



K-7/223rd Street Area Transportation Plan

Columbia Road to Victory Road

K-7 Corridor Management Plan, Task Order #24

KDOT Project No. 7-106 K-7925-03

Prepared for the
Kansas Department of Transportation
City of Spring Hill, Kansas
Miami County, Kansas



HNTB

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Acknowledgements

The K-7/223rd St. Area Transportation Plan was developed through a collaborative process involving a number of key participants. Key staff involved in this plan included:

Kansas Department of Transportation

David Gurss, Corridor Planning Manager
Wayne Gudmonson, District Engineer
Hugh Bogle, Area Engineer
Dave Schwartz, Models and Forecasting Manager

City of Spring Hill

Jim Hendershot, Community Development Director

Miami County

Shane Krull, County Administrator

HNTB Corporation

Phil Eilers, Project Manager
Kip Strauss, Transportation Planning Manager
Jared Miller, Traffic Engineering
David Green, Design Engineer

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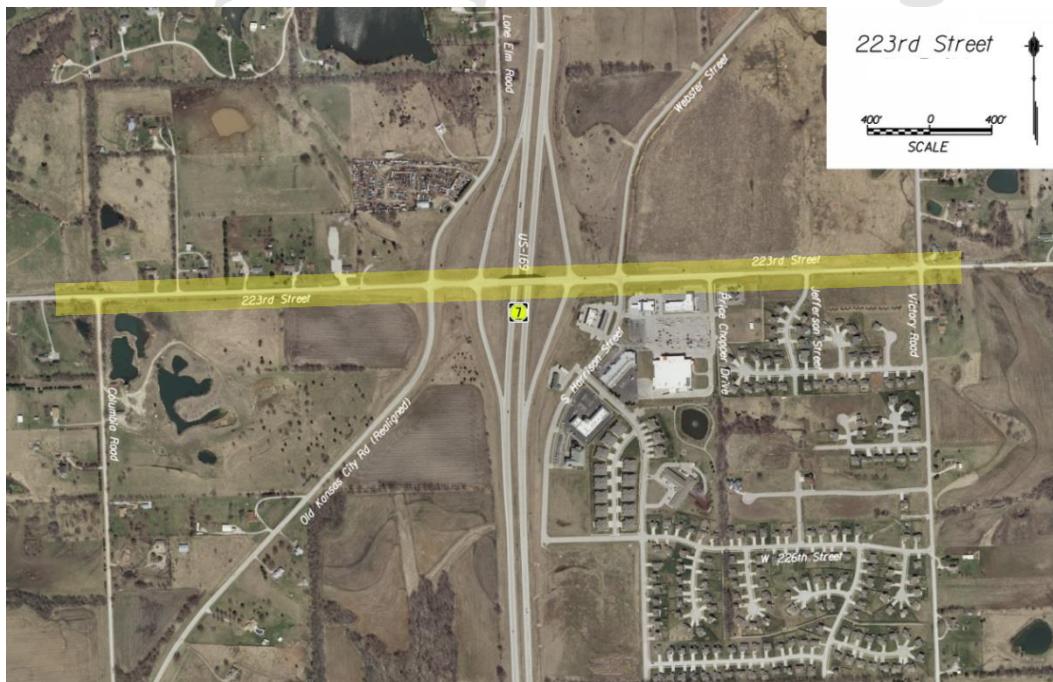
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Purpose

KDOT's partnership with local communities in the planning of transportation decision-making in the K-7 corridor has continued since the K-7 Corridor Management Plan was completed in 2007. In 2014, KDOT partnered with the City of Spring Hill and Miami County to develop an area transportation plan for 223rd Street from Columbia Road to Victory Road in Spring Hill, KS, as shown in Figure 1. This area plan will be a supplement to the K-7 Corridor Management Plan. The plan was needed as a result of increased planned and committed development in the corridor. The goal of the study was to develop an area transportation plan that addressed the following needs:

- Congestion/mobility/efficiency
- Access
- Pedestrian and traffic safety
- Ultimate and phased roadway improvements

Figure 1
223rd Street Corridor
Columbia Road to Victory Road



Source: HNTB

Approach / Methodology

The K-7/223rd Street Area Transportation Plan was performed in two phases - **Phase 1 Initial Alternatives** and **Phase 2 Reasonable Alternatives**. The following section describes the approach and methodology used in each phase.

Phase 1 Initial Alternatives

The first task the study team performed was to review the previous studies performed in the corridor. Nine previous studies are summarized in Appendix A. Based on the previous studies and discussions with the core study team, a range of initial potential corridor improvements was developed. The design year for the facility was assumed to be the year 2040. The alternatives were qualitatively evaluated based on a range of factors:

- Construction Cost
- Phasing Flexibility
- ROW/Property Impacts
- Motorist Safety
- Traffic Operations
- Pedestrian Connectivity/Safety
- Ease of Local Access

Based on the qualitative rating, two reasonable alternatives were identified by the study team to be evaluated in more detail in Phase 2.

Phase 2 Reasonable Alternatives

2040 PM peak hour traffic volumes were developed for Phase 2. The design year traffic volumes were developed by growing 2030 traffic forecasts from the *223rd Street Corridor Improvements Study, February 1, 2007*, to 2040. The City was consulted as to changes in land use along the corridor from the 2007 study. The following modifications were made:

1. Increased volumes 0.5% per year from 2030 to 2040
2. Added additional vehicle trips based on land use changes
 - a. Add Phase 2, 228 unit multi-family 7 buildings, starting in Spring 2015 (south of Harrison)
 - b. Residential on west side. Remove 80 units residential. Add light industrial, 750,000 sq. ft.
 - c. NE corner of Victory and 223rd Street
 - i. 90% should be R1 residential with 9,000 sq. ft. lots
 - ii. 10% should be light commercial with 0.2 FAR. Located in SW corner of parcel
3. Modified assignments based on variations of access for each alternative

Once the new traffic forecast for 2040 was generated, traffic was assigned to the proposed roadway network. The traffic operations of both reasonable alternatives were analyzed using VISSIM micro-simulation software. Although an existing model of the 223rd Street corridor was not calibrated, the two future models were built so they could be compared to each other.

Interim improvements were developed for the corridor and evaluated as to the timing of interim and ultimate needs based on “triggers”. Triggers are when thresholds are exceeded for safe and efficient operations. Triggers were developed for mainline arterial capacity and signalization of intersections.

Phase 1 Initial Alternatives

After reviewing the previous studies performed in the corridor and discussing with the study team the purpose and need for improvements in the corridor, 10 initial alternatives plus a No-Build alternative were developed. The 10 alternatives are shown in Table 1. Each of the 10 alternatives had a concept exhibit developed. The concepts are shown in the Appendix B. A qualitative screening of the 10 alternatives and the No-Build alternative was performed and is shown in Table 2.

