

LOOKING AHEAD

This section “looks ahead” to the next steps in the study process and provides an overview of the elements to be considered. These elements include aspects of land use, the travel demand forecasting model which lead to the process of developing concepts that address existing deficiencies while being mindful of environmental resources, which can be found in the next chapter.

Land Use

Land use both affects and is affected by a roadway. Low intensity or undeveloped land may result in low traffic levels but also a larger tax burden on fewer owners to support infrastructure. Lack of roadway improvements may also discourage some land uses due to lack of access.

Land use was reviewed for the area between US-40 Highway on the north, I-470/291 on the east and south, and Noland Road on the west. This area includes parts of the Cities of Kansas City, Lee’s Summit and Independence, and Unity Village. Some existing data was missing for the City of Independence and Unity Village.

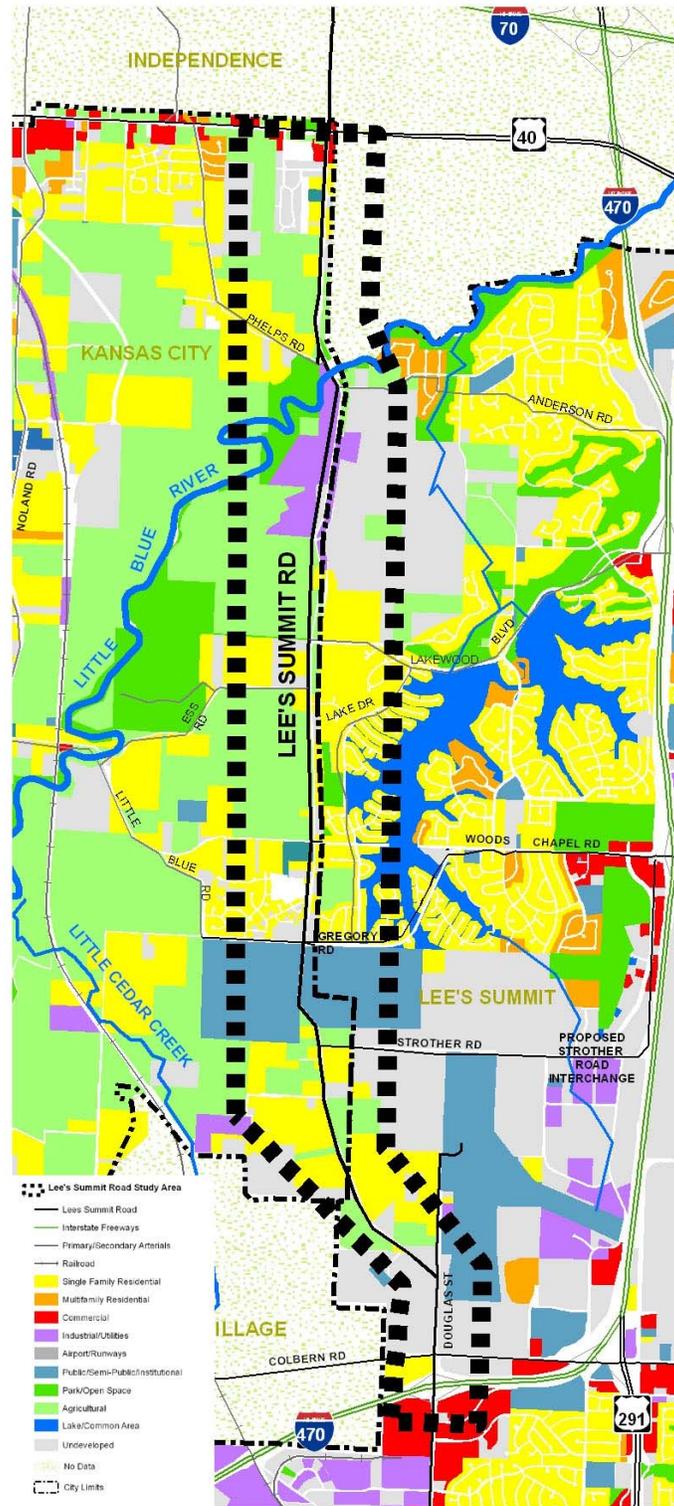
Definitions and data sources for land use differ by City and even within a City for existing and proposed uses. This report clusters and summarizes land use for ease in understanding major trends. The names of most land use types are generally self-evident. “Public/Semi-Public/Institutional” refers to hospitals, schools, churches and other civic functions.

Exhibit 26– Existing Land Use 2006

Category	Acres	Square Miles	Percent	Square Miles	Percent
Single Family Residential	2,644	4.1	26.8%		
Multifamily Residential	212	0.3	2.1%		
Residential - combined				4.5	28.9%
Commercial	147	0.2	1.5%		
Comm-office combined				0.2	1.5%
Industrial/Utilities	329	0.5	3.3%		
Airport/Runway	257	0.4	2.6%		
Industrial/Airport combined				0.9	5.9%
Public/Semi-Public	420	0.7	4.2%		
Park/Open Space	994	1.6	10.1%		
Agricultural	2,857	4.5	28.9%		
Lake/Common Area	64	0.1	0.7%		
Public/Open combined				6.8	43.9%
Undeveloped	2,921	3.0	19.4%		
Undeveloped				3.0	19.4%
	10,846	15.4	100%	15.4	100%

Source: Cities of Kansas City and Lee’s Summit, Missouri

Exhibit 27 – Existing Land Use Map



Existing

The Existing Land Use table, Exhibit 26, provides a detailed breakdown of the distribution of land uses in Kansas City and Lee's Summit, which are also shown on Exhibit 27, Existing Land Use Map. There are almost 10,000 acres or a little over 15 square miles in the Kansas City and Lee's Summit portion of the plan area. Almost 60 percent are undeveloped or used for agriculture, parks/open space or lake/common area. Except for scattered small multifamily areas, most existing residential is very low density at 3 units per acre in subdivisions or in half acre lots or larger.

