed at each of the existing interchanges. The collector-distributor roads would also provide needed north-south connectors between 43rd and 47th Streets that would be very difficult to construct due to the terrain, railroad, existing developments, and other topographic limitations.

Shawnee Mission Parkway – The conceptual design of the Shawnee Mission Parkway Interchange is shown in plan plate B-15 in Appendix B. This existing small clover leaf interchange can serve the traffic demands today and for a few years into the future. However, the full build out design traffic volumes will require that this interchange be modified to provide a collector-distributor system between the northbound and southbound clover leaf ramps on K-7. Without these collector distributor roads the weaving sections along K-7 will fail.

Segment 3

Donahoo Road Interchange – The conceptual design of the Donahoo Road Interchange is shown in plan plate B-27 in Appendix B. Existing development constrained the potential frontage road alternatives, resulting in the roundabout concepts developed for the ramp terminals. At the western roundabout (southbound on/off-ramps), the overall intersection is expected to operate at level of service B, however, the northbound frontage road approach is expected to operate at LOS F under full build out conditions. As development progresses in this area of the corridor, it will be important to monitor the expected operations of this interchange and continue to refine the concept.

Hollingsworth Road Interchange – The conceptual design of the Hollingsworth Road Interchange is shown in plan plate B-28 in Appendix B. Much like the Donahoo Road Interchange, at the western roundabout (southbound on/off-ramps), the overall intersection is expected to operate at level of service B, however, the northbound frontage road approach is expected to operate at LOS E under full build out conditions. As with Donahoo Road, it will be important to monitor the expected operations of this interchange and continue to refine the concept.

Frontage Road Alignments – The conceptual concept of continuous frontage roads is more important than the exact alignments chosen. To ensure a successful continuous facility on each side of K 7, the communities along Segment 3 will need to collaboratively plan (especially at jurisdictional boundaries) with an eye toward ultimately realizing this concept.

Future Property Access – The local access roads shown connecting to the frontage roads represent one concept of how the local properties could be served. They are by no means firm recommendations as to specific alignments. As the frontage roads are planned, and as properties develop or redevelop along the corridor, the responsible jurisdictions will need to consider how access needs will be met while maintaining adequate traffic flow on the system as a whole.

Traffic Addendum (Available Upon Request)

TransCAD K-7 Model with documentation Synchro, VISSIM, Sidra models Full build out Synchro Output for K-7 Corridor

- Intersections HCM Report
- Queue Report