DOWNTOWN CIRCULATION STUDY

Submitted to:

City of Topeka
620 SE Madison Street
Topeka, KS 66603-3983

Submitted by:

LOCHNER

LOCHNER

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INTRODUCTION

The City of Topeka contracted with HW Lochner to update a traffic circulation study completed in 1998 for the Central Business District (CBD). The 1998 study included an area-wide traffic analysis of the existing conditions at that time for the morning, mid-day and afternoon commuter peak hours of travel. It then explored the traffic operation under eight different change scenarios, including changes in one-way to two-way traffic flow, changes in downtown developments, parking and number of lanes on key streets. Sixteen projects were identified as needed to accommodate the future traffic operation.

Since 1998, there have been several significant changes in the CBD traffic operation and land uses, and more changes are anticipated in the future. The City determined that the traffic circulation study should be updated to reflect the previous changes that have occurred and to evaluate the traffic impacts of the anticipated changes. Anticipated changes in the street system which could have significant impact on traffic operation include the Capital District Project which would involve the modification of the street cross section on Kansas Avenue between 7th Street and 9th Street, and on 8th Street between Quincy Street and Jackson Street. Another anticipated project that would significantly affect the traffic movements in the CBD is the reconfiguration of the I-70 access into the CBD. KDOT is currently in the process of concluding this I-70 access study.

STUDY AREA

Figure 1 shows the extent of the CBD study area. To the north the study area is bounded by 3rd Street, to the east by Madison Street, to the south by 12th Street/Huntoon Street, and to the west by Topeka Boulevard. The primary east-west roadways include 4th Street, 6th Avenue, 8th Avenue, and 10th Avenue. The primary north-south streets include Topeka Boulevard on the west edge of the study area, Kansas Avenue, and Madison Street on the eastside of the study area. Monroe Street and Madison Street form a one-way pair that borders the eastern edge of the study area. These two roadways provide access to and from the I-70 mainline facility.

STUDY PURPOSES

The purposes of the Downtown Circulation Study Update are:

- To update the City's traffic model of the CBD for evaluation of current traffic conditions in the CBD
- To identify potential traffic impacts that could result from future land use and development changes in the CBD
- To identify the traffic impacts from the Capital District Project of changing the typical street section on Kansas Avenue and on 8th Street
- To identify the traffic impacts that could result from the change of CBD access to I-70

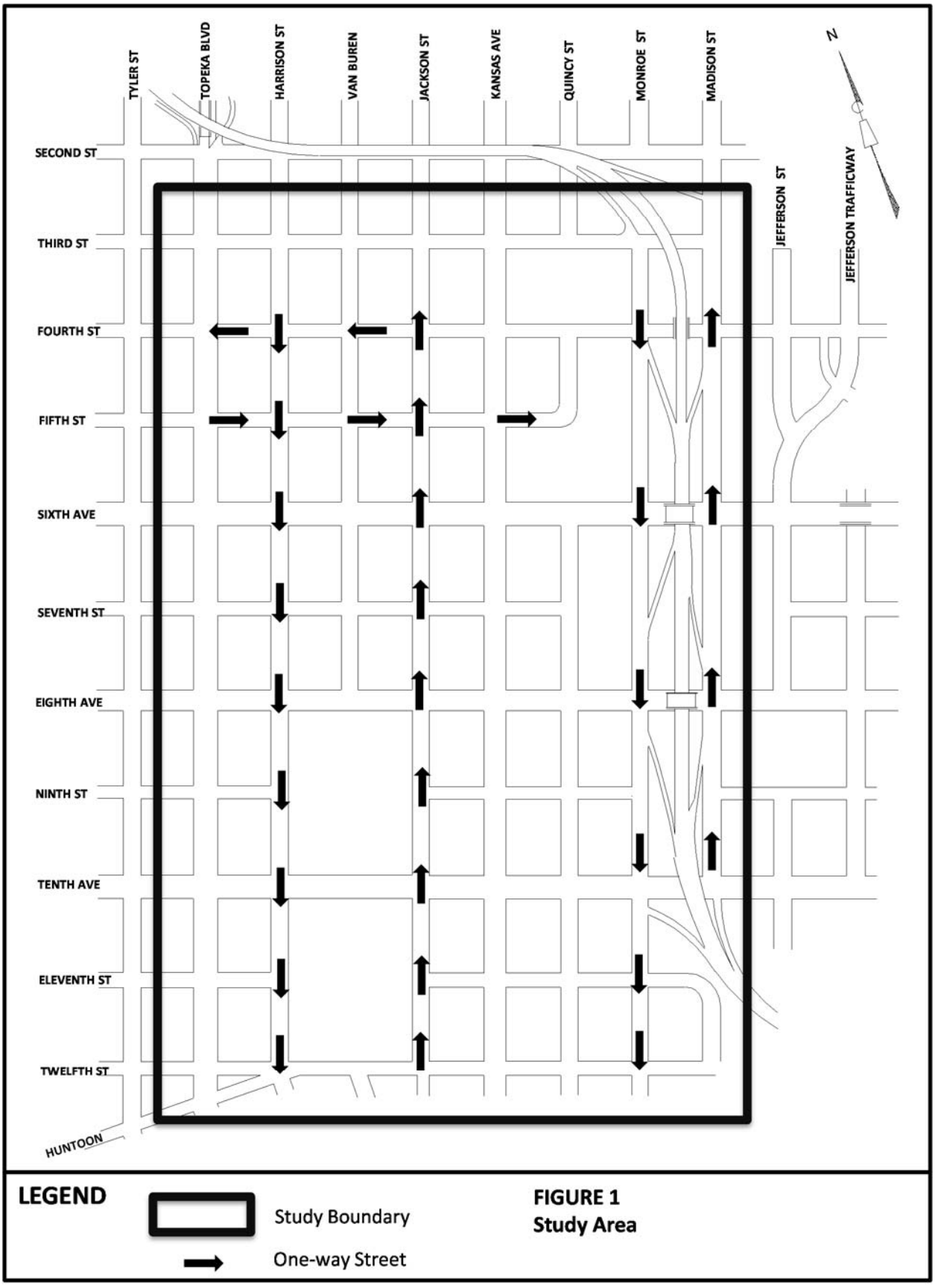


FIGURE 1
Study Area

EXISTING CONDITIONS

CBD ACCESS

Figure 2 shows the major entry points into the CBD study area. I-70 provides the primary access to and from the CBD. The 1st Street off-ramp, which connects to Topeka Boulevard, and the 3rd Street off-ramp which connects to Monroe Street provide access from the north. Kansas Avenue is another entry point serving as one of two river crossings into the CBD.

From the east, there is one southbound off-ramp located between 6th and 8th Avenues and in the northbound direction there are three off-ramps located at 10th Avenue, 8th Avenue, and 4th Street. The primary entry points are along 10th Avenue, 8th Avenue, 6th Avenue, and 4th Street. The same is true from the western part of the study area, as the primary entry points are 10th Avenue, 8th Avenue, and 6th Avenue. These streets provide for the primary east-west movements within the study area.

From the south the primary entry points are along Topeka Boulevard and Kansas Avenue. Jackson Street also carries some northbound traffic.

TRAFFIC DATA

The Consultant worked in a partnership with City staff to complete the Downtown Circulation Study Update. The City staff provided the Consultant with updated street geometry, traffic signal timing information, and current peak hour and 24-hour traffic counts at key locations, as depicted in Figure 3. The Consultant compared the traffic counts with the traffic volumes obtained for the same locations taken from the 1998 study. The comparison of 2011 traffic counts with the 1998 volumes provided rates of traffic change, that were applied to other adjacent intersections to develop estimates of 2011 traffic volumes at locations where traffic counts were not obtained. The observed and estimated turning movements for all intersections are included in Appendix A. Likewise, the 24-hour traffic counts on selected links are included in Appendix B.

Based on a comparison of the 2011 and 1998 traffic count data, the overall traffic volume in the CBD have declined by 13 percent during the morning peak hour, 7 percent during the mid-day peak hour, and 7 percent during the afternoon peak hour.

The Consultant also obtained the existing traffic signal timings from the City for the 42 traffic signals located in the study area. The traffic signal locations are depicted in Figure 4. The traffic signal timings, peak hour traffic volumes, and the existing lane geometry provided the basis for the existing conditions traffic operations analysis. The traffic operations analysis for the three peak periods was performed using the software Synchro version 7.

Figure 5 depicts a summary of the traffic volumes and their directions of arrival entering the CBD during the peak hours.

FIGURE 2
Major Entry Points

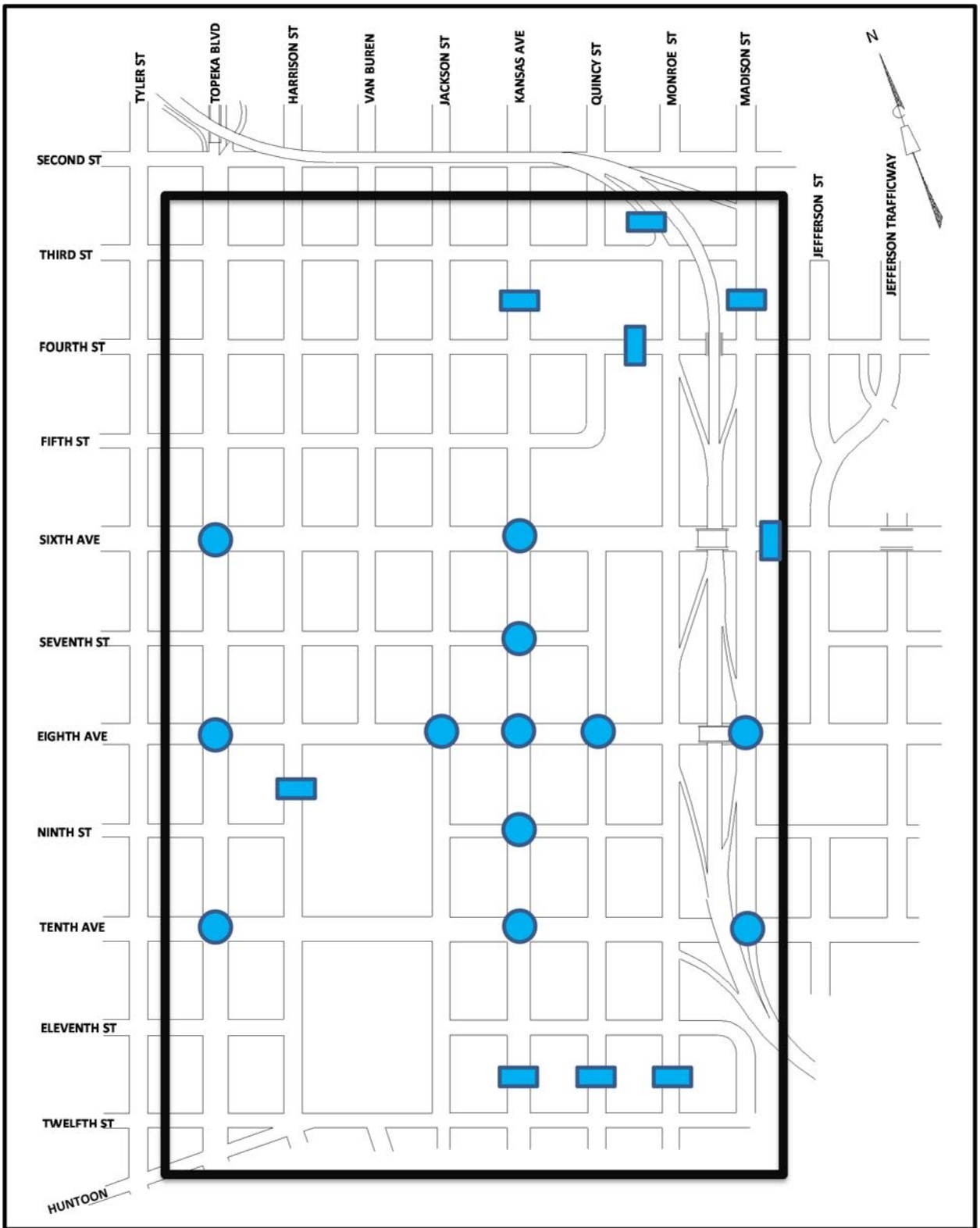
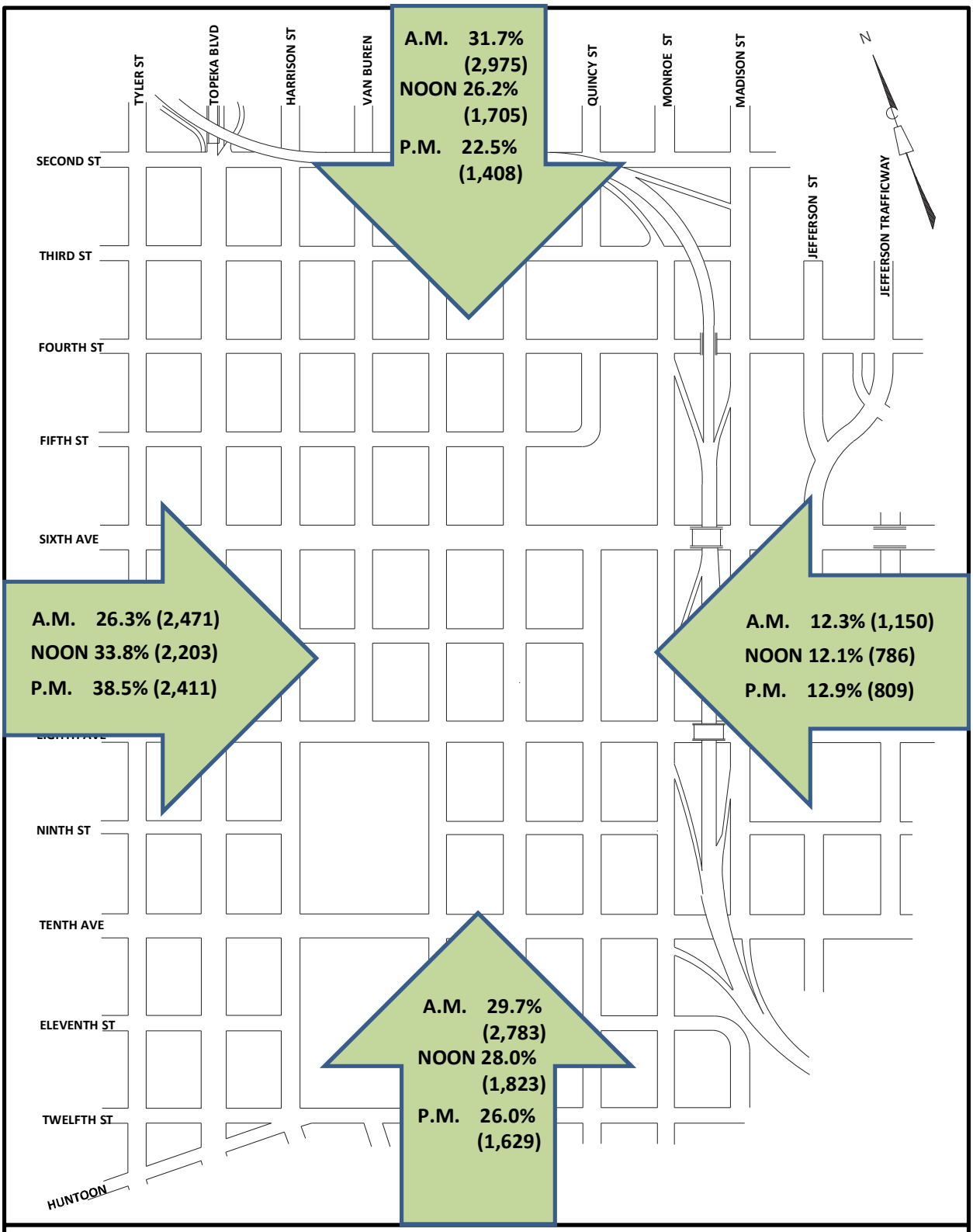