Although the majority of current uses are very low intensity, there are other more intense uses towards the northern and southern ends. At the southern end, more intense uses include the major commercial and medical center area around the intersection of I-470 and Douglas Road, Unity Village and School, the Lee's Summit Municipal Airport, and Truman Medical Center Lakewood. At the northern end, more intense uses include industrial and warehousing associated with undermined area, some small areas of multifamily uses, and commercial uses in the vicinity of US-40 Highway.

One fifth of the area is undeveloped. More intense uses, including Commercial, Industrial, Airport-related, and Public/Semi Public uses like the hospital and churches, represent only a very small part of the plan area.

Proposed

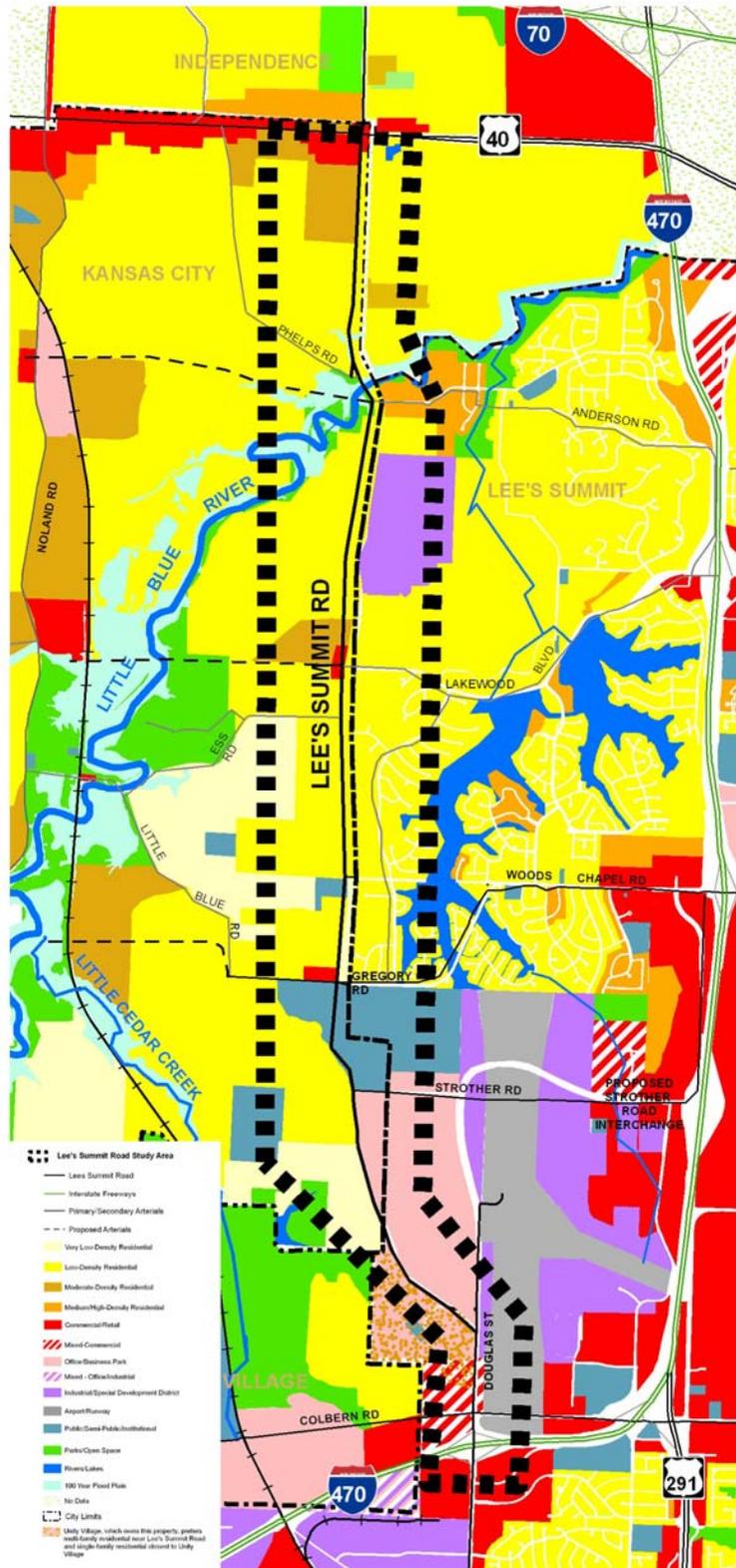
Proposed Land Use is shown below in Exhibit 28 and on the attached map, Exhibit 29. The sources of data for the Cities of Lee's Summit and Independence are from their adopted land use plans. For Lee's Summit, it is the Lee's Summit 2005 Comprehensive Plan and for Independence it is the City of Independence Comprehensive and Thoroughfare Plan, 2004. Proposed Land use maps are used as guides for development, redevelopment and zoning. They show what land uses are appropriate in the long term for locations within the plan boundaries.