Table 1
Initial Alternatives

Alternative No.	Alternative Name	Description
	No Build	No change to existing conditions
1	Wilson Option #1	Stop Controlled @ Harrison, Signalized at Price Chopper Drive/Webster Street Realigned
2	Wilson Option #2	Signalized @ Harrison and Price Chopper Drive/Webster Street Realigned
3	Wilson Option #3	3/4 Access @ Harrison, Signalized at Price Chopper Drive/Webster Street Realigned
4	Wilson Option #4	3/4 Access @ Harrison, Roundabout at Price Chopper Drive/Webster Street Realigned
5	Michigan Left Turn	3/4 Access @ Harrison, Michigan U-Turn at Price Chopper Drive
6	Price Chopper Front Access	3/4 Access @ Harrison, Public Street North of Price to Chopper
7	Jefferson Street Extension	3/4 Access @ Harrison, Connect Jefferson St. from 225th Terr. To 224th St.
8	South of Blackhawk Road	3/4 Access @ Harrison, Construct East/West street south of Blackhawk to Victory Rd.
9	Roundabouts at Ramp Terminals	Northbound Access to Roundabout at Ramp Terminal
10	Oval Roundabout at East Terminal	Oval Roundabout combining ramps and Harrison

Source: HNTB

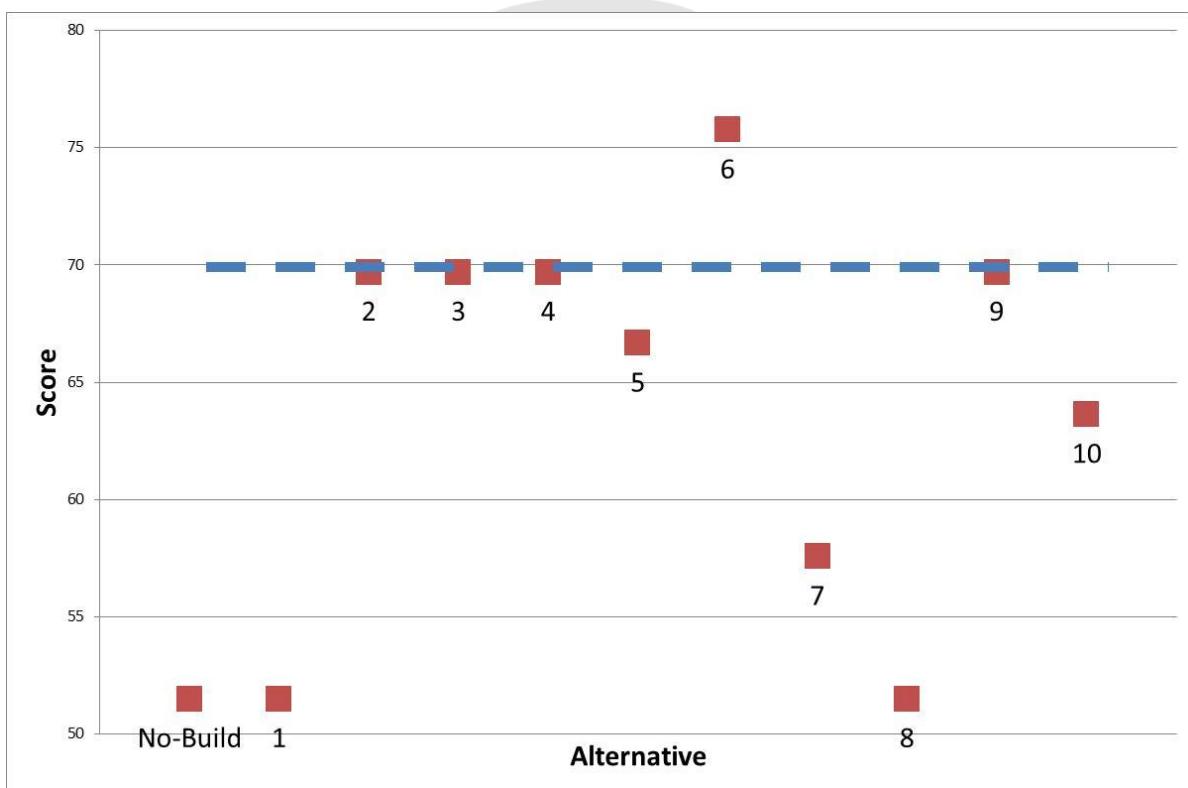
Table 2
Initial Alternatives Evaluation Matrix
K-7 and 223rd Street Corridor (Columbia Road to Victory Road)
2040 Conditions