FIGURE 3
Traffic Count Locations

LEGEND

FIGURE 4
Signalized Intersections



LEGEND

FIGURE 5
Entering Traffic Distribution

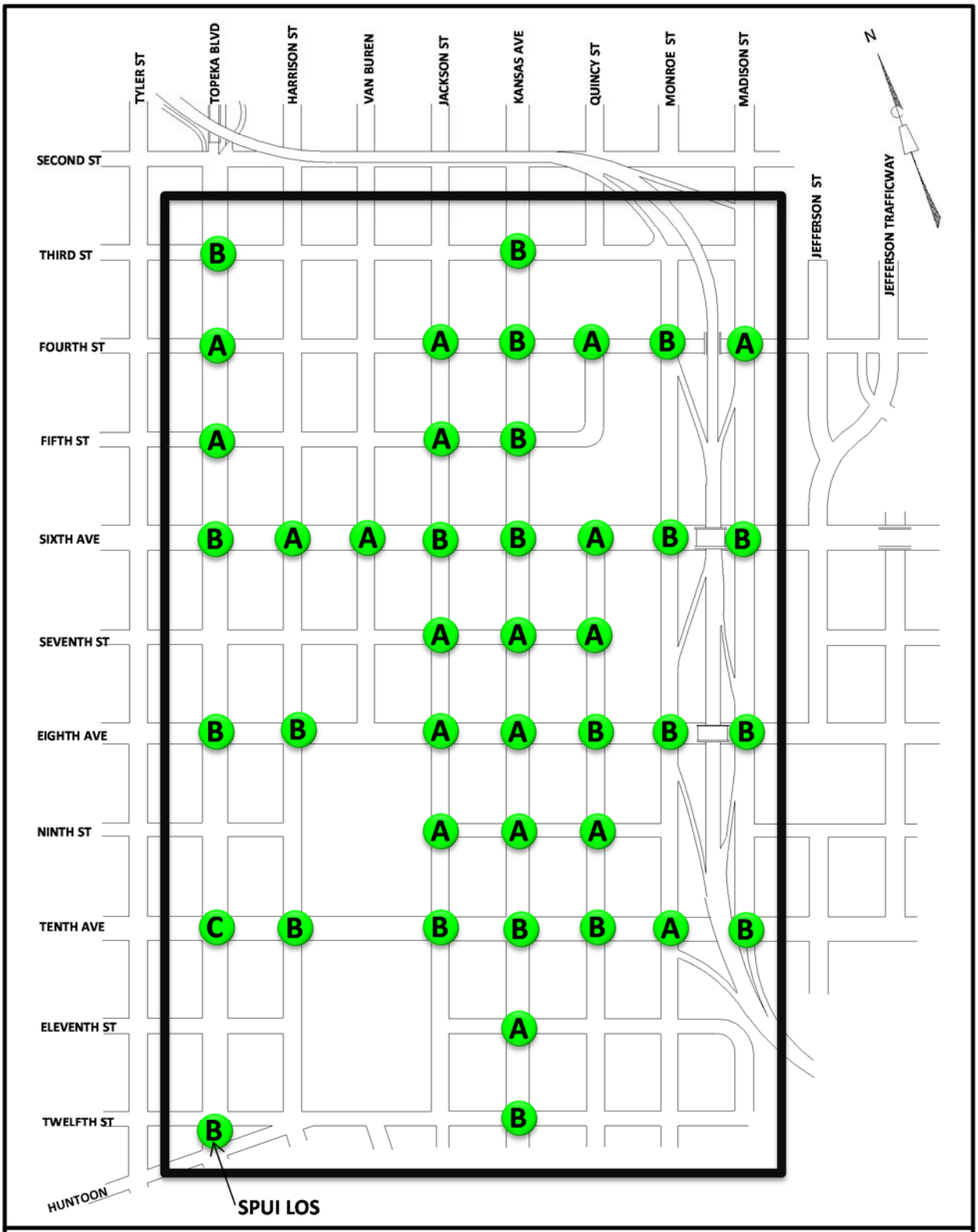
EXISTING TRAFFIC PERFORMANCE

The quality of traffic operation is rated through a methodology developed by the Transportation Research Board (TRB) known as capacity analysis. The professional standard practice for evaluating traffic performance is described in the *Highway Capacity Manual* (HCM) 2000 Edition. That methodology has been embodied in the software Synchro 7. The software inputs include traffic signal timings, the locations of stopped controlled intersections, the number of lanes on each intersection approach, and the peak hour traffic volumes. The results of the analysis provide the output of average vehicle delays at each intersection, and an associated grade of traffic performance, called level of service. The criteria for the level of service at signalized intersections, based on average vehicle delay at the intersection are:

Level of Service Grade	Average Vehicle Delay
A	< 10 sec.
B	> 10-20 sec.
C	> 20-35 sec.
D	> 35-55 sec.
E	> 55-80 sec.
F	> 80 sec.

Capacity analysis was performed for the 42 signalized intersections for the three peak hour periods. The results of level of service have been graphically displayed in Figures 6, 7 and 8. The results of the analysis indicate that all the signalized intersections are operating at an acceptable level of service.

Detailed results that include level of service by traffic movement for each intersection and queuing for both signalized and unsignalized intersections are included Appendices C to H.



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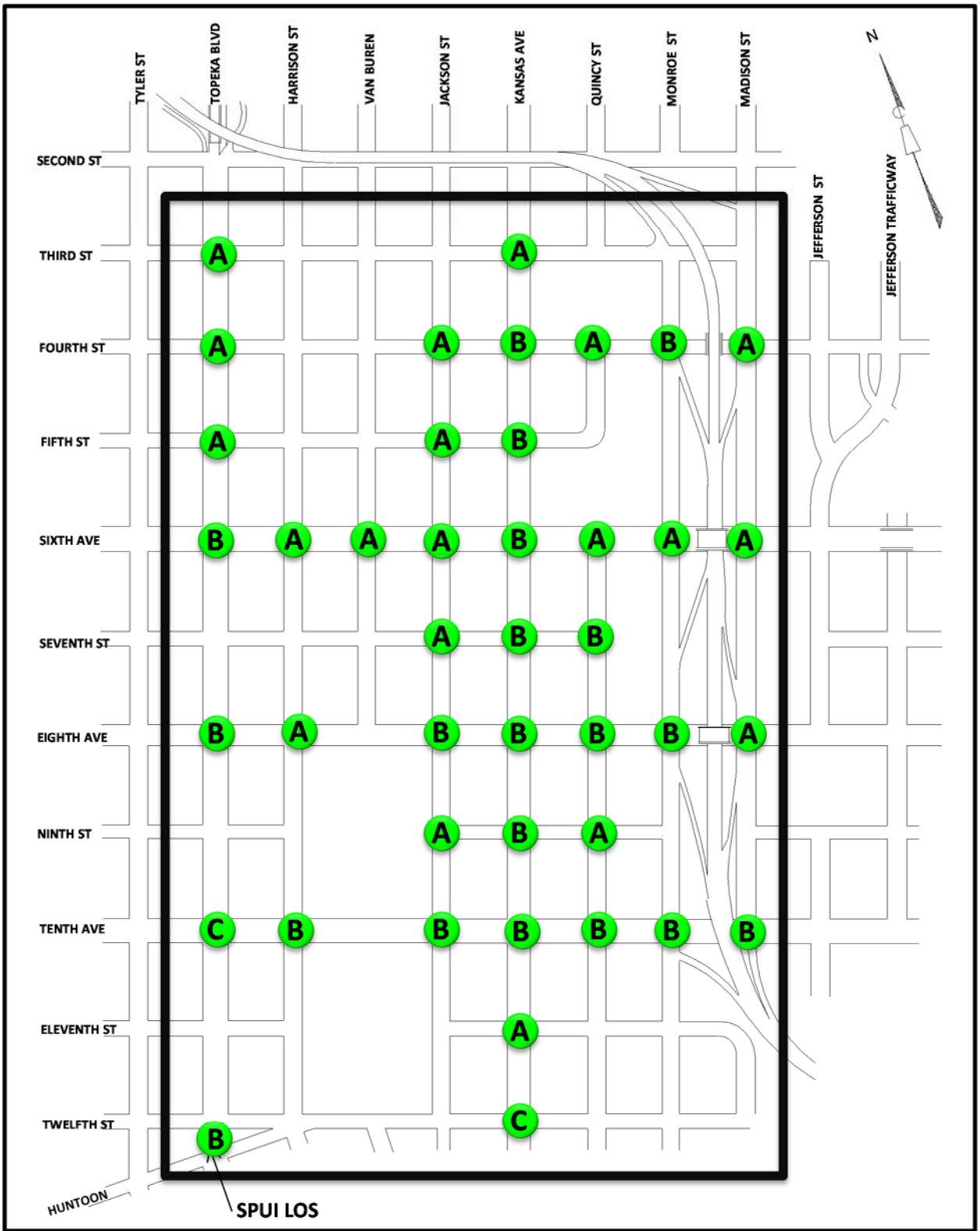
A Level of Service

FIGURE 6
AM Peak Level of Service
2011 Traffic Volumes on Existing Network



LEGEND

A Level of Service

FIGURE 7
Noon Peak Level of Service
2011 Traffic Volumes in Existing Network

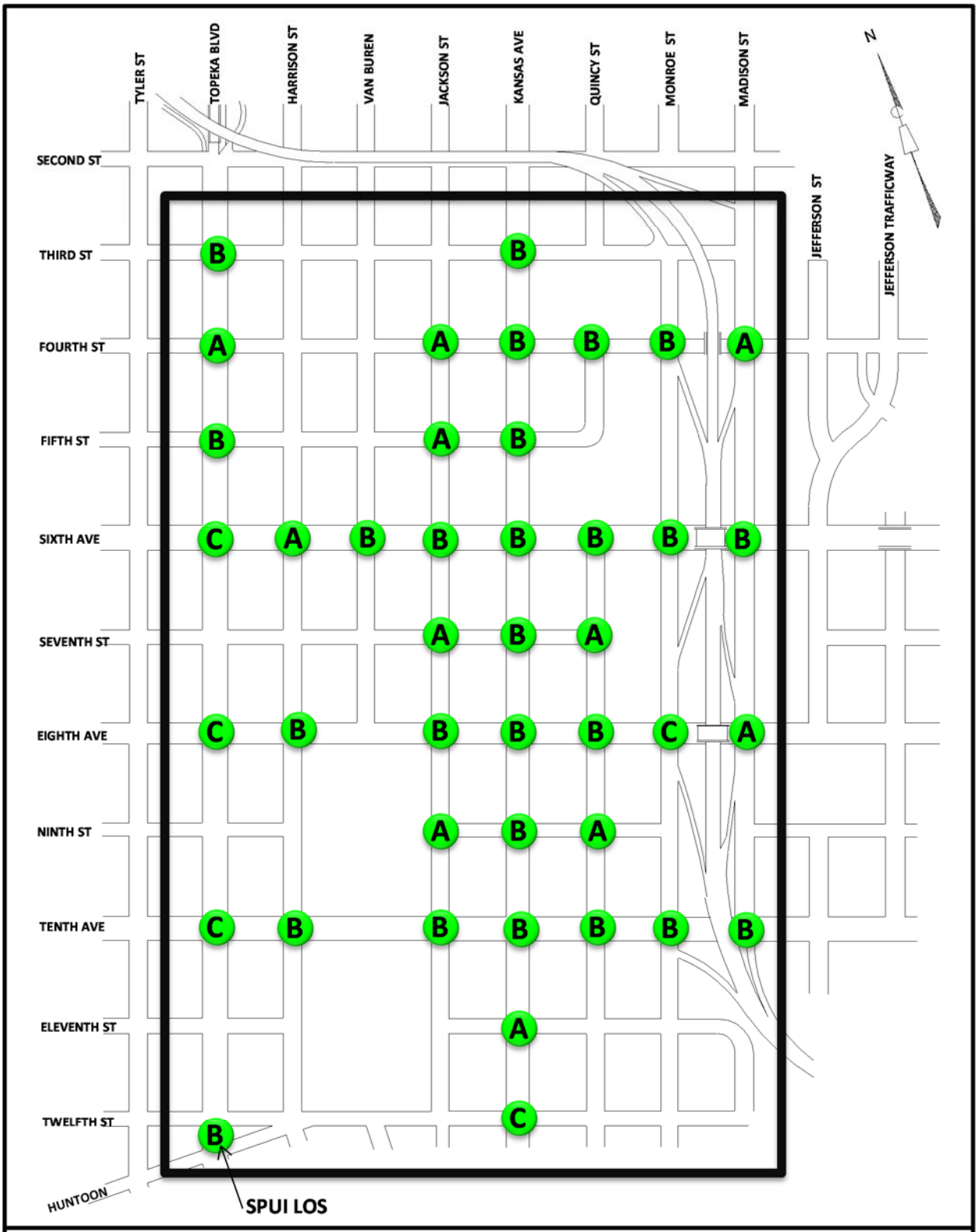


FIGURE 8
PM Peak Level of Service
2011 Traffic Volumes on Existing Network

MEASURES OF EFFECTIVENESS

The measures of performance computed for each signalized intersection include average vehicle delay, level of service, and 95th percentile queue length for each movement at each intersection for the three peak periods. The system-wide measures of performance include system-total vehicle delay, number of stops, average speed, total vehicle hours traveled, total vehicle miles traveled, fuel consumption, fuel economy, and vehicle emissions. These measures of effectiveness (MOEs) for each modeled time period is summarized in Table 1. The MOEs of current traffic circulation and operation will serve as a benchmark to compare the performance of changes modeled in the future conditions analysis in the next section.