Exhibit 28 – Proposed Land Use

Category	Acres	Square Miles	Percent	Square Miles	Percent
Very Low Density Residential	685	1.1	6.9%		
Low Density Residential	4,620	7.2	46.5%		
Moderate Density Residential	443	0.7	4.5%		
Medium-High Density Residential	309	0.5	3.1%		
Residential - combined				9.5	61.0%
Commercial/Retail	576	0.9	5.8%		
Mixed-Commercial	138	0.2	1.4%		
Office/Business Park	428	0.7	4.3%		
Comm-office combined				1.8	11.5%
Industrial/Special Development District	755	1.2	7.6%		
Airport/Runway	412	0.6	4.1%		
Industrial/Airport combined				1.8	11.7%
Public/Semi-Public/Institutional	336	0.5	3.4%		
Parks/Open Space	560	0.9	5.6%		
Rivers/Lakes/100-Yr Flood Plain	674	1.1	6.8%		
Public/Open combined				2.5	15.8%
Undeveloped	0	0	0		
Undeveloped				0.0	0.0%
	9,935	15.5	100%	15.5	100%

Source: Cities of Kansas City and Lee's Summit, Missouri

Exhibit 29 – Proposed Land Use Map



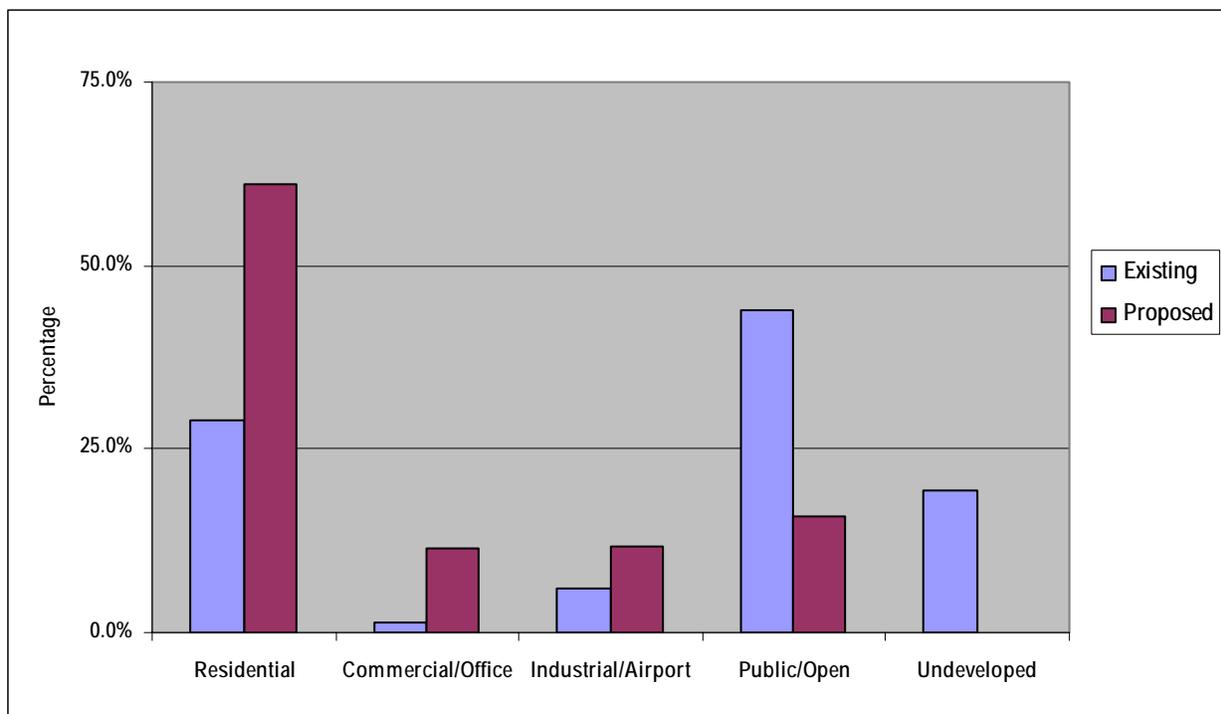
The data that Kansas City provided approximates the adopted plan for this area, the Little Blue Valley Area Plan, last amended in April, 2006. Because the electronic data provided followed lot lines and the adopted plan did not, the Proposed Land Use Map for Kansas City does not exactly correlate with the adopted area plan. Both proposed Public/Semi-Public and Park/Open Space uses are significantly under-reported on the maps and tables.

Exhibits 28 and 29 show that both Cities are planning for a primarily low density residential future; almost half of the land area. Kansas City is planning for a substantial area of very low density residential in areas of steep topography and limited access. The most intense uses would remain at the southern end of the study area from Gregory/79th Street and south.

Comparing Existing and Proposed Land Use

As stated earlier, multiple approaches to land use classification among and within jurisdictions make comparisons inexact. The following chart, Exhibit 30, however, shows the major trends.

Exhibit 30 – Combined Land Use Comparison



Major changes between Existing and Proposed Land Uses would be shifts from undeveloped and agricultural land to residential uses. Commercial/Office and Industrial/Airport uses also grow, but remain only a small percentage of land use.

Changes between Existing and Proposed Land Uses reflect an ultimate use of the land, generally much longer than the 25 to 30 year planning framework of this study. Actual build out will depend on the guidance of adopted plans, the market for any particular use, changes in access, and issues related to topography and the environment.

Adopted plans in both Kansas City and Lee's Summit identify additional east-west arterial roadway connections including Velie Road, 63rd Street/Lakewood Boulevard, Gregory Boulevard, and Strother Road. Of these possible connections, only Strother Road, with a new interchange with I-470 planned starting in 2008, has funds allocated for design or construction. The Strother Road interchange may spur airport, industrial, commercial and hospital-related uses to grow in the southern part of the planning area. Without east-west access, more intense uses, such as

commercial and moderate density residential on the Kansas City side of the Lee's Summit Road/Lakewood Boulevard intersection, are very unlikely.