Option Name	Build Option Number	Description	Evaluation Factor							Score (Out of 100)	Pros & Cons	Recommended Option	
			Construction Cost	Phasing Flexibility	ROW/Property Impacts	Motorist Safety	Traffic Operations	Pedestrian Connectivity/Safety	Ease of Local Access				
Weight			2	1	1	2	2	1	2				
No Build			●	○	●	○	○	○	○	52	Pros - - Cost - no costs - ROW Impacts - no ROW needed	Cons - - Safety - uncontrolled traffic and safety conflict pts. - Traffic Operations - severe corridor congestion - Pedestrian Connectivity/Safety - no sidewalks, no traffic/pedestrian control - Ease of local access - difficult to access businesses	
Wilson Option #1	1	Stop Controlled @ Harrison, Signalized at Price Chopper Drive/Webster Street Realigned	○	○	●	○	○	○	●	52	Pros - - Costs - Moderate construction costs - Ease of local access - Full access to Harrison during non-peak times is good - ROW - Standard ROW for 4-lane divided	Cons - - Safety - uncontrolled conflict pts. at Harrison - Traffic Operations - No alt. options for Harrison thoughts and lefts. Severe congestion at Harrison affecting the corridor. - Pedestrian Connectivity/Safety - difficult to cross Harrison. - Ease of local access - Difficult to access businesses on Harrison because of stop control	
Wilson Option #2	2	Signalized @ Harrison and Price Chopper Drive/Webster Street Realigned	○	○	●	○	○	●	●	70	Pros - - Costs - Moderate construction costs - ROW - Standard ROW for 4-lane divided - Safety - all conflict points are controlled with a signal - Pedestrian Connectivity/Safety - ped control at all intersections - Ease of local access - full access is available but may be difficult at peak hours	Cons - - Safety - closely spaced intersections to interchange may increase accidents. - Traffic Operations - closely spaced intersections to interchange may create high congestion in the corridor	
Wilson Option #3	3	3/4 Access @ Harrison, Signalized at Price Chopper Drive/Webster Street Realigned	○	○	●	○	○	●	●	70	Pros - - Costs - Moderate construction costs - ROW - Standard ROW for 4-lane divided - Safety - restricted turns at Harrison improves safety - Traffic Operations - Improved at Harrison	Cons - - Safety - heavy U-turns at Price Chopper Dr. - Traffic Operations - heavy U-turns at Price Chopper Dr. - Pedestrian Connectivity/Safety - lack of control for pedestrians crossing at Harrison - Ease of local access - restricts some movements to and from Harrison	
Wilson Option #4	4	3/4 Access @ Harrison, Roundabout at Price Chopper Drive/Webster Street Realigned	○	○	○	●	○	○	●	70	Pros - - Costs - Moderate construction costs - Phasing - can construct interim phase with 3/4 access at Harrison and roundabout at Price Chopper Drive - Safety - restricted turns at Harrison improves safety - Traffic Operations - Improved at Harrison	Cons - - ROW - Additional ROW needed for Roundabout - Safety - heavy U-turns at Price Chopper Dr. - Traffic Operations - heavy U-turns at Price Chopper Dr. - Pedestrian Connectivity/Safety - lack of control for pedestrians crossing at Harrison. Roundabouts can be more difficult for pedestrians. - Ease of local access - restricts some movements to and from Harrison	
Michigan Left Turn	5	3/4 Access @ Harrison, Michigan U-Turn at Price Chopper Drive	○	○	○	○	○	○	●	67	Pros - - Costs - Moderate construction costs - Phasing - can construct interim phase with 3/4 access at Harrison and Michigan Left Turn at Price Chopper Drive - Safety - restricted turns at Harrison improves safety - Traffic Operations - Improved at Harrison	Cons - - ROW - Additional ROW needed for U-Turn - Safety - heavy U-turns at Michigan left - Traffic Operations - motorist understanding of Michigan left turn - Pedestrian Connectivity/Safety - lack of control for pedestrians crossing at Harrison. - Ease of local access - restricts some movements to and from Harrison	
Price Chopper Front Access	6	3/4 Access @ Harrison, Public Street North of Price to Chopper	○	●	○	●	●	●	●	76	Pros - - Phasing - can construct interim phase with 3/4 access at Harrison and Price Chopper Front Access - Safety - relocates restricted traffic from Harrison to Price Chopper Dr. - Traffic Operations - relocates restricted traffic from Harrison to Price Chopper Dr. for improved corridor operations - Ease of local access - only minor out of direction travel for some businesses	Cons - - Costs - high construction cost - ROW - ROW impacts for street connection between Harrison & Price Chopper Drive - Pedestrian Connectivity/Safety - lack of control for pedestrians crossing at Harrison.	
Jefferson Street Extension	7	3/4 Access @ Harrison, Connect Jefferson St. from 225th Terr. To 224th St.	○	○	○	●	○	●	●	58	Pros - - Safety - relocates restricted traffic from Harrison to Jefferson St. - Traffic Operations - relocates restricted traffic from Harrison to Jefferson St. for improved corridor operations	Cons - - Costs - high construction cost - Traffic Operations - out of direction travel for Harrison motorists - Pedestrian Connectivity/Safety - lack of control for pedestrians crossing at Harrison. - Ease of local access - increased out of direction travel for some businesses	
South of Blackhawk Road	8	3/4 Access @ Harrison, Construct East/West street south of Blackhawk to Victory Rd.	○	○	○	●	○	●	○	52	Pros - - Safety - relocates restricted traffic from Harrison to Blackhawk Rd. - Traffic Operations - relocates restricted traffic from Harrison to Blackhawk Rd. for improved corridor operations	Cons - - Costs - high construction cost - Traffic Operations - out of direction travel for Harrison motorists - Pedestrian Connectivity/Safety - lack of control for pedestrians crossing at Harrison. - Ease of local access - increased out of direction travel for some businesses	
Roundabouts at Ramp Terminals	9	Northbound Access to Roundabout at Ramp Terminal	○	○	○	●	○	●	●	70	Pros - - Safety - roundabouts provide higher safety record than signalized intersections. - Traffic Operations - Harrison motorists can now exit to K-7 in an efficient manner. - Ease of local access - Provides the highest degree of access to the S.W. quadrant of K-7 and 223r d.	Cons - - ROW - impacts to gas station - Costs - high construction cost - Traffic Operations - Harrison motorists enter and exit at different locations. roundabout operations have not been tested. Two lane roundabouts are not as prevalent in metro area.	
Oval Roundabout at East Terminal	10	Oval Roundabout combining ramps and Harrison	○	○	○	●	○	●	●	64	Pros - - Safety - roundabouts provide higher safety record than signalized intersections. - Traffic Operations - Harrison motorists can now exit to K-7 in an efficient manner. - Ease of local access - Provides the highest degree of access to the S.W. quadrant of K-7 and 223r d.	Cons - - ROW - impacts to gas station - Costs - high construction cost - Traffic Operations - Harrison motorists enter and exit at different locations. roundabout operations have not been tested. Two lane roundabouts are not as prevalent in metro area. - Safety - driveway access on the SE leg of the roundabout could be a safety hazard.	

 Best
  Average
  Worst

The Phase 1 evaluation is summarized in Figure 2. As shown, five of the 9 alternatives had a score of 70 or better. The five alternatives that had a 70 score or better were 2, 3, 4, 6 and 9. These alternatives were discussed by the core team in detail and are summarized in Table 3.