Table 1 – Measures of Effectiveness

MOEs	AM Peak	Noon Peak	PM Peak
Total Delay/Veh (s/v)	9	10	11
Total Delay (hr)	214	193	279
Stops/Veh	0.41	0.39	0.42
Stops (#)	34,496	27,799	36,839
Average Speed (mph)	14	13	13
Total Travel Time (hr)	533	469	626
Distance Traveled (mi)	7,314	6,231	7,828
Fuel Consumed (gal)	620	529	701
Fuel Economy (mpg)	12	12	11
CO Emissions (kg)	43.31	37.01	49.00
Nox Emissions (kg)	8.43	7.20	9.53
VOC Emissions (kg)	10.04	8.58	11.36

FUTURE TRAFFIC CONDITIONS

Two major factors were examined in evaluating future traffic conditions within the Topeka CBD. The first factor is the potential redevelopment of current unoccupied buildings or office spaces over the next two decades. The second factor is the proposed changes in existing access to the CBD from the proposed I-70 interchanges, as well as the proposed modifications to typical section on 8th Street and Kansas Avenue.

This section of the report outlines the approach to estimating future2030 CBD traffic and the traffic redistribution resulting from changes to the CBD access and street network. It also presents the results of traffic analysis that examines how the CBD street network would operate under increased future traffic with the planned modifications to the existing street network.

LAND USE DEVELOPMENTS

For the purpose of the Downtown Topeka Circulation Study, the Topeka Planning Department staff prepared the land use inventory. The methodology described in this section is directly quoted from the draft *Downtown Topeka Circulation Study 2011 and 2030 Land Use*.

As City Staff pointed out, the Topeka downtown area is a giant mixed-use district with uses intertwined within buildings and blocks making for difficult and somewhat disjointed land use planning which does not follow traditional patterns. To come up with a reasonable inventory and hence future estimate of CBD land uses, City Staff adopted the approach outlined below.

The study area was broken down into the following 9 sub-areas that focused on similar character, function, and geographic location -- not necessarily land use.

1. Large Office
2. Retail Core
3. Capital District
4. Topeka Boulevard
5. Transitional
6. Water Tower
7. Industrial
8. Future I-70 ROW
9. Neighborhood Edge

Figures 9 and 10 depict the defined sub-areas. Figure 9 reflect the existing land uses with the existing I-70 access points. Figure 10 shows future potential major venues, as well as the future I-70 access points.

For each sub-area, square footage was calculated by land use. Vacancy estimates were calculated for the total square footage of all uses. The primary source of the land use data was Downtown Topeka, Inc.'s BID database. Residential properties were not included initially. Staff added residential and augmented the database by updating any missing data as known from the Shawnee County Appraiser and the State of Kansas records.

The square footage by land use types for the 8 sub-areas is summarized in Table 2. The **Neighborhood Edge** sub-area represents the edge of residential neighborhoods adjacent to Downtown. It is comprised mostly of early 20th Century single or two family housing. Square footages were not calculated for these blocks. A brief discussion of each sub-area follows Table 2.

Table 2 – Topeka CBD Land Use Sub-Areas

Land Uses	Large Office		Retail Core		Capital District		Topeka Boulevard		Transitional	
Multi Family Units	91		108		218		27		14	
Retail (SQFT)	2,255	0%	145,410	8%	13,633	1%	34,952	7%	72,564	17%
Multi Family (SQFT)	32,295	2%	58,588	3%	85,610	4%	22,159	5%	7,728	2%
Hotel (SQFT)	30,957	2%								
Industrial (SQFT)									74,805	18%
Office (SQFT)	1,021,809	77%	1,238,378	64%	1,834,112	93%	408,589	85%	218,433	53%
Vacant (SQFT)	233,762	18%	486,250	25%	35,263	2%	15,619	3%	41,128	10%
Total (SQFT)	1,321,078	100%	1,928,626	100%	1,968,618	100%	481,319	100%	414,658	100%

Land Uses	Water Tower		Industrial		Future I-70 ROW		Downtown Total	
Multi Family Units	82		0		0		540	
Retail (SQFT)	30,233	25%					299,047	4%
Multi Family (SQFT)	58,264	48%					264,644	3%
Hotel (SQFT)							30,957	0%
Industrial (SQFT)			1,663,882	87%	151,107	73%	1,889,794	23%
Office (SQFT)	16,794	14%		0%	41,762	20%	4,779,877	57%
Vacant (SQFT)	17,168	14%	254,143	13%	15,296	7%	1,098,629	13%
Total (SQFT)	122,459	100%	1,918,025	100%	208,165	100%	8,362,948	100%

Source: Topeka Planning Department, June 10, 2011

The first three sub-areas – Large Office, Retail Core, and Capital Plaza – are the most stable and intensely developed of all the Downtown. They represent the image of Downtown most people know.

Large Office – This represents a built-out area of large office and government users along I-70 represented by BNSF, City/County, AT&T, and Bank of America tower. Any new development is not anticipated to occur in this area primarily due to it being built-out already. There is room to increase occupancy with an 18% vacancy rate. Another potential change would be the addition of a privately operated ice skating rink at 8th and Jefferson on land donated by the City.

Retail Core – This represents the heart of Downtown with iconic storefronts lining either side of Kansas Avenue – Topeka's main street. While half of Downtown's retail is located here, office is still the dominant use led by the State, Westar, and Capital Federal Bank. It also is a built-out area, but with a 25% vacancy rate. Other than filling more existing spaces and reducing vacancies, the only anticipated future change may come from using Kansas Avenue more as an event space for evenings and weekends. A proposal to re-do 8th Street and Kansas Avenue intersection to attract more on-street festivities is in

the CIP. It would be designed to potentially close-off 8th Street from Quincy to Jackson and Kansas from 7th to 9th as needed for community events (e.g., farmers market).

Capital Plaza – This area is the core of the State government functions dominated by the State Capital and the Judicial Center. Over 86% of the space is office, largely State occupied. The vacancy rate is 4% although that really only reflects the private space and not the state offices. Of the future changes, one could include construction of a new state office building at the southeast corner of 10th and Topeka Blvd. While government is expected to shrink, cost efficiencies may demand an investment to consolidate State functions into a Class A space in the range of 250,000 sq. ft.

Topeka Boulevard – This corridor is anchored on the southern end by the Blue Cross and Blue Shield of Kansas headquarters representing 80% of the 408,000 sq. ft. of total office space. The remaining character is an older building type that may be prone to redevelopment pressures in the future should the new I-70 alignment give it even greater connectivity. No major changes are projected for this corridor.

Transitional – This area begins the transition out of the primary office and retail districts of Downtown and into the secondary or "back" office, industrial, and retail uses. Generally, this area has smaller building footprints/scale in a greater state of deterioration. The largest presence is the YMCA at SW Van Buren and 5th occupying a city block. Redevelopment is more of a possibility here but there are no significant changes intended for this area at this time.

Water Tower – Over the past 30 years, this area has been planned on and off again for major redevelopment projects (e.g., movie theaters, office campus, low-rise housing). The land sits largely vacant under a single private ownership and would likely be considered a prime location for a significant addition to Downtown. It is now considered a potential site for a new multi-use stadium (2,500 capacity) as home to an independent minor league baseball team. The stadium could be used for outdoor concerts, ice skating in the winter, soccer, etc. Significant commitments in new retail shops and restaurants (est. 25,000–30,000 sq. ft.) would accompany the stadium if built. A mix of residential and office uses above the storefronts are planned.

Industrial – This area functions primarily for heavier industrial and railroad uses. It is largely divided from the rest of Downtown by I-70. No major changes are anticipated. Minor changes may include re-use of buildings for non-industrial uses (e.g., residential, artist space) and expansion of existing employers (e.g., Hill's Pet Food plant). The riverfront on the south side has been looked at for larger redevelopment projects (e.g., parks, stadiums, entertainment) but is considered too expensive at this time to be feasible. Office space is included within industrial.

Future I-70 ROW – The future planned route of the I-70 Polk-Quincy Viaduct will likely affect many industrial blocks in its current vicinity. The square footage of the buildings in these blocks should not be included in long-range planning for Downtown. If removed for the new route, it is uncertain whether this space would be absorbed by Downtown or be lost for good.

Downtown – Adding all of the sub-areas together in the study area results in the numbers presented in Table 2. These are conservative figures based on multiple sources. It is not meant to be an exhaustive or comprehensive study.

Based on data from appraisers and realtors, some 540 **residential units** are estimated in the study area. Over half (57%) are considered elderly/disabled or low income units. All units are 100% attached. The market is very weak at present and in the foreseeable future for condo or owner-occupied apartments. Bank lending dried-up several years ago for mixed-use projects (i.e., condos above store fronts or offices) making if very difficult to obtain homeowner financing. For example, the 23 "lofts" over the new

US Bank building remain unfinished for now. However, rental units appear to be at a premium judging by the waiting list at Core First's apartments at 9th and Kansas. Therefore, we are estimating the growth in Downtown could manage at least 10% of the city-wide attached housing market and 1% of the non-attached market (based on the last 10 years) which equates to roughly over 400 units in the next 20 years. This would essentially double the current inventory over 20 years. The vision for Downtown is to add 1,500 units or four times the current estimated inventory.

Other considerations

Additional information relevant to the purpose of estimating future trip generation in the CBD study area is depicted in Figures 9 and 10. Existing and future elements to note include the I-70 access points, major office employees, and major venues.

 **I-70 Access Points** – In addition to a new route for the Polk-Quincy Viaduct, I-70 access points will also change under the proposed KDOT and City preferred option.

Existing – 1st, 3rd, 4th, 8th, and 10th access points.

Future – Topeka, Van Buren, Kansas, 4th, 6th, and 10th access points.

 **Major Office Employers** – These points on the map show Downtown's largest employment and visitor centers (generally exceeds 200,000 sq. ft.). They are major destinations for vehicle trips during the 8-5 working day and are considered stable anchors for Downtown.

Existing –State Docking Building, State Capital Building, State Landon Building, State Curtis Building, State Eisenhower Building, County Courthouse/City Hall, City of Topeka Holliday Building, Blue Cross Blue Shield (12th and Topeka), BNSF (10th and Quincy), Hills Pet Nutrition office (8th and Harrison), Westar (8th and Kansas), Bank of America Tower (6th and Kansas), and Hallmark (3rd and Madison).

Future (additions) – New State Office Building (10th and Topeka) and Hills plant expansion (NE Crane)

 **Major Venues** – These points on the map show Downtown's largest entertainment and activity venues. They are major destinations for vehicle trips during the evening hours and weekends.