Considering the number of acres proposed for residential uses, perhaps 1,000 more residential units could theoretically fit into the area. The existing pattern of large lot development, lack of east-west access, steep topography, and large area of flood plain, however, will discourage the development of future residential subdivisions in large parts of the Lee's Summit Road planning area on the Kansas City side.

Traffic Forecasting

For the purpose of forecasting future year traffic volumes along the Lee's Summit Road corridor, the City of Lee's Summit's Travel Demand Model (LS TDM) and the City of Kansas City's Travel Demand Model (KCMO TDM) were reviewed. A travel demand model is a tool used to estimate future growth of traffic in a study area. These growth estimates are later used to assess the impacts on the existing street network.

The KCMO TDM area comprises the entire Greater Kansas City region. The LS TDM area comprises all of Lee's Summit and a surrounding area which includes the Lee's Summit Road corridor to US-40 Highway. Both travel demand models are traditional four-step models and include an Existing Scenario and a Future Year Scenario. The latest version of KCMO TDM Future Year Scenario is available for the year 2020 and for the PM peak hour only. The LS TDM includes Future Year 2030 Scenario and has both the AM and PM peak hours as well as a daily model available. Due to the macroscopic nature of the KCMO TDM, this study uses the LS TDM for travel forecasting.

An important distinction between the two models is the inclusion of potential and committed future transportation networks. The LS TDM includes various committed and planned improvements including:

- Strother Road and I-470 interchange, and associated auxiliary lanes on I-470
- Strother Road (relocated and improved from two-lanes to four-lanes)
- Lee's Summit Road/Douglas Street – from City Limit line to Colbern Road (improved from two-lanes to five-lanes)
- Douglas Street connection to Strother Road (Douglas Street is not connected to Strother Road in the future street network)
- Colbern Road – west of Douglas Street (improved from two-lanes to four-lanes)

The KCMO model includes several east-west connection arterial roadways which per the Kansas City Major Street Plan (MSP) are proposed in conjunction with an undetermined time frame of a full-build scenario. It should be noted that the following MSP roadways are not included in the LS TDM. The MSP includes a new arterial of Gregory Boulevard (west of Lee's Summit Road) which is currently named Little Blue Road. Two additional new arterials on the MSP include a new Little Blue Road as an extension of Lakewood Boulevard west of Lee's Summit Road and the secondary arterial, Velie Road, which would run parallel along the Little Blue River. At this time it is anticipated that none of these proposed facilities will be in place by the future time frame of 2030. The future year forecasts on these streets from the KCMO TDM suggest that these new facilities would attract significant traffic volumes. While this study acknowledges the Kansas City MSP, specifically addressing these future east-west routes is beyond the scope of this study. Nonetheless, consideration must be given to these potential facilities and at a minimum they are to be acknowledged so as not to preclude or in any way limit their potential for development with improvements to Lee's Summit Road. This philosophical approach has been integrated into the development of design concepts.

The land use data included for the study TAZ's in the LS TDM for existing and future year (2030) scenarios. The TAZ's growth for each land use type is highlighted. Altogether, over the next 25 years, development within in the study area TAZ's is anticipated to add approximately:

- 726 single family units,
- 327 multi family units,
- 375,315 square feet of commercial and retail development,
- 1,424,800 square feet of office space, and
- 489,455 square feet of industrial development.

The majority of single family housing units are located west of Lee's Summit Road between US-40 Highway and Strother Road. The majority of multi family housing units are located west of Lee's Summit Road between US-40 Highway and Phelps Road as well as in Lee's Summit near the Woods Chapel interchange with I-470. The majority of commercial and retail development is located in Lee's Summit near the Douglas Street and the Woods Chapel interchanges with I-470. The majority of office and industrial development is located in Lee's Summit near the Douglas Street and the proposed Strother Road interchanges with I-470.

This data (by type and location) was compared to the existing and future year comprehensive land use maps (with adopted land use information from Kansas City, Lee's Summit and Independence) for the study area. The type of land use by TAZ and future year growth shown in the model are in agreement with the comprehensive land use maps.

The future year model includes future year committed and planned street network improvements as well as forecasted land use information. Utilizing the future year and existing model flows in the LS TDM, future year growth is calculated. This future year growth is then added to the existing traffic counts to obtain projected future year traffic volumes. See Exhibit 31 for the 2030 projected AM and PM peak hour traffic volumes and Exhibit 32 for the 2030 projected 24-hour traffic volumes.

Some manual adjustments were made by direction to compensate for future year peak hour model flow discrepancies. Select link analysis performed along the study corridor indicates that the future year model is diverting Lee's Summit Road traffic to destinations west and north of US-40 Highway via Phelps Road. Manual adjustments were made to keep the majority of traffic on Lee's Summit Road. As noted previously, Ess Road and Woods Chapel Road are not included as part of the LS TDM. Manual estimates were also made for these intersections in order to conduct future operational analyses.