Figure 2
Summary of Phase 1 Evaluation



Source: HNTB

Table 3
Summary of Highest Rated Initial Alternatives

Alternative	Discussion Summary
No-Build	This alternative provides the lowest cost and ROW impact but performed the worst in all other evaluation factors. This alternative would not meet the purpose and need of the project for a safe and efficient corridor for mobility of all users. This alternative was ultimately removed from further consideration.
Alternative 2 , Wilson Option #2, Signalized @ Harrison and Price Chopper Drive/Webster Street Realigned Score = 70	This alternative has a fatal flaw of a traffic signal at Harrison. Previous studies have indicated that this would not provide safe and efficient operations along the corridor and the study team agrees. The alternative did perform well for ROW impacts, pedestrian connectivity/safety and ease of local access but the traffic congestion and safety associated with the traffic signal at Harrison was deemed to be poor. This alternative was ultimately removed from further consideration.
Alternative 3 , Wilson Option #3, 3/4 Access @ Harrison, Signalized at Price Chopper Drive/Webster Street Realigned Score = 70	Although this alternative removes the traffic signal at Harrison and replaces it with a $\frac{3}{4}$ access, northbound Harrison motorists wanting to get to K-7 would be required to turn right at Harrison and maneuver a U-turn at the signalized intersection at Price Chopper Drive to access K-7. There are approximately 76 vehicles that would need to make these moves. KDOT also indicated that they would not be in favor of a $\frac{3}{4}$ turn at Harrison. This alternative was ultimately removed from further consideration.
Alternative 4 , Wilson Option #4, 3/4 Access @ Harrison, Roundabout at Price Chopper Drive/Webster Street Realigned Score = 70	Although this alternative removes the traffic signal at Harrison and replaces it with a $\frac{3}{4}$ access, northbound Harrison motorists wanting to get to K-7 would be required to turn right at Harrison and maneuver a U-turn at the roundabout intersection at Price Chopper Drive to access K-7. There are approximately 76 vehicles that would need to make these moves. KDOT also indicated that they would not be in favor of a $\frac{3}{4}$ turn at Harrison. This alternative was ultimately removed from further consideration.
Alternative 6 , Price Chopper Front Access, 3/4 Access @ Harrison, Public Street North of Price to Chopper Score = 76	This alternative has a $\frac{3}{4}$ access at Harrison and encourages motorists to use a new road established in the Price Chopper parking lot over to Price Chopper Drive where motorists can turn left onto 223 rd Street. This would reduce or eliminate the need for an eastbound to westbound U-turn at Price Chopper Drive. This alternative performed very well in regards to motorist safety and traffic operations and ease of local access. This alternative was advanced to Phase 2.
Alternative 9 , Roundabouts at Ramp Terminals, Northbound Access to Roundabout at Ramp Terminal Score = 70	This alternative removed the traffic signal at Harrison and establishes an extension of S. Franklin Street to connect to a roundabout at the northbound K-7 ramp terminal. This alternative performed very well in regards to motorist safety, traffic operations, pedestrian connectivity/safety and ease of local access. This alternative was advanced to Phase 2.

Note: Wilson Option refers to the 223rd Street Corridor Improvements Study, February 1, 2007, submitted by Wilson and Company

Based on the Phase 1 initial screening results, Alternatives 6 and 9 were selected by the study team to be advanced to Phase 2, Reasonable Alternatives for quantitative analysis. Some of the elements of the other alternatives were deemed to be beneficial and added to the alternatives advanced to Phase 2. These additional elements include:

- New arterial connecting Harrison Street to Victory Road south of the Blackhawk development.
- Realignment of Webster Street to connect to Price Chopper Drive, north of 223rd Street.
- Roadway network west of K-7 would be the same in both reasonable alternatives.

Phase 2 Reasonable Alternatives

Phase 1 screening identified 10 alternatives and narrowed them down to two reasonable alternatives based on a qualitative screening approach. The two reasonable alternatives were analyzed in more detail using a quantitative analysis approach.

1. Roundabouts at K-7 ramp terminals with Harrison tied into NB ramp terminal
2. Signals at K-7 ramp terminals with right-in, right-out (RIRO) at Harrison

Figure 3
Reasonable Alternative 1 – Roundabouts at K-7



Source: HNTB

Figure 4
Reasonable Alternative 2 – Signals at K-7



Source: HNTB

The two alternatives are shown in Figures 3 and 4. The primary factors that were evaluated in Phase 2 were traffic operations, safety, access, and engineering. Each is discussed below.

Traffic Operations

Traffic results of the two alternatives were developed from VISSIM micro-simulation models. The primary output results are intersection level of service (LOS) and delay along with arterial level of service and speed. Intersection LOS is shown in Table 4 and Arterial LOS is shown in Table 5. Table 6 provides a summary of the traffic operations of both alternatives.

Table 4
PM Peak Hour Intersection LOS

	Alternative 1 Roundabout	Alternative 2 Signal
Node Name	LOS (Delay)	LOS (Delay)
1: 223rd and SB K-7	F (858.1)	D (35.5)
2: 223rd and NB K-7 / Harrison	F (744.4)	C (24.7)
6: 223rd and Harrison RIRO	--	F (268.0)
3: 223rd & Price Chopper	D (41.8)	D (41.2)
4: 223rd and RIRO	A (6.8)	A (6.5)
5: 223rd & Victory	C (23.7)	B (12.5)

Source: HNTB VISSIM Model

Table 5
PM Peak Hour Arterial LOS

	Alternative 1 Roundabout	Alternative 2 Signal
Segment Name	LOS (Speed)	LOS (Speed)
EB from SB Ramp Terminal to Victory	E (17.9)	D (18.4)
WB from Victory to SB Ramp Terminal	D (18.9)	D (18.9)

Source: HNTB VISSIM Model

FF Speed = 45

Table 6
PM Peak Hour Intersection LOS Summary

Intersection	Alternative 1 Roundabouts	Alternative 2 Signals
223rd and SB K-7	Over Capacity	Under Capacity
223rd and NB K-7 / Harrison	Over Capacity	Under Capacity
223rd and Harrison RIRO	N/A	Over Capacity
223rd & Price Chopper	Under Capacity	Under Capacity
223rd and RIRO	Under Capacity	Under Capacity
223rd & Victory	Under Capacity	Under Capacity

Source: HNTB

Safety

Both vehicular and pedestrian/bicycle safety were evaluated in Phase 2. The primary indicators of safety are the number of conflict points and traffic operations. The only difference between the two alternatives is the roundabouts at the K-7 ramp terminals versus the traffic signals. Generally, roundabouts are safer for motorists with fewer and less severe crashes than traffic signals. However, due to the congestion associated with the roundabouts discussed in the previous section, the number of motorist related accidents is expected to be higher with the roundabout than the traffic signals due to the congestion.

Pedestrian safety is generally safer at a traffic signal crossing due the ability to have a pedestrian walk phase that is not present with the roundabout. Therefore, pedestrians and bicycles crossing the K-7 interchange ramp terminals would be safer with the traffic signals than the roundabouts.

As a result of the motorist and pedestrian safety summary, Alternative 2 is the safer alternative.

Access

Access to businesses is important for the corridor to be prosperous. At the same time, good access management is important to protect the investment in the corridor and maintain good operations and safety. Both alternatives have almost identical access. Alternative 1 has slightly better access because it provides an additional access point to the businesses in the southeast quadrant of the K-7 and 223rd Street Interchange.