Existing – TPAC and Ramada Inn

Future (additions) – Water Tower Ballpark, Topeka Ice skating rink (8th and Madison), and NOTO/Great Overland Station/Riverfront park (north of Kansas River)

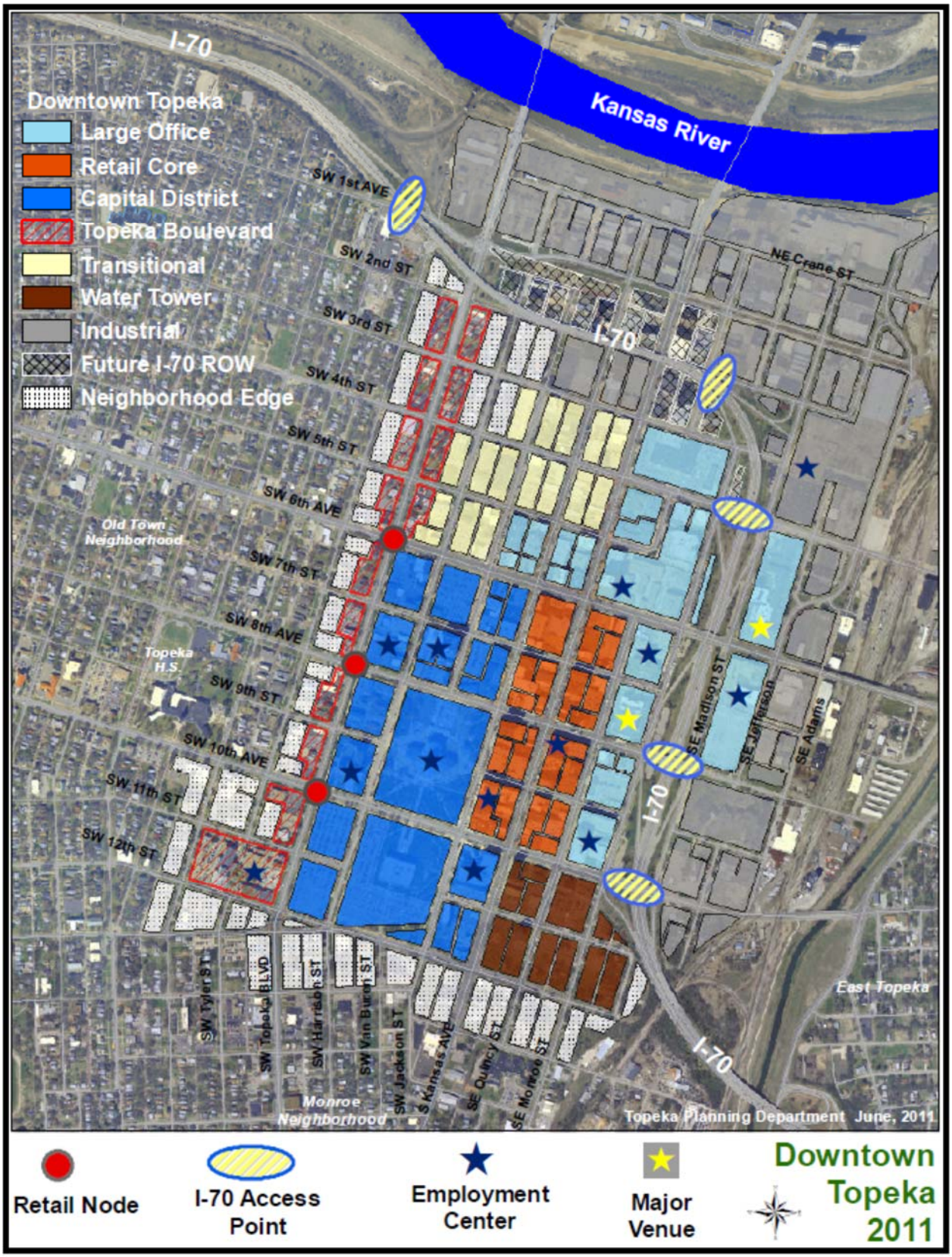


FIGURE 9 2011 Topeka CBD Sub-Area Land Uses

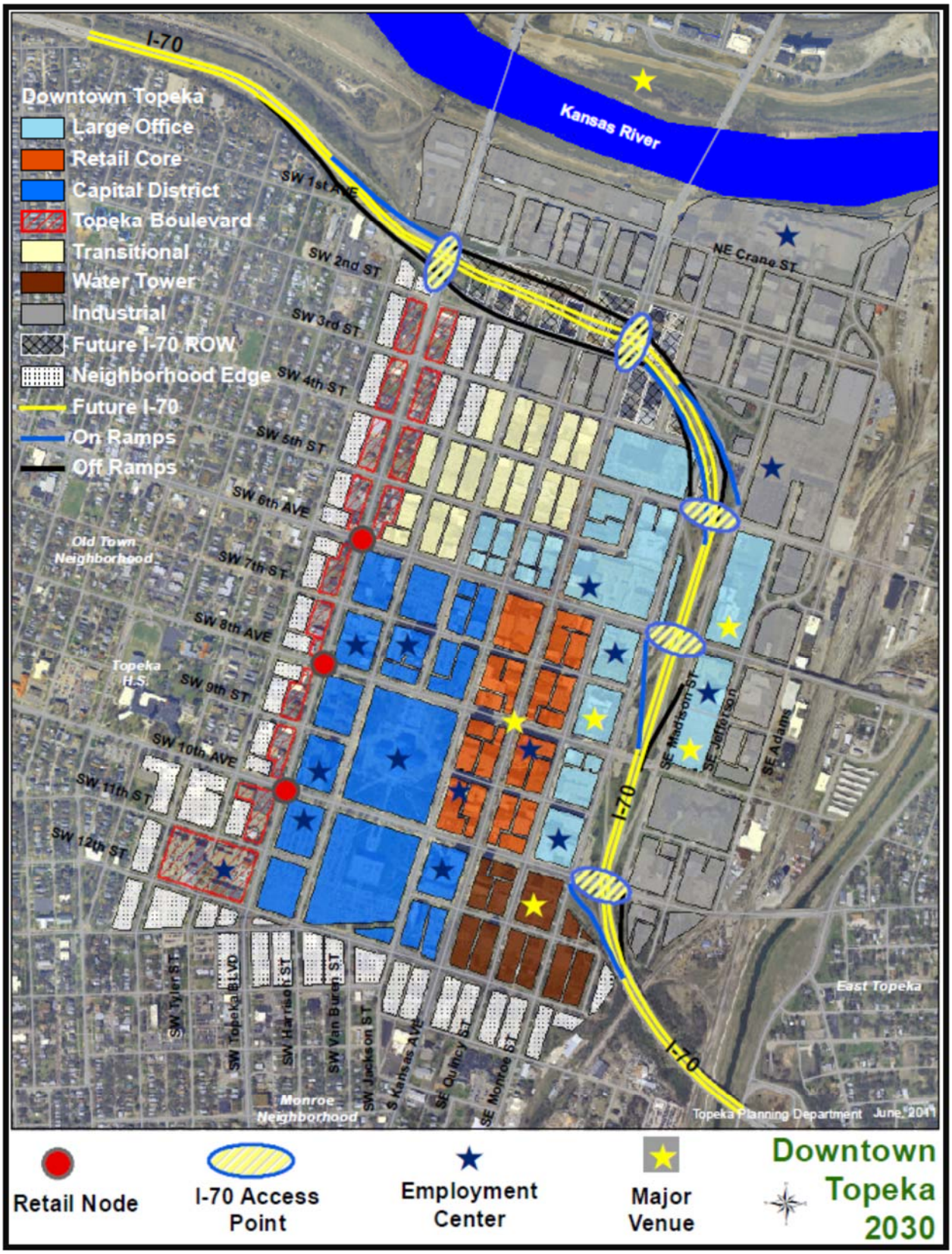


FIGURE 10 2030 Topeka CBD Sub-Area Land Uses

FUTURE CBD TRAFFIC

The estimate of future (year 2030) traffic generation within the CBD is solely based on vacant land uses in each subarea as summarized in Table 2. Potential major venues, such as the Topeka Ice Skating rink on 8th and Madison and the NOTO/Great Overland Station/Riverfront Park, are not included in the trip generation analysis. The rationale for this exclusion relates to the time period of the traffic analysis that examines trip making during the average morning and evening peak commuting hours and during the mid-day downtown activities.

Analysis of trip generation by land use type follows the Institute of Transportation Engineers (ITE) Trip Generation Manual. The trip generation is divided into three time periods: AM peak, noon peak, and PM peak. For each peak period, the trips are divided into IN trips and OUT trips. IN trips relate to the number of entering vehicles during the one hour peak period while OUT trips are associated with the number of vehicles existing the site during the one hour peak period. The estimated year 2030 trips by sub-area are given in Table 3.

Table 3 – Year 2030 Trip Generation from Existing CBD Vacant Land Uses

Sub-Area	AM PEAK			NOON PEAK			PM PEAK		
	IN	OUT	Total	IN	OUT	Total	IN	OUT	Total
Large Office	380	57	436	159	161	321	137	368	504
Retail Core	573	93	666	334	334	669	179	599	777
Capital District	69	9	78	0	0	0	31	69	100
Topeka Boulevard	21	3	24	10	10	20	4	19	23
Transitional	41	5	45	31	31	63	17	50	67
Water Tower	4	1	4	9	9	18	7	11	17
Industrial	206	3	208	114	114	229	30	217	247
Future I-70 ROW	14	1	15	7	7	15	2	14	17
TOTAL	**1,308**	**169**	**1,477**	**666**	**668**	**1,333**	**406**	**1,347**	**1,753**

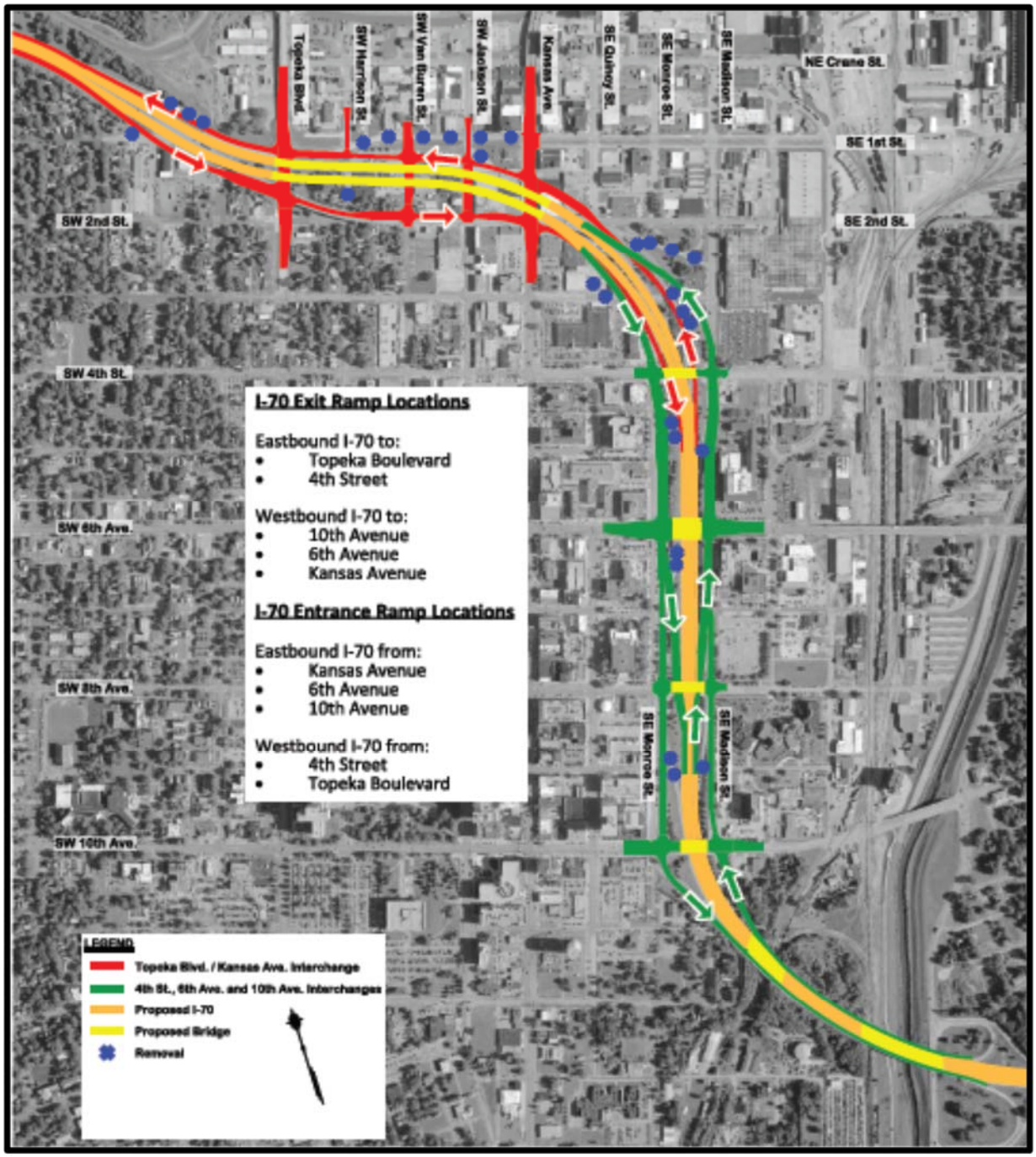
The estimated future trips going to or coming out of each sub-area need to be distributed onto the CBD street network. To reasonably distribute traffic would require the use of a travel demand model. For this study, a system-wide growth in CBD traffic is used. Based on the trip generation estimate in Table 2, the system-wide percentage growth is 13.6 percent during the morning peak, 14.1 percent for the mid-day peak, and 13.1 percent for the afternoon peak. These system-wide percentage traffic growth rates were applied to the existing intersection turning movements to derive the year 2030 turning movements.

PROPOSED CHANGES TO CBD ACCESS AND TYPICAL SECTIONS

Future I-70 Connections

The I-70 preferred alternative depicted in Figure 11 creates an access system with two "split diamond" interchanges, one serving the north side of the downtown area and one serving the east side. On the north side, the existing 1st Street ramps will be relocated to provide direct connection with Topeka Boulevard. These ramps serve traffic traveling to and from the west of I-70. A complementary set of ramps will connect to Kansas Avenue and serve traffic traveling to and from the east on I-70. These ramps are joined by a pair of one-way connector roads to form a system that will provide access to downtown from the north, the proposed Riverfront redevelopment area, and North Topeka.

A similar system of ramps and connector roads will serve the east side of the downtown area. The existing 3rd Street ramp will be relocated to 4th Street and will serve traffic traveling to and from the west on I-70. The existing 10th Avenue ramps will be widened and new 6th Avenue ramps will be constructed, serving traffic traveling to and from the east on I-70. The 4th Street, 6th Avenue, and 10th Avenue ramps will be connected by the one-way, connector road pair of Madison and Monroe Streets. Other ramps between 10th Avenue and 4th Street will be removed.



Source: I-70 Topeka Polk-Quincy Viaduct Study

FIGURE 11 I-70 Preferred Alternative

8th Street and Kansas Avenue Proposed Changes

The proposed changes along 8th Street (between Jackson and Quincy) include converting to a one-lane in each direction with a center diagonal parking as Figure 12 portrays. On Kansas Avenue, between 7th Street and 9th Street, there will be diagonal parking on both sides with a single lane of traffic in each direction plus a center lane as Figure 12 shows.