Exhibit 31 – Future Year 2030 AM and PM Peak Hour Projected Traffic Volumes

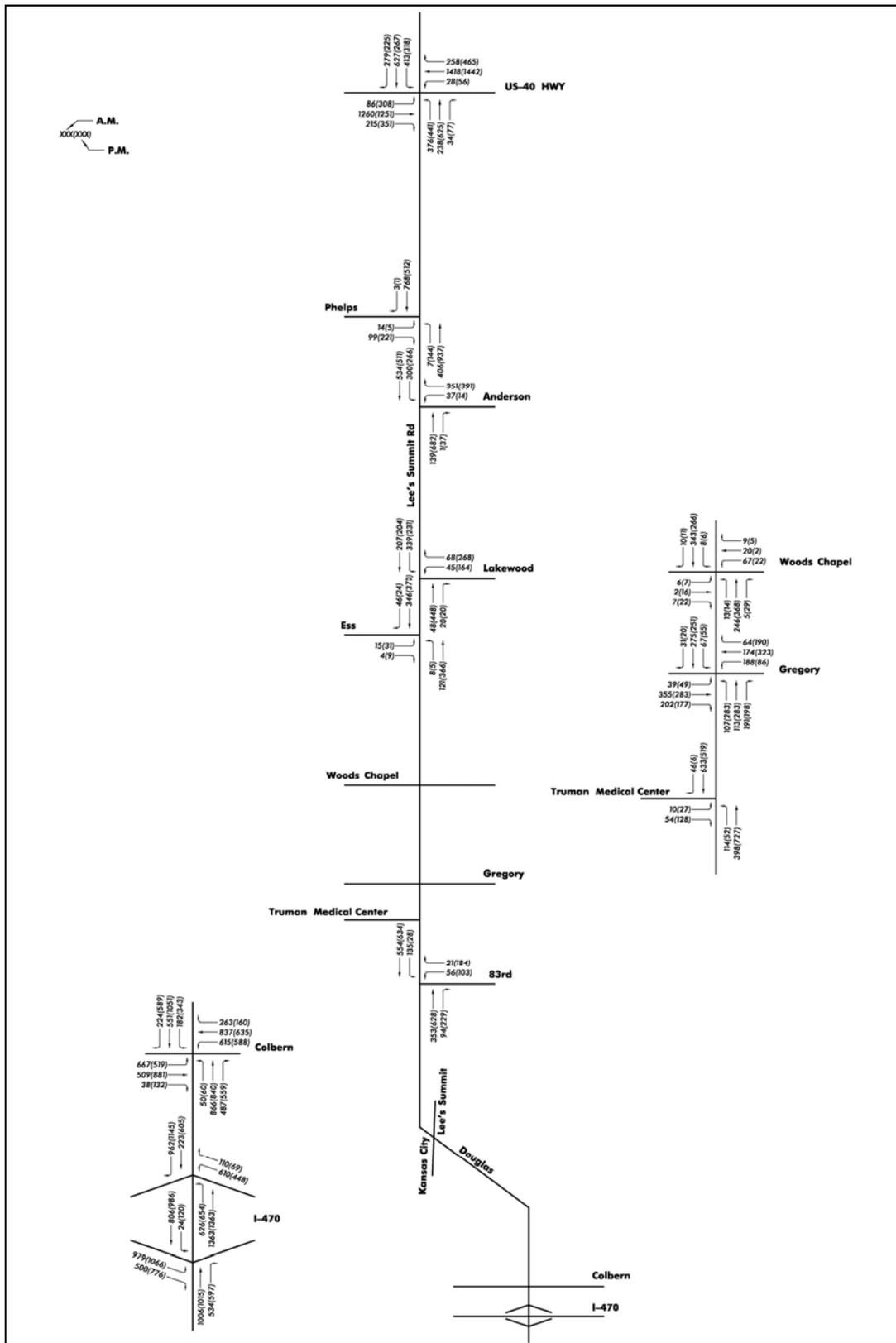
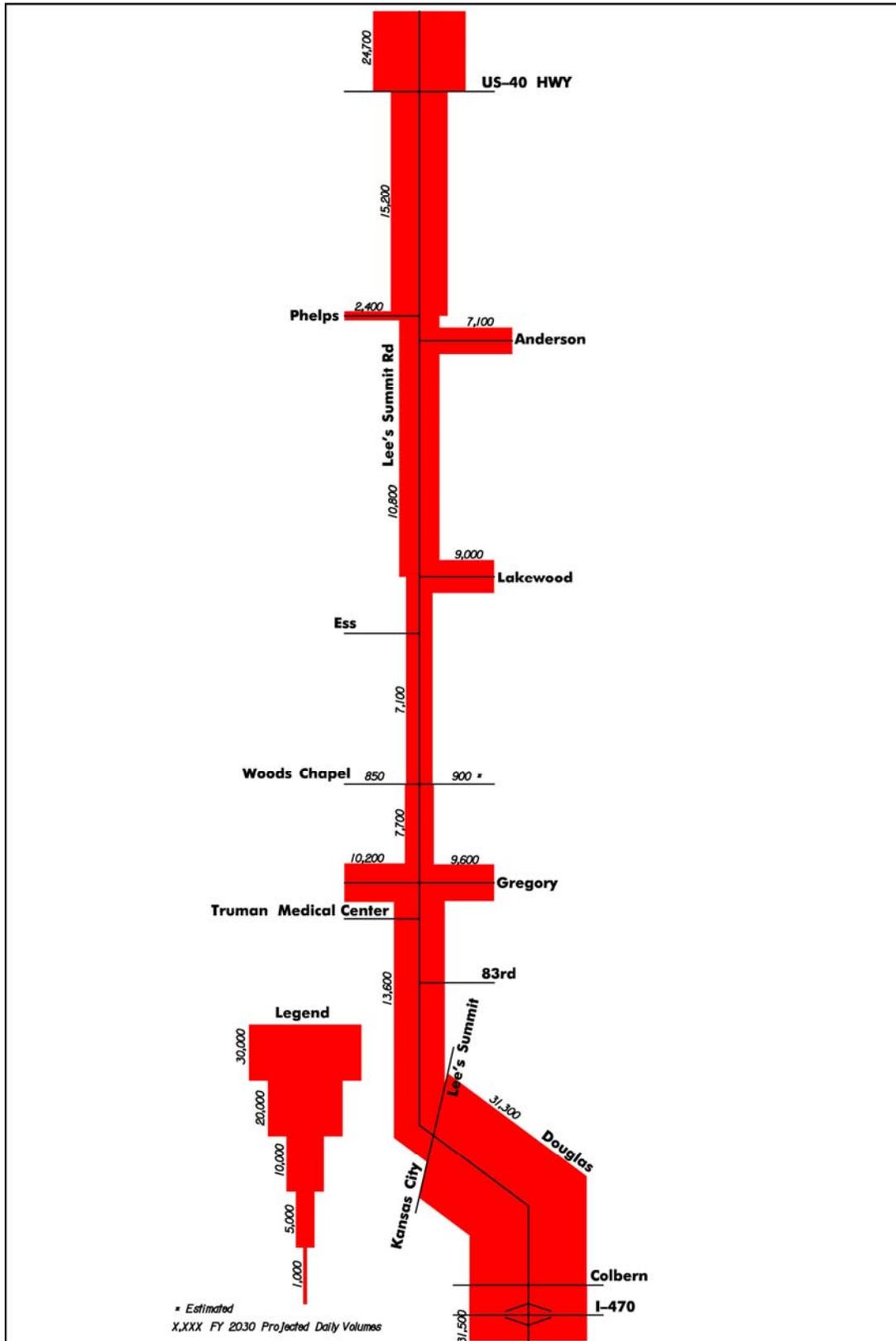