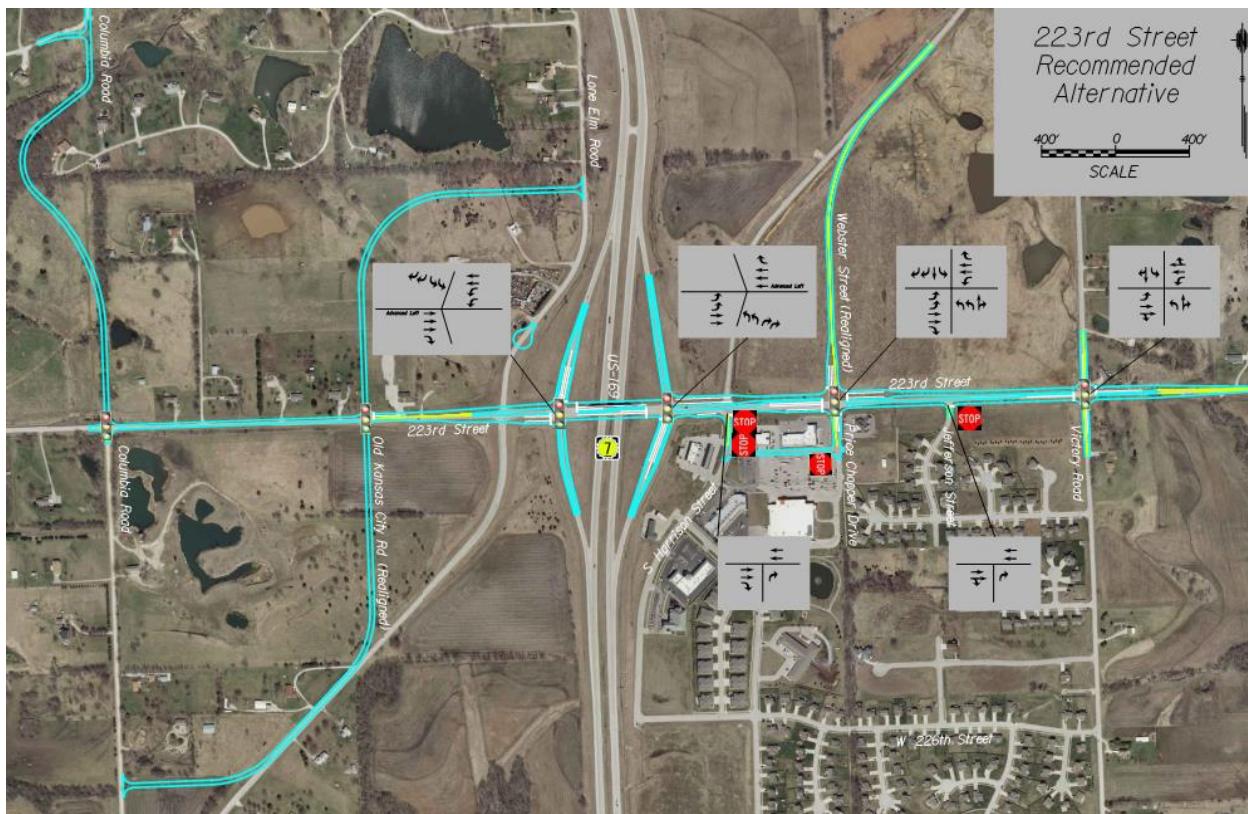
Recommendations

Based on traffic operations, safety, access and engineering, the recommended ultimate configuration for 223rd Street is Alternative 2. The 4-lane divided 223rd Street with traffic signals is the recommended alternative because it provides:

1. Superior LOS and travel time
2. Driver expectancy is high
3. Maintains access to Harrison via a RIRO and a new east/west connection between Harrison and Price Chopper Drive.
4. Provides pedestrian access via pedestrian signal phasing

The Alternative 1, roundabout did not provide an acceptable level of service even when more than a standard two lane roundabout was tested at the ramp terminals. Figure 5 provides the recommended ultimate configuration. A full size 11x17 version can be seen in the Appendix C.

Figure 5
Recommended Ultimate Configuration



Source: HNTB

Phased Implementation

As a result of the lack of existing funding to build the ultimate configuration, a phased implementation plan is necessary. The recommended ultimate configuration can be built in phases over time as the need arises. A phased implementation would build part of the ultimate configuration in the short-term and finish the ultimate configuration when traffic demand and safety warrant the improvements and funding is available. As a result of current and planned development, it is recommended to start on the east side of K-7. Future phasing would be implemented based on traffic and safety needs. An example of phased implementation from K-7 east to Victory Road is shown with the highlighted movements in Figure 6.

For example, Phase 1 might include improvements to 223rd Street from the east of the northbound K-7 ramp terminal to Price Chopper Drive. The improvements would include the new roadway connection from Harrison to Price Chopper Drive. Future improvements would be implemented as warranted by triggers.

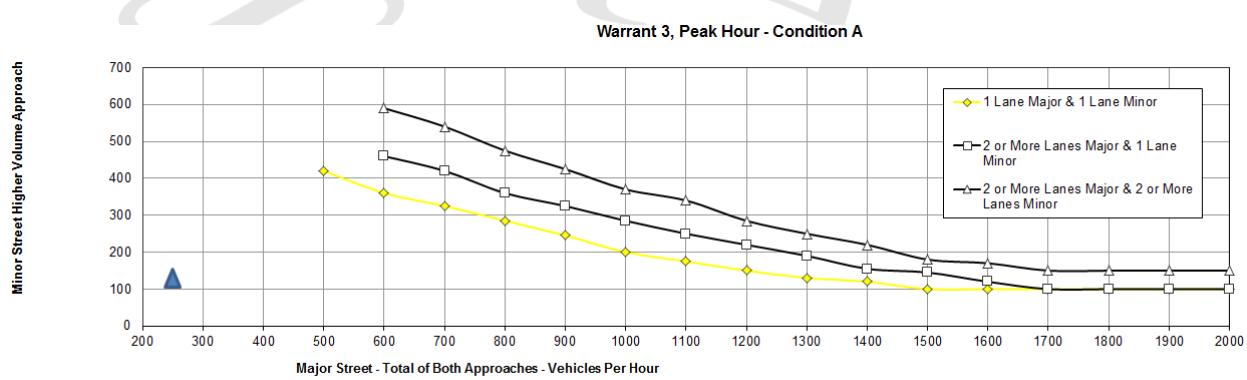
Figure 6
Example Phasing



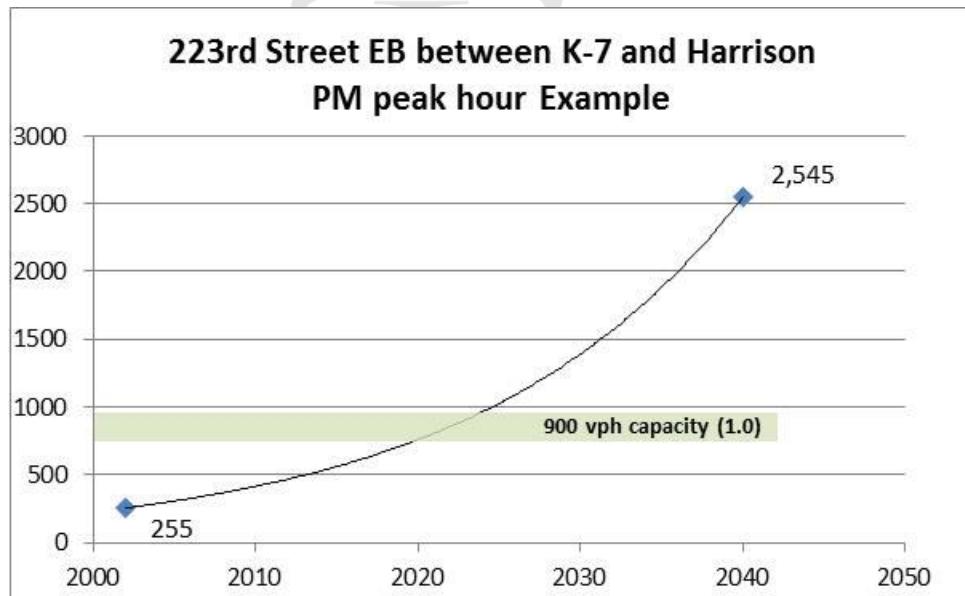
Source: HNTB

Triggers can be developed that indicate when traffic signals or roadway widening is needed in the corridor. Triggers are closely tied to development.