Source: Capital District Project

FIGURE 12 8th Street and Kansas Avenue Proposed Typical Section

TRAFFIC IMPACT OF FUTURE TRAFFIC AND NETWORK CHANGES

The impact of future traffic in the CBD together with proposed changes to access and lane capacities on sections of 8th Street and Kansas Avenue was analyzed by evaluating the capacities of existing intersections to handle future increased traffic. Level of service using Synchro version 7 was used in the analysis. In addition, a micro-simulation using VISSIM was developed specifically to examine the impact of parking and reduced capacities on 8th Street and Kansas Avenue. Results of the micro-simulation are discussed in later section of this report.

EVALUATION SCENARIOS

Six evaluation scenarios, shown graphically in Figure 13, were developed. A future network that includes new I-70 connections and changes along 8th Street and Kansas Avenue was first established. For each time period (AM peak, noon peak, and PM peak), the existing 2010 traffic volumes representing 2010 land use was then assigned to the future network to first evaluate the impact of changes to the CBD street network. Similarly, the estimated future traffic volumes representing 2030 land use for each time period was assigned to the future network to evaluate the impact of increased traffic within the CBD.

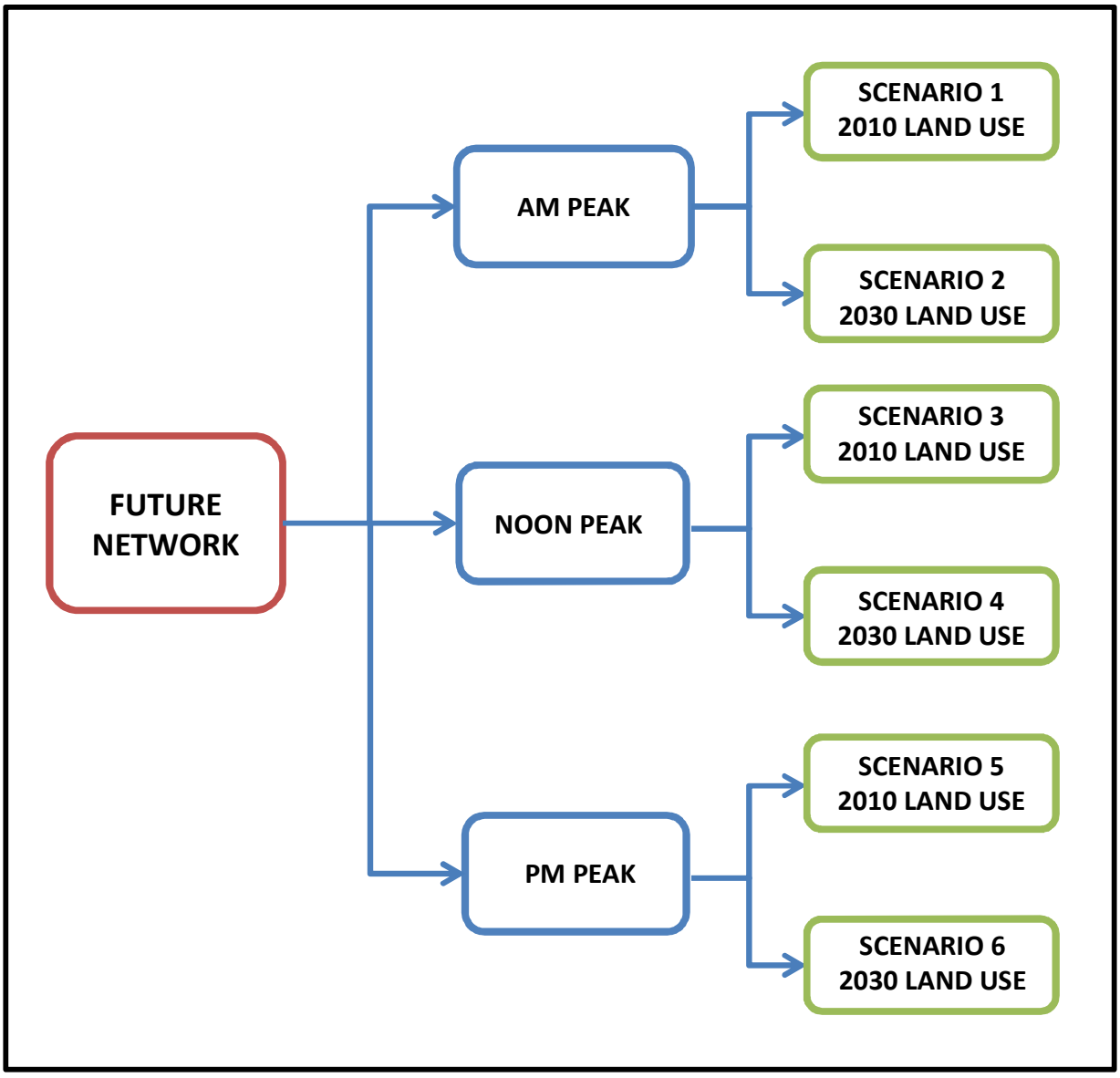


FIGURE 13 Evaluation Scenarios

COMPARISON OF TRAFFIC PERFORMANCE

Changes in CBD access with the proposed I-70 connections necessitated re-distribution of existing traffic as graphically shown in Figure 14. The existing ramp on 3rd Street will be changed to have traffic exiting onto 4th Street. This change will close 3rd Street. Consequently, existing eastbound traffic on 3rd Street would likely re-route to 4th Street and 6th Avenue via Kansas Avenue. Likewise, existing westbound traffic on 3rd Street would likely use 4th Street and 6th Avenue via Kansas Avenue or via other alternative streets, such as Jackson Street or Van Buren. The proposed new on-ramps south of 6th Avenue and 10th Avenue, as well as the proposed off-ramp at 4th Street would consequently increase traffic on these routes. On the other hand, the removal of the off-ramp north of 8th Street and the on-ramp south of 8th Street would reduce traffic along 8th Street. The proposed reduction in lane capacity on a portion of 8th Street would be a major factor for motorists to use an alternative east-west route.

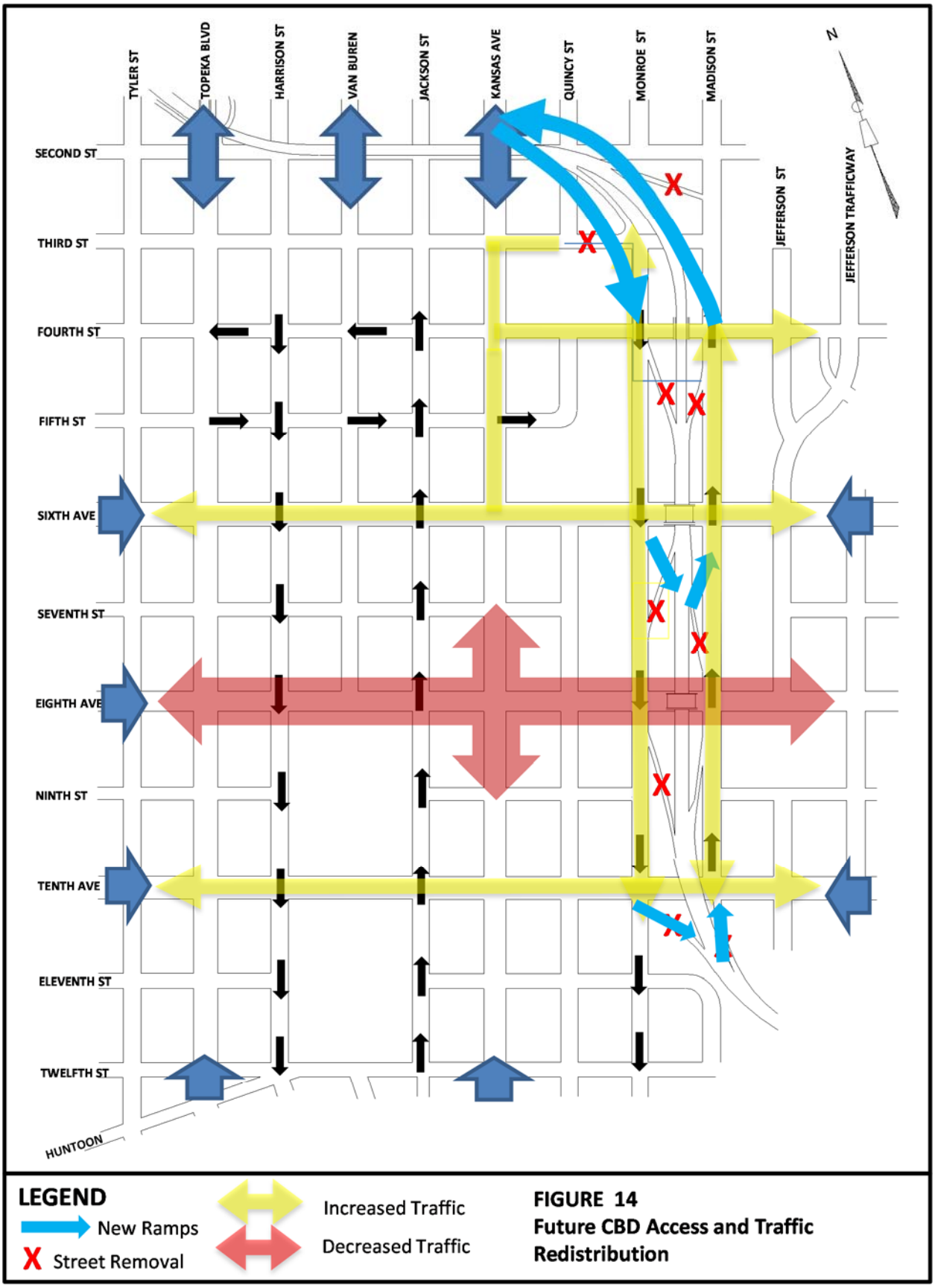


FIGURE 14
Future CBD Access and Traffic Redistribution

Network Changes Impact on Level of Service under Current Land Use

Capacity analysis was performed for the six evaluation scenarios. The resulting level of service is summarized in Figures 15 to 20. Figures 15 to 17 present a comparison of LOS with the existing traffic condition (shown in Figures 6 to 8) to the LOS with existing traffic assigned onto a future network (Scenarios 1, 3, and 5). In other words, Figures 15 to 17 shows the impact, measured in terms of level of service, of the changes to the existing CBD street network. Delays would be expected to increase, thus consequently worsening the LOS on 6th Avenue and 10th Avenue, as these two east-west corridors would be expected to carry most of the diverted traffic from 8th Street. During the noon peak period, delays would be expected to increase due to the reduced lane capacity and the added friction of on-street parking.

Future Traffic Growth Impact on Level of Service

Figures 18 to 20 compare the LOS of future 2030 traffic with the existing 2011 traffic (Scenarios 1 to 6). As can be expected level of service would worsen for some intersections by 2030. Retiming of the traffic signals to respond to the changes in traffic patterns and volumes could alleviate some of the delay.

The anticipated growth on PM peak traffic will be the time period that will have the most impact on the performance of the CBD street network. Sixth Avenue and 10th Avenue, as well as the one-way connector road pair of Madison and Monroe Streets, would also be impacted.