Exhibit 32 – Future Year 2030 Projected 24-Hour Traffic Volumes



Future Year Traffic Operations

No Build

The results of the segment and intersection analyses for weekday AM and PM peak hours with future development and no build conditions are shown in Exhibit 33. This scenario adds general background traffic growth from future developments and previously noted committed projects included in the LS TDM. An exception could be the relocation and improvement of Strother Road in Lee's Summit (83rd Street in Kansas City) from Ralph Powell to Lee's Summit Road. This improvement is not financially committed but may occur through development initiatives. For capacity analysis purposes, the improvement is assumed to be in place by the design year, yet it is acknowledged that the location of the 83rd Street and Lee's Summit Road junction may be relocated because of topographical issues. The study intersections were evaluated with the projected peak hour traffic volumes utilizing existing and committed lane configurations and traffic controls.

Exhibit 33 illustrates the future year - no build conditions. The two-lane highway segment analysis shows a change from LOS C to LOS D along with corresponding increases in the volume to capacity (v/c) ratios. The northern and southern sections of the Lee's Summit study corridor show significant growth from existing conditions to the future year. The intersections at US-40 Highway and Colbern Road growth on all approaches and now require modifications to improve operations to an acceptable level. The analysis indicates that there are no capacity issues for turning movements along Lee's Summit Road with an exception at the intersection of Gregory Boulevard. In the year 2030, both the AM and PM peak hour traffic would meet the MUTCD peak hour signal warrant. Eight hour traffic volumes were estimated from the projected daily volumes and based upon that estimate, the intersection would appear to meet the MUTCD eight-hour vehicular volume signal warrant. At several unsignalized intersections, eastbound and westbound traffic on minor streets experience some delays due to heavier traffic volumes on Lee's Summit Road although this is not considered to be a significant issue.

Exhibit 33 – Future Year 2030 (No Build) AM and PM Peak Hour Capacity Analysis

a. Segments	AM Peak Hour		PM Peak Hour	
	LOS	v/c	LOS	v/c
48 th Terrace to Woods Chapel Road	C	0.264	D	0.431
Gregory Boulevard to Colbern Road	D	0.415	D	0.494

b. Signalized Intersections	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
US-40 Highway	F	>100.0	F	>100.0
Colbern Road	D	44.1	D	48.7
I-470 Westbound Ramps	E	72.0	E	70.7
I-470 Eastbound Ramps	C	34.5	E	55.2

c. Unsignalized Intersections	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
Phelps Road	<i>Eastbound</i>	C 22.7	C 21.6	
	<i>Northbound</i>	A 0.3	A 4.3	
Anderson Drive	<i>Westbound Left-turn</i>	E 48.4	F >100.0	
	<i>Westbound Right-turn</i>	B 12.0	F 90.6	
	<i>Southbound Left-turn</i>	A 8.3	B 11.6	
Lakewood Boulevard	<i>Westbound Left-turn</i>	D 29.1	F 82.4	
	<i>Westbound Right-turn</i>	A 8.9	C 17.6	
	<i>Southbound</i>	A 5.9	A 6.2	
Ess Road	<i>Eastbound</i>	B 12.2	C 15.7	
	<i>Northbound</i>	A 0.6	A 0.2	
Woods Chapel Road	<i>All-way Stop Controlled</i>	B 11.2	B 11.7	
Gregory Boulevard	<i>All-way Stop Controlled</i>	F >100.0	F >100.0	
Truman Medical Center Entrance	<i>Eastbound Left-turn</i>	D 34.3	E 39.8	
	<i>Eastbound Right-turn</i>	B 14.6	B 14.4	
	<i>Northbound</i>	A 3.7	A 1.5	
Strother Road / 83rd Street	<i>Westbound</i>	E 39.3	F >100.0	
	<i>Southbound</i>	A 3.2	A 1.1	

LOS – Level of Service
 Delay – Delay in Seconds per Vehicle
 v/c – Volume to Capacity Ratio

With Improvements

As a result of iterative traffic operations analysis, improvements identified along the Lee's Summit Road corridor to support the future year conditions include the following:

- At US-40 Highway provide two through-lanes and dual left-turn lanes for both northbound and southbound approaches. On the southbound approach provide an exclusive right turn lane. Provide dual left-turn lanes and an exclusive right-turn lane for the eastbound approach. Provide an exclusive left-turn and right-turn lane for the westbound approach.
- Because of side street intersection spacing and private access points, provide a continuous two-way, left-turn lane along Lee's Summit Road to the Space Center junction. Maintain the exclusive northbound right-turn lane at the Space Center driveway.
- Between the Space Center and Woods Chapel Road, intersection capacity analysis at the few intersections suggests that a two-lane roadway would operate acceptably. Such a two-lane roadway would need standard travel lane widths and actual shoulders as well as significant improvements to the horizontal and vertical alignment. Even with such improvements, a southbound left turn is recommended at the Lakewood Boulevard intersection for increased safety.
- For the design year, the intersection with Gregory Boulevard appears to meet MUTCD peak hour signal warrant for both peak hours and the eight-hour vehicular volume signal warrant. Consequently, it is recommended to install a traffic signal at this intersection and provide exclusive left-turn lanes on all approaches along with an exclusive northbound and eastbound right-turn lane.
- In conjunction with the "new" 83rd Street/Strother Road improvement provide separate left-turn and right-turn lanes on the 83rd Street approach, as well as a northbound right-turn lane and a southbound left-turn lane.
- In conjunction with and in addition to the committed project in the City of Lee's Summit to improve Lee's Summit Road /Douglas Street from two-lanes to five lanes from the city limit line to Colbern Road, improve Colbern Road west of Douglas Street from two-lanes to four-lanes as well as providing associated turn lanes as shown in Exhibit 34.
- Provide exclusive southbound Douglas Street right-turn lane at the I-470 westbound on-ramp. Modifying the northbound dual-left turn lane to a single protected/permitted left turn lane would operate well under current traffic conditions yet would experience extensive queuing issues in the future. It could be possible to include this modification as part of MoDOT's US-50/470 improvements.
- Other transportation related improvements could include:
 - At the US-40 Highway intersection, many of the necessary improvements are along US-40 and are not directly associated with the Lee's Summit Road corridor under investigation for this study. Consequently less intensive improvements could be installed on only the south leg of Lee's Summit Road. These improvements would benefit overall intersection operations for several years.
 - The analyses show that at Anderson Drive and Lakewood Boulevard, the westbound exiting traffic experiences delay. However, these delays are confined to peak hours. The intersection at Anderson Drive meets the peak hour signal warrant in the year 2030 with the projected traffic volumes. The intersection should be monitored with respect to the eight-hour vehicular volume signal warrant as traffic increases. The intersection was also analyzed with a single lane roundabout; with the results indicate that delays are reduced considerably.

The Future Year with Improvements scenario analysis includes the improvements identified above. The study intersections were evaluated with the projected traffic volumes as well as the lane configurations and traffic controls shown on Exhibit 34. The results of the intersection analyses for weekday AM and PM peak hours with these improvements are shown in Exhibit 35. The Synchro and HCM analysis output files are included in the Appendix.