- **Traffic Signals** – Traffic signals are needed when they meet one of nine warrants identified in the Manual of Uniform Traffic Control Devices (MUTCD). One of the primary warrants used in the early planning stages is forecasted peak hour volumes from the major road and minor road. The triangle shows the estimated major and minor street 2015 volumes for 223rd Street and Webster Street/Price Chopper Drive. As traffic grows, the City will need to watch to see when one of the curves lines is exceeded.



- **Roadway** – Detailed peak hour operational analysis is needed to determine when roadway widening is needed. However, one of the primary methods in the early planning stages is forecasted volume compared to the capacity of the road or volume / capacity (v/c). The volume of an arterial road is approximately 900 vehicles per hour per lane (depending on signal timings along the corridor). Planning for roadway widening should occur at approximately 85% of the arterial lane capacity. The graph below shows one estimate of when capacity east of K-7 would warrant improving the corridor from two-lanes to four-lanes.



The slow growth rate is shown for illustrative purposes. Traffic growth is tied to development.

- **Right-In, Right-Out at Harrison** – As mentioned before, the ultimate configuration consists of a median on 223rd Street through the Harrison intersection, thus creating a right-in, right-out configuration on Harrison. While the ultimate necessity of the right-in, right-out is generally understood by the City, County, and neighboring stakeholders, it is desired that this current full access intersection remain as long as it functions acceptably. Whether the full access intersection can remain will be considered as interim improvements are designed and traffic analysis is performed.

Appendix

- A. Previous Studies Summary
- B. 10 Initial Alternative and No-Build Concepts
- C. Recommended Ultimate Configuration

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Appendix A

K-7/223rd Street Area Transportation Plan

Previous Studies Summary

October 17, 2014

The following section summarizes the reports and correspondence between July, 2002 and January, 2014 regarding the K-7 and 223rd Street Corridor in Spring Hill, Kansas. The documents are listed in chronological order.

1. 223rd Street Corridor Study, Columbia Road to Woodland Road

Prepared for Miami County and Kansas Department of Transportation

Prepared by TranSystems Corporation

July 23, 2002

Study Goal - The study focused on analyzing the existing and future traffic operations along 223rd Street from Columbia Road to Victory Road assuming two scenarios. The first scenario (Phase I) was currently under construction. The second scenario (full build-out) mainly assumes commercial and residential developments along 223rd Street from Columbia Road to Victory Road.

Study Conclusions – The study concluded that driveway restrictions be put in place and turn lanes be built to accommodate the traffic increase due to Phase I development.

Ultimately, the corridor will need an eight-lane bridge over U.S. 169 and a five-lane cross-section on 223rd Street.

2. Letter to Larry Winn

Prepared for Poisinelli, White, Vardemand, Shalton

Prepared by TEC

October 29, 2002

Study Goal – Assess the Blackhawk Business Center down zoning from commercial to multi-family land use.

Study Conclusions – Three areas of note from a traffic standpoint:

- The density of development that could occur today with commercial use is seven times higher than the amount of traffic generated by the multi-family housing.
- The reduction in trips for this parcel of land would only help any future considerations of how to handle the traffic at 223rd Street and Harrison.
- The street network, as currently laid out, provides for the ability of traffic from this parcel of land to proceed east to Victory or in the future to proceed east and then north to a potential new location of an intersection at 223rd Street.

3. Traffic Study, Proposed Multi-Family Units, Blackhawk Development, Spring Hill, Kansas

Prepared for Polisinelli, White, Vardeman, Shalton

Prepared by Traffic Engineering Consultants, Inc.

May 2003

Study Goal – A Master Plan Development was under construction in the southeast quadrant of US 169 and 223rd Street. A substantial number of single family units platted as part of the development are either occupied or under construction. A convenience store/gas station, oil change center, a bank and some retail space has also been developed. Parcels of land yet to be developed include a quality restaurant, a grocery store, additional retail development, a post office, a hotel and townhomes.

Parcel 1 is approximately 11.82 acres. It is currently zoned commercial. It could be constructed as either offices or a retail development center. This parcel of land serves as a buffer between US 169 and the residential area. The developer is wishing to down zone the property from office/commercial to multifamily. One hundred and eighty multi-family units are planned if the zoning is approved. The purpose of the traffic study was to analyze the effects of the down zoning on the surrounding residential area as well as the street network.

Study Conclusions – The switch to multi-family units for the proposed development is a down zoning. The multi-family units will generate less traffic. The traffic that is generated is more compatible with the surrounding residential land uses. The multi-family units also provide a buffer or step down zoning from US 169 corridor to the single residential area. The impacts of the expected traffic to be generated from the multi-family development will not adversely impact any of the surrounding street system including 226th Street.

4. Letter to Mayor and City Council

Prepared by BHC

Prepared for City of Spring Hill

July 3, 2003

Study Goal – Review Traffic Study for Proposed Multi-Family Units in Blackhawk prepared by TEC, May 2003.

Study Conclusions – The methodology, research data collection and analysis were found to comply with accepted standards of traffic engineering.

5. Project Meeting Memorandum

Prepared by BHC

Prepared for Dave Peterson, City Planner

December 22, 2005 (The letter is dated 2005 but it is summarizing a report that was completed in 2007, so the date is believed to be in error)

Study Goal – Review of the 223rd Street Corridor study completed by Wilson & Company and the traffic report completed by TEC.

Study Conclusions – The memo recommended that Option 2 or 4 in the Wilson & Company report would best serve the 223rd Street corridor in the design year 2030.

6. 223rd Street Corridor Improvements

Prepared for City of Spring Hill

Prepared by Wilson & Company

February 1, 2007

Study Goal - The purpose of this study is to verify that the future year 2030 traffic demands on 223rd Street between US-169 and Victory Road, in Spring Hill, Kansas, warrant improving 223rd Street to a four-lane, median divided arterial roadway. In addition, the study evaluated traffic operations using signalized and roundabout intersection traffic control at the 223rd Street/Price Chopper intersection, which included relocating Webster Street to the north of the intersection. As part of this analysis, an evaluation was also completed to identify the need for maintaining existing Webster Street north of 223rd Street.