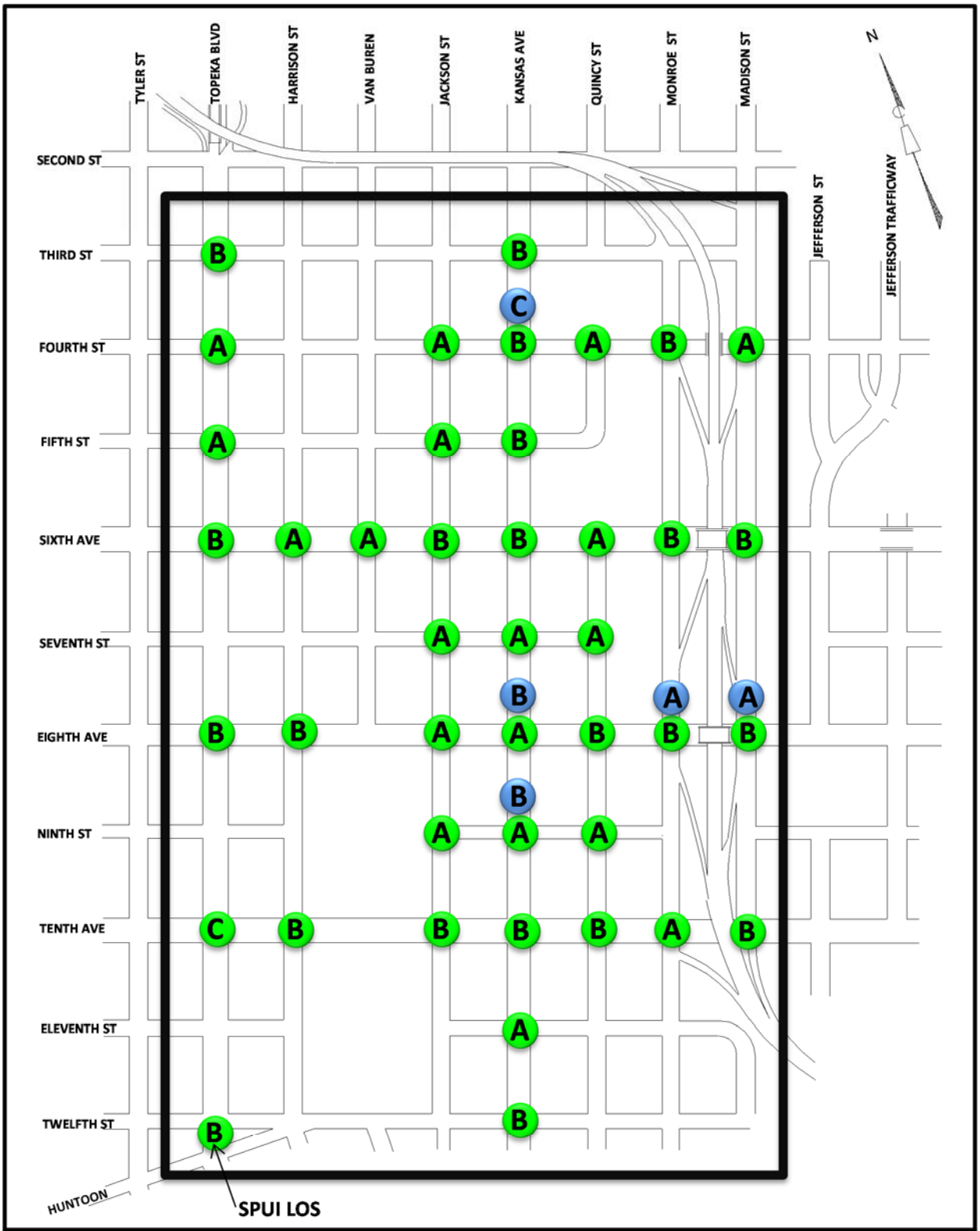


FIGURE 15
AM Peak Level of Service
2011 Traffic Volumes

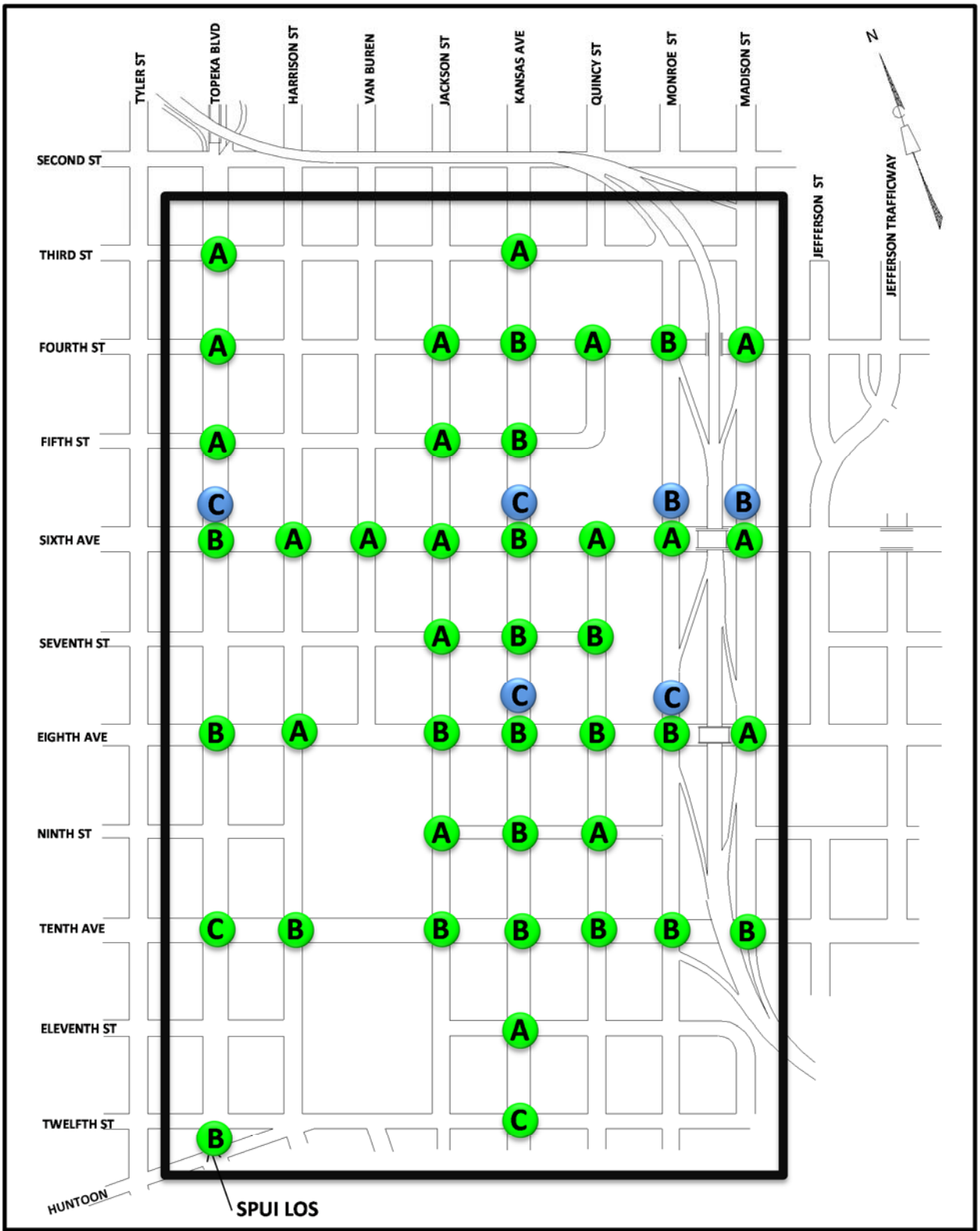


FIGURE 16
NOON Peak Level of Service
2011 Traffic Volumes

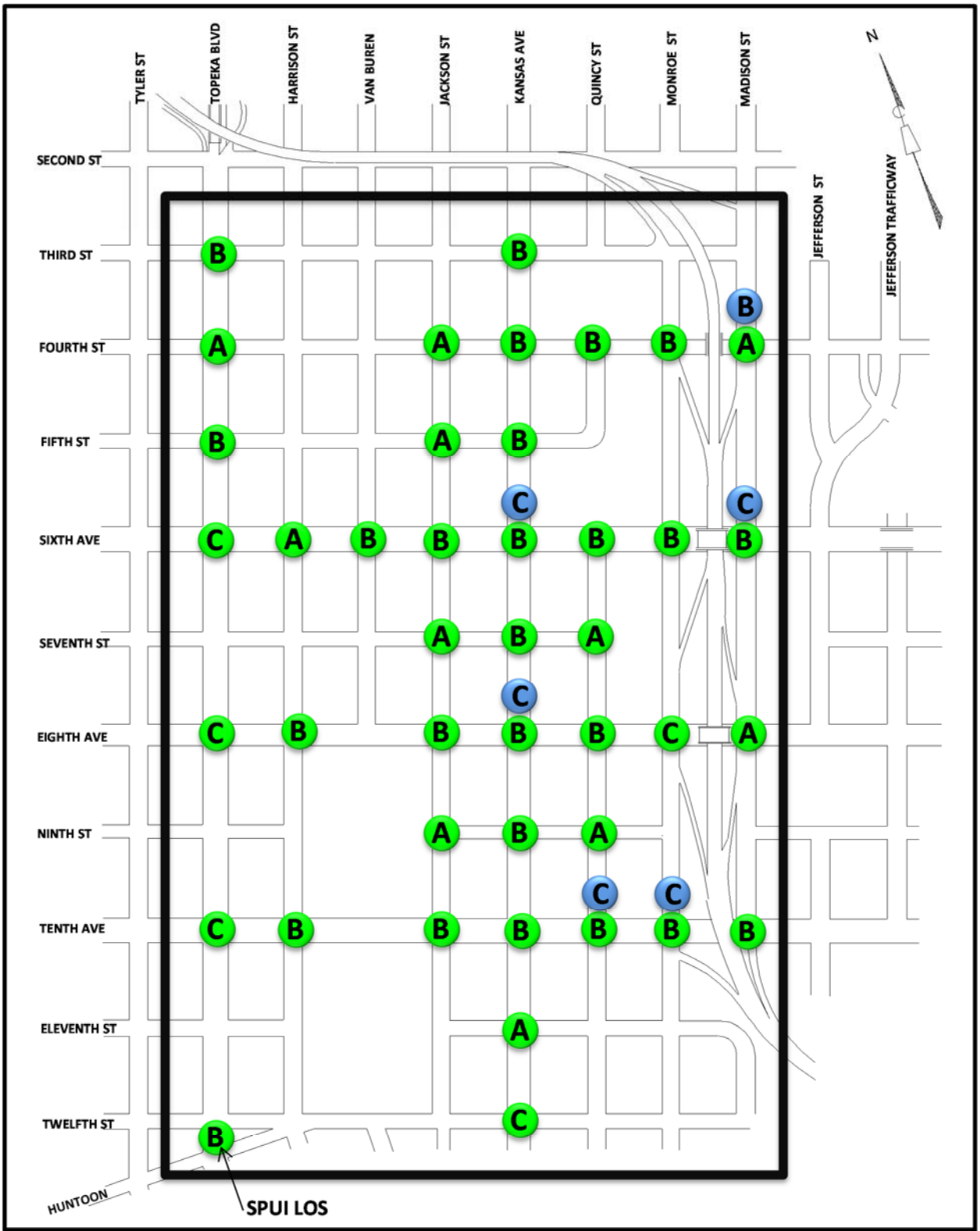


FIGURE 17
PM Peak Level of Service
2011 Traffic Volumes

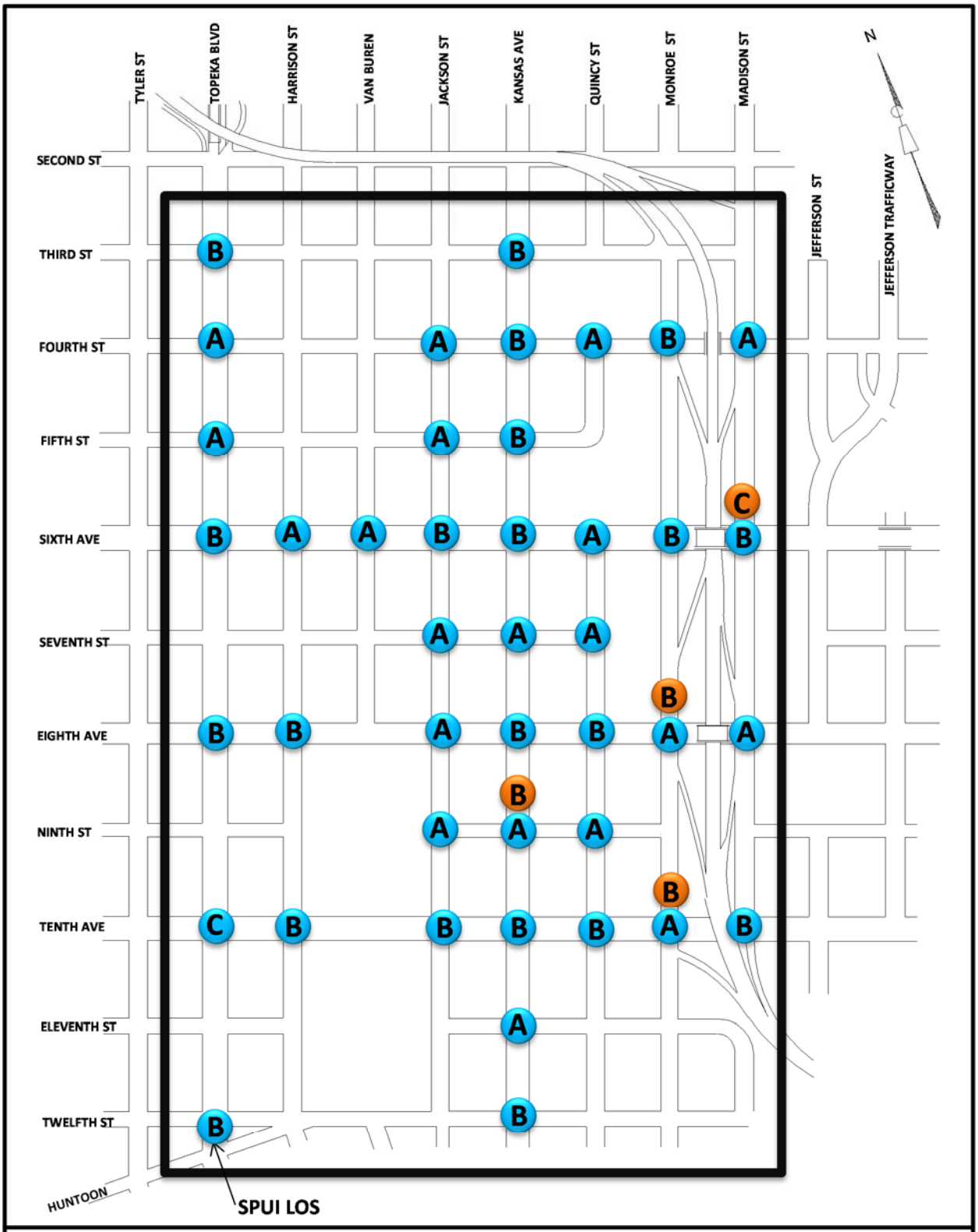


FIGURE 18
AM Peak Level of Service
Future Network

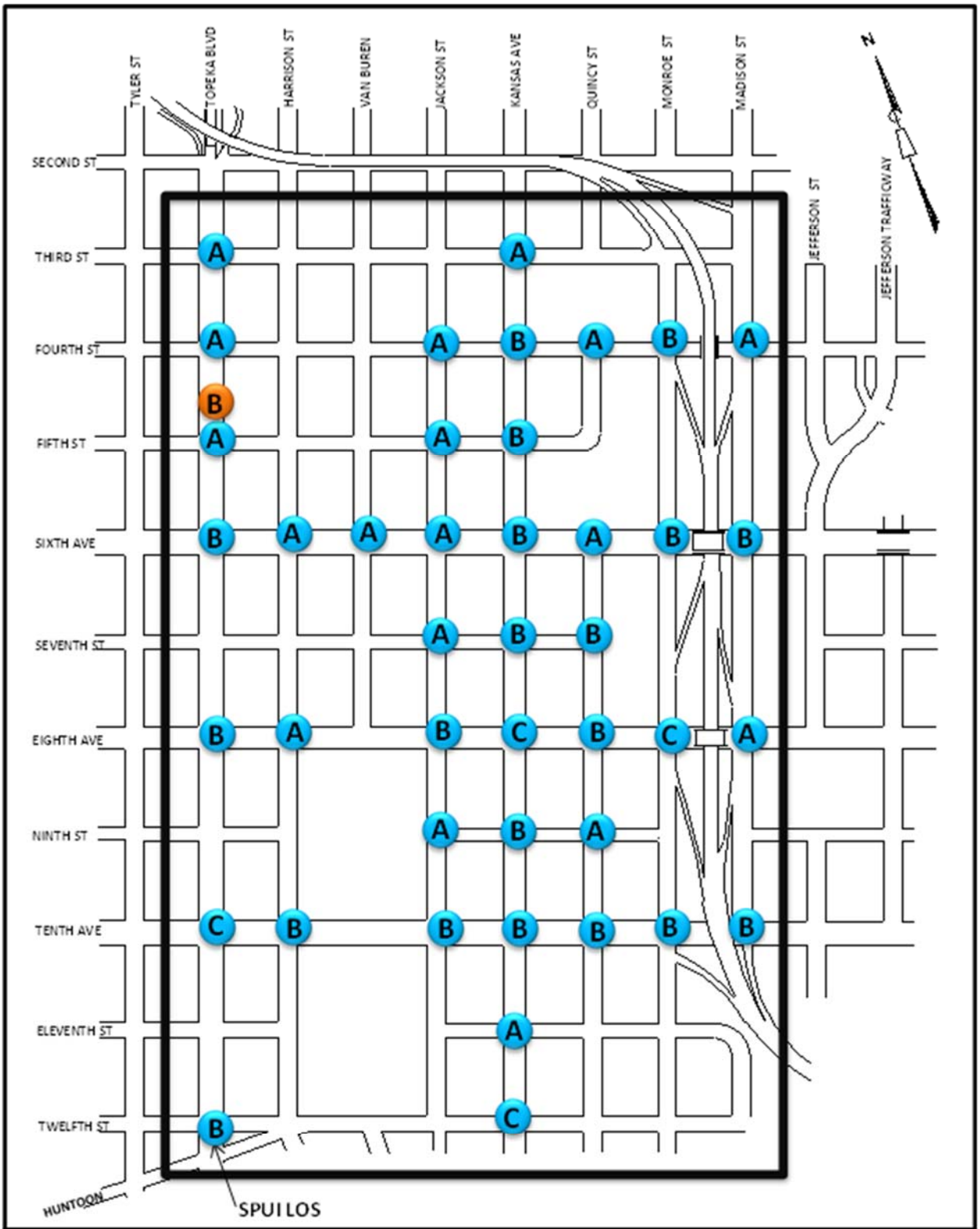


FIGURE 19
NOON Peak Level of Service
Future Network

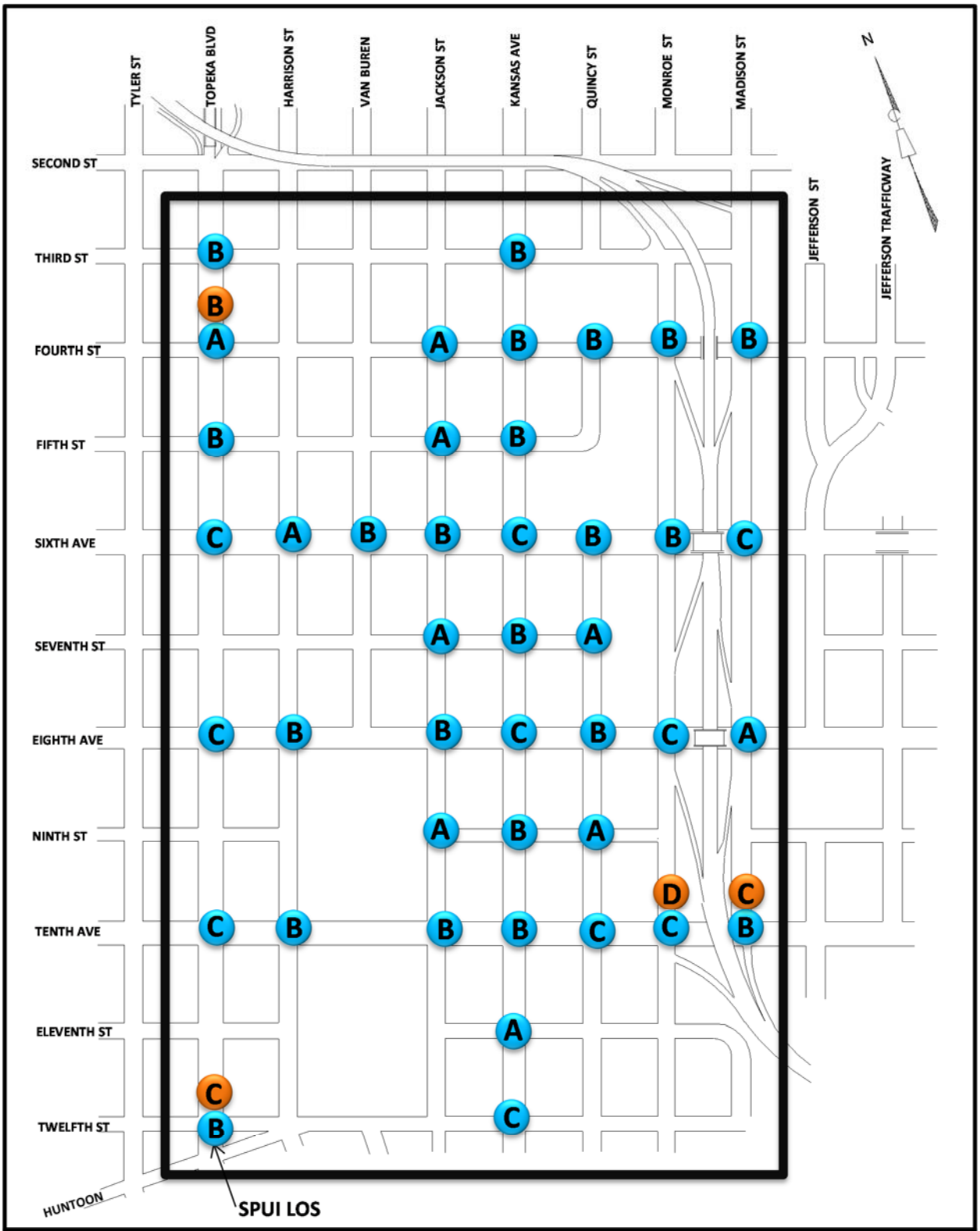


FIGURE 20
PM Peak Level of Service
Future Network

MEASURES OF EFFECTIVENESS

Tables 4 to 6 present a comparison of measures of effectiveness. As can be expected, delays and travel times would increase with increased traffic. Changes to the street network, which include reduced capacity on portion of 8th Street and on Kansas Avenue, would be expected to result in increased travel time for all peak periods.

Table 4 – AM Peak MOE Comparison

MOEs	Existing	Scenario 1	Scenario 2
Total Delay/Veh (s/v)	9	10	11
Total Delay (hr)	214	235	289
Stops/Veh	0.41	0.43	0.45
Stops (#)	34,496	36,991	43,559
Average Speed (mph)	14	14	13
Total Travel Time (hr)	533	580	681
Distance Traveled (mi)	7,314	7,982	9,055
Fuel Consumed (gal)	620	674	786
Fuel Economy (mpg)	11.80	11.80	11.50
CO Emissions (kg)	43.31	47.09	54.92
Nox Emissions (kg)	8.43	9.16	10.69
VOC Emissions (kg)	10.04	10.91	12.73

Table 5 – Noon Peak MOE Comparison

MOEs	Existing	Scenario 3	Scenario 4
Total Delay/Veh (s/v)	10	11	12
Total Delay (hr)	193	224	271
Stops/Veh	0.39	0.40	0.42
Stops (#)	27,799	28,975	33,537
Average Speed (mph)	13	13	12
Total Travel Time (hr)	469	510	592
Distance Traveled (mi)	6,231	6,432	7,228
Fuel Consumed (gal)	529	565	651
Fuel Economy (mpg)	11.80	11.40	11.10
CO Emissions (kg)	37.01	39.53	45.48
Nox Emissions (kg)	7.20	7.69	8.85
VOC Emissions (kg)	8.58	9.16	10.54

Table 6 – PM Peak MOE Comparison

MOEs	Existing	Scenario 5	Scenario 6
Total Delay/Veh (s/v)	11	14	15
Total Delay (hr)	279	361	438
Stops/Veh	0.42	0.42	0.45
Stops (#)	36,839	39,418	47,423
Average Speed (mph)	13	11	11
Total Travel Time (hr)	626	731	857
Distance Traveled (mi)	7,828	8,380	9,485
Fuel Consumed (gal)	701	793	929
Fuel Economy (mpg)	11.20	10.60	10.20
CO Emissions (kg)	49.00	55.42	64.90
Nox Emissions (kg)	9.53	10.78	12.63
VOC Emissions (kg)	11.36	12.84	15.04

SIMULATION OF TRAFFIC IMPACT ON 8TH STREET AND KANSAS AVENUE

Individual vehicular and pedestrian traffic are simulated. The extent of the simulated network stretches from 6th Avenue to 10th Avenue and from Jackson Street to Monroe Street. Figure 21 depicts a screen shot of the intersection of 8th Street and Kansas Avenue during the PM peak period. A screen shot showing the two blocks on 8th Street and on Kansas Avenue is shown on Figure 22. AVI recording of simulations showing snapshots of heavy traffic for each AM, noon, and PM peak periods were prepared for City Staff to view.

Results of the simulations support the macro analysis results from Synchro that level of service would decline at the intersection of 8th Street and Kansas Avenue during the noon and PM peak times. During the noon peak, increased pedestrian conflict would add to delays at the intersection while during the PM peak the higher traffic on both 8th Street and Kansas Avenue compared to the AM peak would increase delays, and hence LOS would decline. The PM peak period simulation snap shot shown in Figure 22 indicate that queues on 8th Street could back up to the intersection.