Exhibit 34 – Future Year 2030 (With Improvements) Lane Configurations

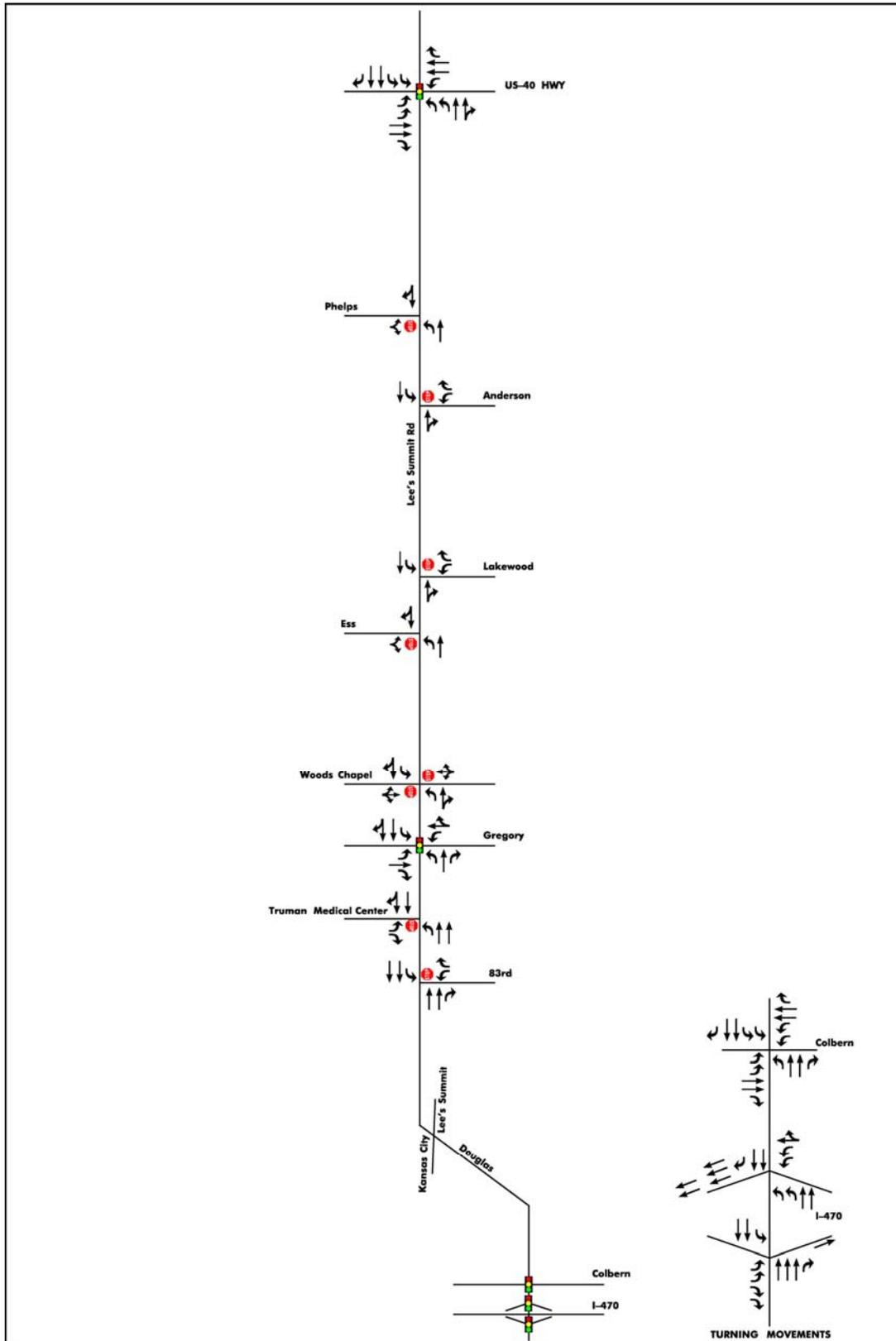


Exhibit 35 – Future Year 2030 (With Improvements) AM and PM Peak Hour Capacity Analysis

b. Signalized Intersections	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
US-40 Highway	D	42.0	D	54.0
Colbern Road	D	40.9	D	48.2
I-470 Westbound Ramps	C	24.9	B	17.1
I-470 Eastbound Ramps	B	18.7	C	23.2
Gregory Boulevard	C	24.3	C	32.1

c. Unsignalized Intersections	AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay
Phelps Road				
<i>Eastbound</i>	C	22.7	C	21.6
<i>Northbound Left-turn</i>	A	9.6	A	9.2
Anderson Drive				
<i>Westbound Left-turn</i>	E	48.4	F	>100.0
<i>Westbound Right-turn</i>	B	12.0	F	90.6
<i>Southbound Left-turn</i>	A	8.3	B	11.6
Lakewood Boulevard				
<i>Westbound Left-turn</i>	D	29.1	F	>100.0
<i>Westbound Right-turn</i>	A	8.9	C	17.6
<i>Southbound Left-turn</i>	A	8.1	A	9.5
Ess Road				
<i>Eastbound</i>	B	12.2	C	15.7
<i>Northbound Left-turn</i>	A	0.6	A	0.2
Woods Chapel Road				
<i>Eastbound</i>	B	13.6	B	14.0
<i>Westbound</i>	C	18.7	C	17.5
<i>Northbound Left-turn</i>	A	8.1	A	7.9
<i>Southbound Left-turn</i>	A	7.8	A	8.2
Truman Medical Center Entrance				
<i>Eastbound Left-turn</i>	D	29.5	D	25.8
<i>Eastbound Right-turn</i>	B	11.3	B	11.3
<i>Northbound Left-turn</i>	A	9.9	A	8.8
Strother Road / 83rd Street				
<i>Westbound Left-turn</i>	D	28.4	E	43.2
<i>Westbound Right-turn</i>	A	9.5	C	12.9
<i>Southbound Left-turn</i>	A	8.9	B	10.1

LOS – Level of Service

Delay – Delay in Seconds per Vehicle

v/c – Volume to Capacity Ratio

The analyses indicate that, in general, traffic operations at all of the signalized intersections would improve to acceptable conditions. The intersection of Douglas Street and Colbern Road operates at LOS D, while the acceptable level of service in Lee's Summit for signalized intersections is LOS C. However, reasonable capacity improvements have already been identified in the committed project. In order to operate at LOS C, this intersection would need three-through lanes on all approaches. The Simtraffic animation and the Synchro analysis indicate queuing on the east leg of Colbern Road at this intersection, but do not indicate any excessive delays on the southbound approach to the next intersection at the I-470 Westbound ramps. However, design consideration should be given to improving the flow of traffic between these closely spaced intersections of Colbern Road and the I-470

westbound ramps. Possible concepts could include such options such as relocating Colbern Road north of its current location or a single point interchange.

At unsignalized intersections, where left-turning movements along Lee's Summit Road would be provided with an exclusive left-turn lane it may be noted that the delay for the approach appears to increase over no-build conditions without an exclusive left-turn lane. This apparent anomaly is associated with the delay for all vehicles on an approach (no-build condition) versus the delay for only those vehicles making the left turn. Obviously the through movement would not experience these delays.

While a two-lane roadway may satisfy traffic operations for a certain segment length, several other issues must be acknowledged that influence the selection of a typical section beyond just capacity analysis. One major issue with a true two-lane highway is the treatment of pedestrian mobility. The two-lane highway section would include an open-ditch for drainage, an undesirable section to include a sidewalk on both sides of the roadway. While a wider multi-use trail could be provided, a wide separation between the ditch and the trail would be required along with another drainage ditch for the trail. In addition, if the trail were placed on only one side, issues of choosing a location and access for all would arise. Consequently, a closed drainage system with curb and gutter makes the most sense and allows a sidewalk on both sides. Therefore it is recommended that the continuous turn lane from the Space Center be continued south to the junction with Gregory Boulevard.

The all-way stop control at the intersection of Woods Chapel Road was installed as a safety improvement to address right-angle crash experiences associated with limited sight distance in the northwest quadrant. Under proposed roadway concepts for Lee's Summit Road, the sight distance issue could be addressed, thus potentially eliminating the need for all-way stop control. The existing daily traffic on Woods Chapel Road is 800 vehicles per day.

At the Truman Medical Center entrance, the westbound left-turning traffic could either utilize the signalized intersection at Gregory Boulevard or find gaps in through traffic provided by the traffic in order to exit.