Study Conclusions – Based on the future traffic forecasted from the projected land uses along the corridor, there are capacity improvements, network mobility improvements, and traffic control improvements recommended for the 223rd Street Corridor to allow for acceptable mobility and traffic operations. These improvements can be phased as development occurs. However, the timing of the improvements at realigned Webster Street and existing Webster Street must occur at the same time.

223rd Street Capacity Recommendation

The current roadway system will be insufficient in handling the capacity of future traffic in the system. The following recommendations will address the capacity issues relating to the future land uses that are projected in the area:

- Widen 223rd Street from two lanes to four lanes and include turn lanes at the intersections. This is consistent with prior recommendations from both the 223rd Street Location Study (BWR, January 2002) and the 223rd Street TEAP Study (TranSystems, July 2002).
- The bridge over US-169 needs to be widened to accommodate four through lanes and a split left turn lane for 223rd Street traffic turning left onto the interchange ramps, creating a five-lane bridge. Although the US-169 ramp intersections with

223rd Street were evaluated for 223rd Street traffic flow, an in depth study of the interchange is needed to identify a proper configuration that can maximize both the ramp and 223rd Street operations.

- Access control in the form of medians should be added through the corridor which will provide additional safety and spacing between conflicting traffic movements while providing a buffer for left turn lanes and opposing through traffic.

Network Mobility Recommendations

Having a network in place to help distribute the traffic demand on the system will allow for better traffic operations on the transportation network. The following network mobility recommendations will contribute to acceptable traffic operations:

- A three-quarter access at the Harrison Street/Webster Street intersection is needed to help distribute traffic north of 223rd Street. As a three-quarter access, the Harrison/Webster intersection allows traffic north of 223rd Street to have direct, close access to the freeway but maintains good traffic operations by not permitting left turning vehicles.
- The existing Webster Street and the realigned Webster Street must connect north of 223rd Street to properly distribute traffic.
- The Harrison Street/Webster Street intersection is recommended to be STOP sign controlled for access onto 223rd Street.
- A connection south of 223rd Street should be considered to allow for an additional way for motorists to access US-169 from Harrison Street south of the intersection.

Intersection Operational Recommendations

The projected land uses in the area, and the associated traffic volumes will create an environment requiring intersection improvements not currently seen in the City of Spring Hill. The future traffic demands will place a great amount of pressure on 223rd Street, especially between the US-169 interchange and realigned Webster Street. The following intersection operational improvements are recommended for the 223rd Street corridor:

- Signalize the realigned Webster Street intersection or provide a roundabout at realigned Webster Street/Price Chopper Drive. By providing a roundabout, it will allow motorists and trucks to make a u-turn at this intersection. A traffic signal will require some large vehicles to use another route to access US-169 from Harrison Street.

- Provide a signal or a roundabout at Victory Road to improve capacity and mobility at this intersection.
- Signalize the US-169 ramp intersections at 223rd Street to improve capacity at the intersections.
- Provide protected left-turn phasing for traffic accessing the on-ramps as well as off-ramp turning movements.
- Complete an interchange study that will identify the appropriate type of interchange based on the expected traffic demand on the interchange.
- A three-quarter access at the Harrison Street/Webster Street intersection is needed to help distribute traffic north of 223rd Street. As a three-quarter access, the Harrison/Webster intersection allows traffic north of 223rd Street to have direct, close access to the freeway but maintains good traffic operations by not permitting left turning vehicles.

7. Transportation Planning / Traffic Engineering Support Services, 223rd Street / Webster Street / Harrison Street, Signal Warrant Evaluation
Prepared for City of Spring Hill
Prepared by Wilson & Company
July 5, 2007

Study Goal - This report documents the results of the traffic control signal warrant analysis performed for the stop-controlled intersection of 223rd Street and Harrison Street/Webster Street in Spring Hill, Kansas.

Study Conclusions - The intersection of 223rd Street and Harrison/Webster does not currently warrant a traffic control signal. However, the following is recommended:

- Monitor the intersection periodically, based on development, to determine if a traffic control signal would be warranted.
- Construct a southbound to westbound right-turn lane on Webster Street.
- Provide additional street lighting at the intersection.
- Until future intersection improvements are warranted or a traffic signal is installed, the City should consider installing an intersection control beacon at this location.
- Reduce the speed limit on 223rd Street from 55 MPH to 35 MPH between US 169 and Columbia Road. This speed limit reduction will also require additional police enforcement on 223rd Street.

8. Memo
Prepared for Jim Hendershot, Community Development Director
Prepared by Olsson

January 28, 2014

Study Goal - This technical memorandum addresses a request from the City of Spring Hill, Kansas to review the update to the dwelling unit density within the Blackhawk Development located in Spring Hill, Kansas. Specifically, the original study completed by Traffic Engineering Consultants, Inc. in May of 2003 cited 180 dwelling units of multi-family residential development, and the updated plan changes the density to 228 dwelling units. A trip generation comparison was performed to examine the effects of this change on the amount of trips entering and exiting the site.

Study Conclusions - Based on the results of the trip generation comparison the proposed density is expected to experience an increase of 291 daily trips, 24 AM peak hour trips, and 27 PM peak hour trips when compared to the original density. Overall this ranges between a 23-26% increase for Daily, AM, and PM peak hours.

In the AM peak hour, 8 more trips are expected to enter the development via the east and west directions on 223rd Street turning south on to Harrison. In addition, 12 additional trips are expected to exit the development to the north on Harrison, where they will turn east or west on to 223rd Street.

In the PM peak hour, 18 more trips are expected to enter the development via the east and west directions on 223rd Street turning south on to Harrison. In addition, 12 additional trips are expected to exit the development to the north on Harrison, where they will turn east or west on to 223rd Street.

Overall, this increase in trips due to the increase in land use density will have a negligible effect on traffic operations at the study intersection of 223rd Street and Harrison.

To conclude that the proposed multi-family land use in the study area would result in less traffic than office or retail land uses is reasonable and logical based on the results of the study. Any perceived adverse traffic impacts should not be a significant issue in consideration of this proposed down zoning.