The absence of left turn lanes on 8th Street will handicap the intersection and contribute to congestion. The simulation shows a random sampling of the peak hour traffic; a snap shot, if you will. How well the intersection will operate during each signal cycle is dependent on the arrival of left turn vehicles. A left turn vehicle waiting for opposing traffic to clear would essentially block all other traffic behind them from entering the intersection. So, some signal cycles will be worse than others.

The intersection configuration as modeled also presents concerns about the safety of the pedestrians. The simulation depicts operation, but not safety factors. There has not been an exclusive pedestrian signal phase provided, and there is a concern that the pedestrian movements will be in completion with the vehicle turning movements, which are already restricted by only providing a single lane.

Providing parking in the center of 8th Street instead of along the curb could create substantial opportunity for pedestrian-vehicle conflicts. Most people that park in the center of the street will not go to a signalized crossing to get to the outside sidewalk, but will jay walk through traffic, which is of course undesirable. Also, dedicated center angle parking with only a single moving lane in each direction would not provide a staging area for truck deliveries.

While creating a center-of-street area for occasional events and establishing architectural monuments at the intersection can contribute to place making in the downtown, it is recommended for the sake of safety to further develop the concept to include a left turn lane on 8th Street and move parking to the outside curb. In lieu of constructing the left turn lanes on 8th Street, prohibiting left turns could provide the same operational and safety benefits as adding the lanes, but would restrict accessibility of motorists to Kansas Avenue.

The simulation was based on the assumption the I-70 access would be reconfigured concurrent with the 8th Street and Kansas Avenue changes. While those two network changes were not modeled separately, if 8th Street and Kansas Avenue changes, and I-70 access does not, then intuitively it can be expected that there will be increased congestion and at 8th Street and Kansas Avenue. It is uncertain at this time when the changes in I-70 access will occur.

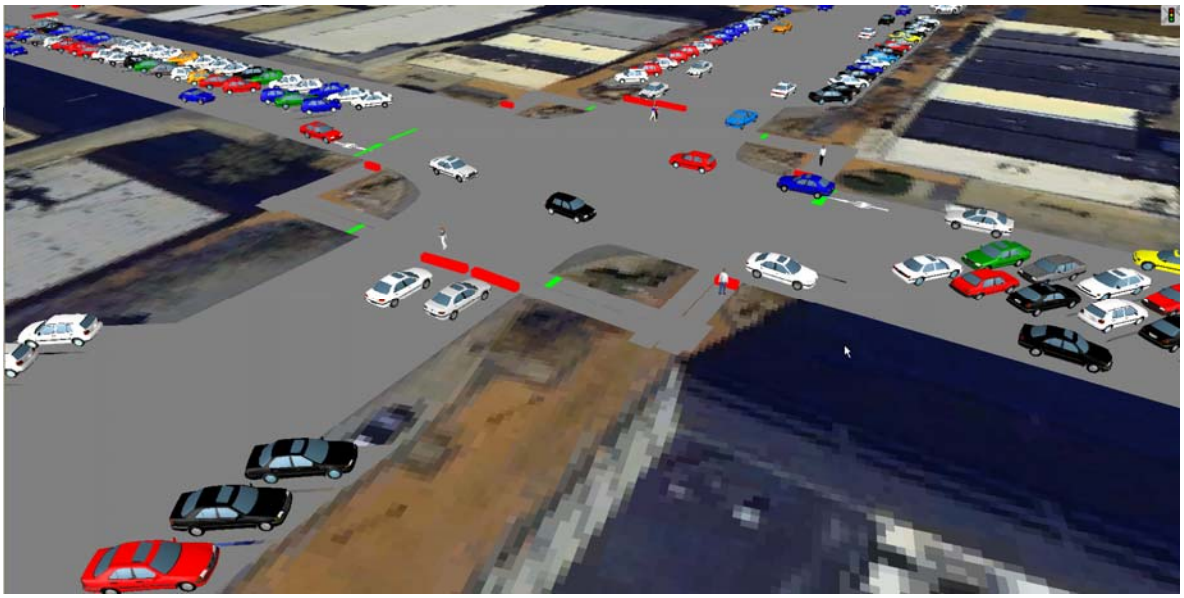


FIGURE 21 8th St and Kansas Ave Intersection PM Peak Simulation Screen Shot1

FIGURE 22 8th St and Kansas Ave PM Peak Simulation Screen Shot2

COMPLETE STREET SCORECARD

Complete streets are designed and operated to enable safe access for all users (pedestrians, bicyclists, and motorists) of all ages and abilities along and across the street. The streets of the downtown area play an important role in defining community character and making the urban environment an enjoyable experience. The National Complete Streets Coalition indicates complete streets provide benefits to the community in many ways by improving public health, lowering transportation costs for families, fighting climate change, reducing our dependence on foreign oil, increasing capacity, and improving mobility for all.

There is no one size fits all approach to designing streets. Each street and each block is unique and should respond to the context of the area and the adjoining land uses in which it is located. A complete street in Downtown Topeka should typically include sidewalks, safe pedestrian crossings, accessible pedestrian signals, bicycle facilities, bus accommodations and bus stops amenities, on-street parking, curb extensions, streetscapes comfortable for walkers and bicyclists, and moderate to slow traffic speeds. Many streets in Downtown Topeka currently lack the design and amenities to be considered a complete street.

There is a range of street types downtown generally based on the traffic volumes they accommodate. The Downtown Street Functional Classification Map identifies the street types which range from high traffic arterial thoroughfares to streets with moderate to lower traffic volumes (collector, and local streets). The urban design and streetscape character of these street types vary and have a range of design characteristics in the Pedestrian Zone (the area between the street curb and the building line which includes sidewalks and landscaping) and the Traveled Way – Vehicular Zone (the area between the street curbs including the vehicular lanes and on-street parking). A complete street for a high traffic volume arterial street may look quite different from a low volume local street.

The Complete Streets Scorecard for Downtown Topeka shown on the next page is organized to address both the Pedestrian Zone and the Traveled Way – Vehicular Zone areas of a street. The Scorecard should be used as a guide, primarily to identify streets with significant complete street deficiencies. It is not a rating system and does not include a point system, and it does not evaluate the urban design quality of the streetscape or the adjoining buildings – even though these features play an important role in the character of the street. The Scorecard is most useful in identifying the streets with a distinct lack of characteristics that make them feel comfortable, safe, and inviting for all users.

Not all design characteristics in the Scorecard are appropriate for each street type. Thus, the Scorecard identifies characteristics “recommended” for the street and characteristics to “consider” by traffic engineers and streetscape urban designers for the street design depending on the context and adjoining land uses in which the street is located. When using the Scorecard to document the current street environment, the design feature characteristics for the street (required and considered) should be noted (yes / no) as to whether they are present.

<u>How to use the Scorecard</u>

1. A separate scorecard sheet should be used for each block of the street being evaluated. In the upper left hand corner of the sheet, identify the street name and the block. For example if reviewing Sixth Street it should be listed as the “Street Name”, and the block being evaluated from Jackson St. to Kansas Avenue.
2. Only one Street Type column should be completed for the street being evaluated. For example, Sixth Street is classified as an “Arterial” roadway by the Functional Classification Map, depicted

in Figure 23. Therefore only the “Arterial High Capacity Thoroughfare” column of the Scorecard should be completed.

3. Circle either Y (Yes) or N (No) for each design feature in which a “Recommended” or “Consider” symbol is noted in the street type column for the design feature being evaluated.
4. If a design feature does not have a “Recommended” or “Consider” symbol item in the column for the street type being evaluated, then no response is necessary.
5. After completing the Scorecard, if certain blocks or entire street corridors lack a significant number of “Recommended” or “Consider” design features then those street segments should be targeted for complete street improvements.

Complete Streets Scorecard - Downtown Topeka, KS

Street Name_____

From (Street) _____

To (Street) _____

	Street Type							
	Arterial High Capacity Thoroughfare		Collector Moderate Capacity Thoroughfare		Local Mixed-Use Street		Local Downtown Residential Street	
Pedestrian Zone								
Primary Design Features Feature Recommendation: ■ Recommended ☐ Consider	Feature Recommendation	Currently Provided	Feature Recommendation	Currently Provided	Feature Recommendation	Currently Provided	Feature Recommendation	Currently Provided
Sidewalks buffered from moving traffic by additional sidewalk width, or by including a planting strip or on-street parking	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Minimum 12-foot wide sidewalk / pedestrian and amenity zone	■	Y / N	■	Y / N	☐	Y / N		Y / N
Minimum 20-foot wide sidewalk / pedestrian and amenity zone	☐	Y / N	☐	Y / N		Y / N		Y / N
Minimum 5-foot wide sidewalk setback from the street curb		Y / N		Y / N		Y / N	■	Y / N
Street trees and landscaping	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Pedestrian amenities (e.g. benches, kiosks, trash receptacles, etc.)	■	Y / N	■	Y / N	■	Y / N		Y / N
Pedestrian scaled lighting	■	Y / N	■	Y / N	■	Y / N	☐	Y / N
Bus shelters or weather protection integrated with buildings at transit stops	☐	Y / N		Y / N		Y / N		Y / N
ADA compliance	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Secure Bicycle Parking / Storage facilities	■	Y / N	■	Y / N	☐	Y / N		Y / N
Screening of adjoining off-street surface parking (landscaping or low screen wall)	■	Y / N	■	Y / N	■	Y / N		Y / N
Traveled Way – Vehicular Zone								
On-street parking	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Curb extensions to reduce pedestrian crossing distance	■	Y / N	■	Y / N	■	Y / N		Y / N
Small curb radii (less than 25-ft)	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Highly-visible crosswalks	■	Y / N	■	Y / N	☐	Y / N		Y / N
Signalized crosswalks	■	Y / N	■	Y / N		Y / N		Y / N
Audible Pedestrian Signals (where traffic signals are present)	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Mid-block crossings on long block sections	☐	Y / N		Y / N		Y / N		Y / N
Striped Bicycle lanes	■	Y / N	☐	Y / N		Y / N		Y / N
Share-Lane Markings / Sharrows appropriate to share with motor vehicles and designated bicycle routes signage		Y / N	☐	Y / N	☐	Y / N		Y / N
Bicycle Signage (e.g. designated bicycle route)	☐	Y / N	☐	Y / N	☐	Y / N	☐	Y / N
Bicycle Detectors	☐	Y / N	☐	Y / N		Y / N		Y / N
Traffic speed calming measures	■	Y / N	■	Y / N	■	Y / N	■	Y / N
Bus pads with curb extension and shelters	■	Y / N	☐	Y / N		Y / N		Y / N
Stormwater Best Management Practices (Green Solutions)	■	Y / N	■	Y / N	■	Y / N	■	Y / N

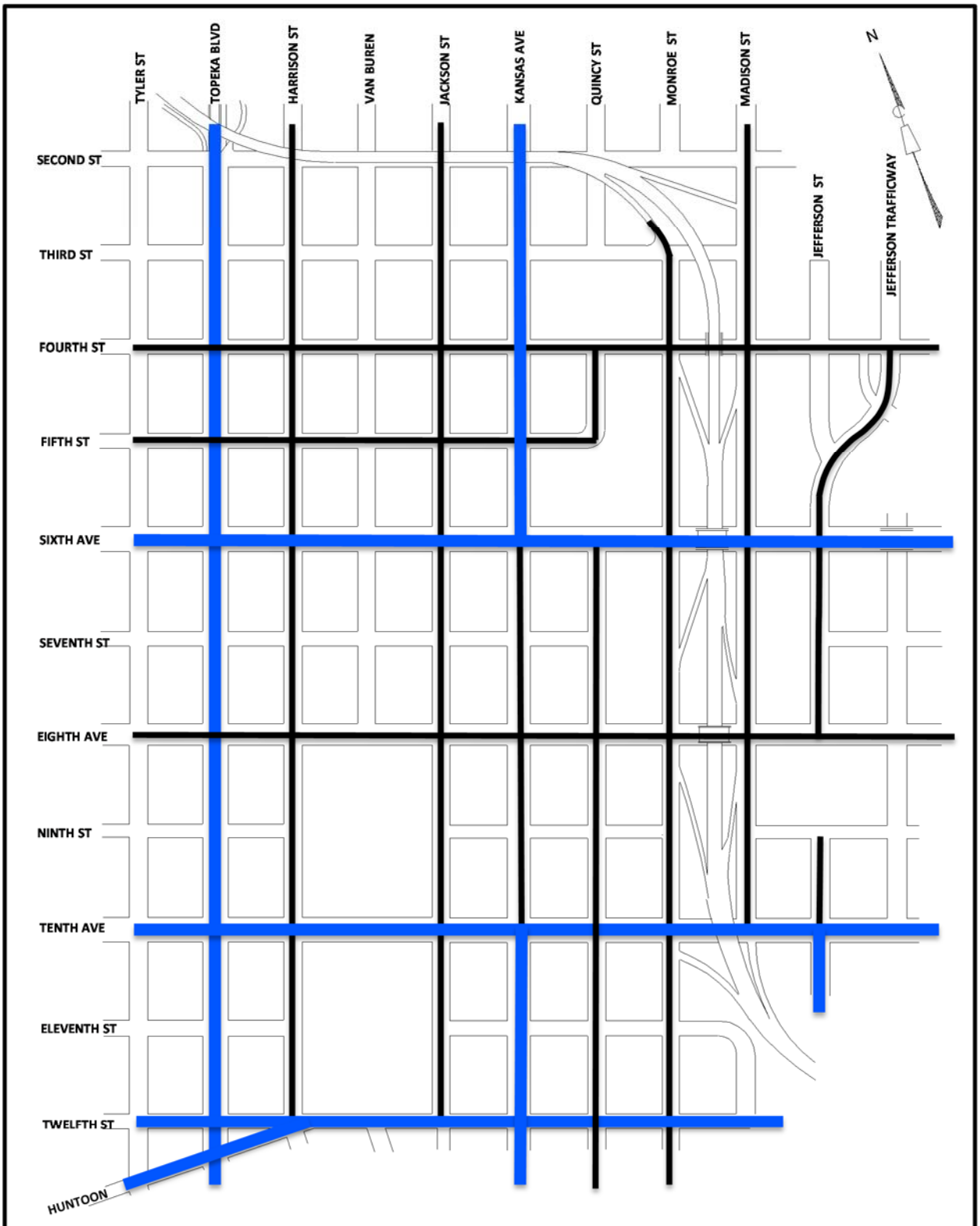


FIGURE 23
Complete Street Map

SUMMARY AND RECOMMENDATIONS

The purposes of the Downtown Circulation Study Update were to update the City's traffic model of the CBD for evaluation of current traffic conditions in the CBD and to identify potential traffic impacts that could result from the following: (a) future land use and development changes in the CBD, (b) Capital District Project of changing the typical street section on Kansas Avenue and on 8th Street, and (c) change of CBD access to I-70.

Working in partnership with the City staff, the consultant updated the City's traffic model. Based on a comparison of the 2011 and 1998 traffic count data, the overall traffic volume in the CBD has declined by 13 percent during the morning peak hour, 7 percent during the mid-day peak hour, and 7 percent during the afternoon peak hour.

The results of the analysis of the existing CBD traffic operation indicate that all the signalized intersections are operating at an acceptable level of service.

City staff provided a land use inventory that was used to project future (year 2030) trip generation within the CBD. Based on this future trip generation, system-wide percentage growth was determined as follows: 13.6 percent growth during the morning peak hour, 14.1 percent during the mid-day peak hour, and 13.1 percent during the afternoon peak hour. This system-wide percentage traffic growth was applied to the existing intersection turning movements to derive the year 2030 turning movements.

Impacts of increased future CBD traffic and the planned future changes to the CBD access and to typical sections of 8th Street and Kansas Avenue were evaluated. The results of capacity analysis indicate some decline in level of service for some turning movements at intersections along 6th Avenue and 10th Avenue. The intersection of 4th Street and Kansas Avenue would also experience decline in level of service. Increased traffic on the proposed one-way pair of Monroe and Madison Streets would also experience decline in level of service. However, these intersections would still be operating at an acceptable overall level of service.

The reduced capacity on portion of 8th Street and on portion of Kansas Avenue would cause some traffic backups particularly during the busy mid-day peak hour and during the evening rush hour.

Recommendations to improve traffic operation include periodic retiming of the signals to accommodate changes in traffic volumes over time.

APPENDIX

APPENDIX A

2011 PEAK HOUR TURNING MOVEMENTS

APPENDIX B

2011 - 24-HOUR TRAFFIC COUNTS AT SELECT LOCATIONS

APPENDIX C

AM PEAK LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX D

AM PEAK LEVEL OF SERVICE & QUEUING RESULTS UNSIGNALIZED INTERSECTIONS

APPENDIX E

NOON PEAK LEVEL OF SERVICE & QUEUING RESULTS SIGNALIZED INTERSECTIONS

APPENDIX F

NOON PEAK LEVEL OF SERVICE & QUEUING RESULTS UNSIGNALIZED INTERSECTIONS

APPENDIX G

PM PEAK LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX H

PM PEAK LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS

APPENDIX I

AM PEAK SCENARIO 1
LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX J

AM PEAK SCENARIO 1
LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS

APPENDIX K

AM PEAK SCENARIO 2
LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX L

AM PEAK SCENARIO 2
LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS

APPENDIX M

AM PEAK SCENARIO 3
LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX N

AM PEAK SCENARIO 3
LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS

APPENDIX O

AM PEAK SCENARIO 4
LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX P

AM PEAK SCENARIO 4
LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS

APPENDIX Q

AM PEAK SCENARIO 5
LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX R

AM PEAK SCENARIO 5
LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS

APPENDIX S

AM PEAK SCENARIO 6
LEVEL OF SERVICE & QUEUING RESULTS
SIGNALIZED INTERSECTIONS

APPENDIX T

AM PEAK SCENARIO 6
LEVEL OF SERVICE & QUEUING RESULTS
UNSIGNALIZED INTERSECTIONS