9. Blackhawk Development Trip Generation Comparison Letter

Prepared for Jim Hendershot, Planning and Development Director

Prepared by BHC Rhodes

January 31, 2014

Study Goal – BHC Rhodes reviewed the following exhibits:

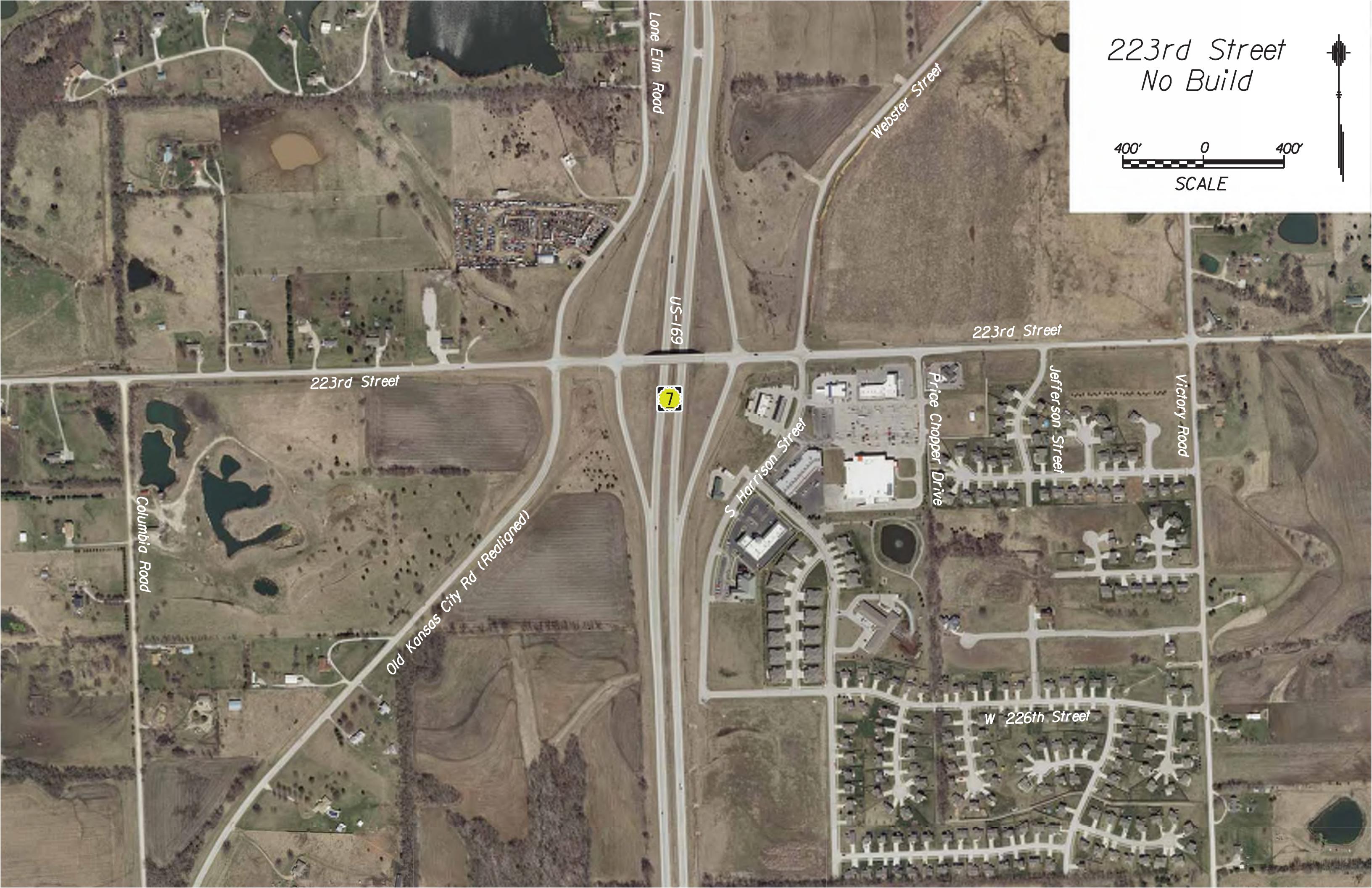
- 223rd Street Corridor Study -Columbia Road to Woodland Road dated July 23, 2002, submitted by TranSystems Corporation of Kansas City, MO
- Trip Generation letter dated October 29, 2002, submitted by Traffic Engineering Consultants, Inc. (TEC) of Oklahoma City, OK

- Traffic Study dated May 2003, submitted by TEC of Oklahoma City, OK
- Trip Generation Comparison memorandum dated January 28, 2014, submitted by Olsson Associates

Study Conclusions - The information submitted in the Olsson memorandum is well thought out and appropriate for the conditions described. I offer concurrence that the change in land use from office/commercial to apartments would decrease the anticipated impact to the surrounding street network.

Appendix B:

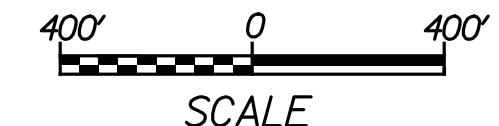
10 Initial Alternative and No-Build Concepts



223rd Street
No Build

400' 0 400'
SCALE

223rd Street Option 1



223rd Street Option 2

NE

400' 0 400'
SCALE

Location of future street network west of K-7 is conceptual and will be determined as development occurs.



223rd Street Option 3

400' 0 400'

SCALE



223rd Street Option 4

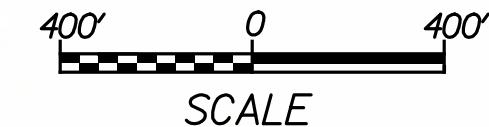


400' 0 400'

SCALE



223rd Street Option 5



223rd Street Option 6

400' 0 400'
SCALE

Location of future street network west of K-7 is conceptual and will be determined as development occurs.



223rd Street Option 7



400' 0 400'

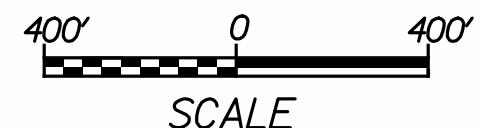
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Location of future street network west of K-7 is conceptual and will be determined as development occurs.

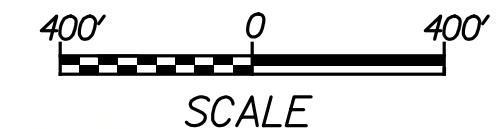


Location of future street network west of K-7 is conceptual and will be determined as development occurs.

223rd Street Option 8



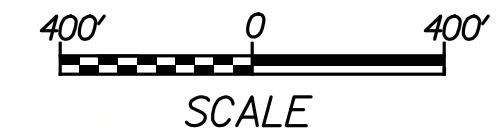
223rd Street Option 9



Location of future street network west of K-7 is conceptual and will be determined as development occurs.



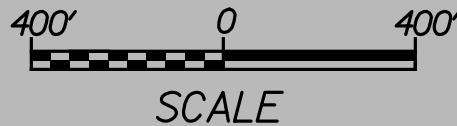
223rd Street
Option 10



Appendix C:

Recommended Ultimate Configuration

223rd Street Recommended Alternative



Location of future street network west of K-7 is conceptual and will be determined as development occurs.

