KANSAS TRAFFIC ENGINEERING ASSISTANCE PROGRAM

INTERSECTION ANALYSES

Woodlawn Boulevard and 53rd Street North
Rock Road and 53rd Street North

Prepared for

CITY OF BEL AIRE

By

TranSystems

EXPERIENCE | Transportation

August 2021

TranSystems
2400 Pershing Road
Suite 400
Kansas City, MO 64108
Tel 816 329 8600
Fax 816 329 8601
www.transystems.com

August 31, 2021

Ms. Anne Stephens, PE
Public Works Director/City Engineer
7651 E. Central Park Avenue
Bel Aire, KS 67226

Re: Intersection Analyses
Woodlawn Boulevard and 53rd Street North
Rock Road and 53rd Street North

Dear Ms. Stephens:

In accordance with your request, TranSystems has prepared the following analyses for the above noted intersections in Bel Aire, Kansas. In general, the focus of the analyses was to review the existing conditions at these locations and evaluate the need for intersection control modifications to enhance safety. Our data collection efforts, results, and recommendations are summarized in the attached report.

We trust that this study has adequately addressed the concerns of the city. The Kansas Department of Transportation is interested in learning whether this study proves to be useful to you and whether the recommendations will be or have been implemented. A questionnaire for the county's use has been included in the Appendix (Page A-24). Please send any comments to the Bureau of Local Projects by using the postage-paid, return envelope included with this report; or, you can e-mail it to them at KDOT.LPePlans@ks.gov

We have appreciated this opportunity to be of service to the Kansas Department of Transportation and the City of Bel Aire. We will be available to review this study with you at your convenience.

Sincerely,

TranSystems

By: _____
Chris Roberts, PE

By: _____
James J. Stanek, PE, PTOE

JJS:CSR:csr:P101210079

Introduction

TranSystems Corporation has prepared the following intersection analyses for two (2) intersections in Bel Aire, Kansas: Woodlawn Boulevard and 53rd Street North; and, Rock Road and 53rd Street North. In general, the focus of the analyses was to review the existing conditions at these locations and evaluate the need for intersection control modifications to enhance safety. A map showing the location of the study intersections and the surrounding area is shown on Figure 1. The study was requested by Ms. Anne Stephens, PE, Bel Aire Public Works Director/City Engineer, under the Traffic Engineering Assistance Program (TEAP), administered by the Kansas Department of Transportation (KDOT).

Study Purpose

Woodlawn Boulevard, Rock Road and 53rd Street North are section line arterial roadways that form part of the major road system in Bel Aire and the surrounding area. Woodlawn Boulevard and Rock Road are north/south routes while 53rd Street North follows an east/west alignment. Each road has a two-lane rural type cross section (no curb & gutter), and left-turn lanes are provided on the east legs of the study intersections (north/south traffic is uninterrupted). Both of the intersections operate under two-way stop control, with drivers on 53rd Street North required to stop. The intersections are located in a somewhat rural setting on the north side of Bel Aire. While there are some neighborhoods in the vicinity, the land near the intersections is mostly undeveloped. Both intersections are located near schools and experience school related traffic patterns. Isely Traditional Magnet Elementary School is located in the southeast quadrant of the Woodlawn Boulevard and 53rd Street North intersection, with driveways located on both roads. Northeast Magnet High School is located northeast of the Rock Road and 53rd Street North intersection and is accessed via Lycee Street.

Due to an increase in crashes in recent years, the city has expressed safety concerns given the higher speed traffic on the uncontrolled approaches of the intersections and their proximity to the nearby schools. The city has suggested that crashes occur for a variety of reasons, such as drivers violating the stop sign control, offset through lane approaches, or sight distance limitations. The city has requested a review of the existing traffic patterns and intersection conditions to determine whether geometric modifications or other improvements should be considered to enhance safety and operations. They have also asked whether the speed limit on Rock Road between 53rd Street North and Lycee Street should be reduced from 55 m.p.h. to 45 m.p.h. Recommendations could include changes to the existing intersection control, geometric improvements, or modifications to the existing signing and pavement markings.

Scope of Study

The following program was developed to complete the analyses:

1. Obtain 24-hour traffic volume counts on the study intersection approaches over a typical weekday using machine traffic volume counters.
2. Conduct manual traffic volume counts at the study intersections during typical weekday morning and afternoon peak periods.
3. Conduct spot speed studies on each of the study intersection approaches.
4. Review intersection sight distances at both intersections based on criteria identified in *A Policy on Geometric Design of Highways and Streets* (2018 Edition, also referred to as the AASHTO Green Book) published by the American Association of State Highway and Transportation Officials (AASHTO).
5. Review recent crash experience for the study intersections.
6. Analyze the data that were collected to address specific concerns expressed by the city at each intersection. Assess whether other measures, such as geometric modifications, sight line improvements or changes to the existing traffic control devices may be appropriate to address identified or observed deficiencies.
7. Prepare a report documenting our data collection, analyses and recommendations.

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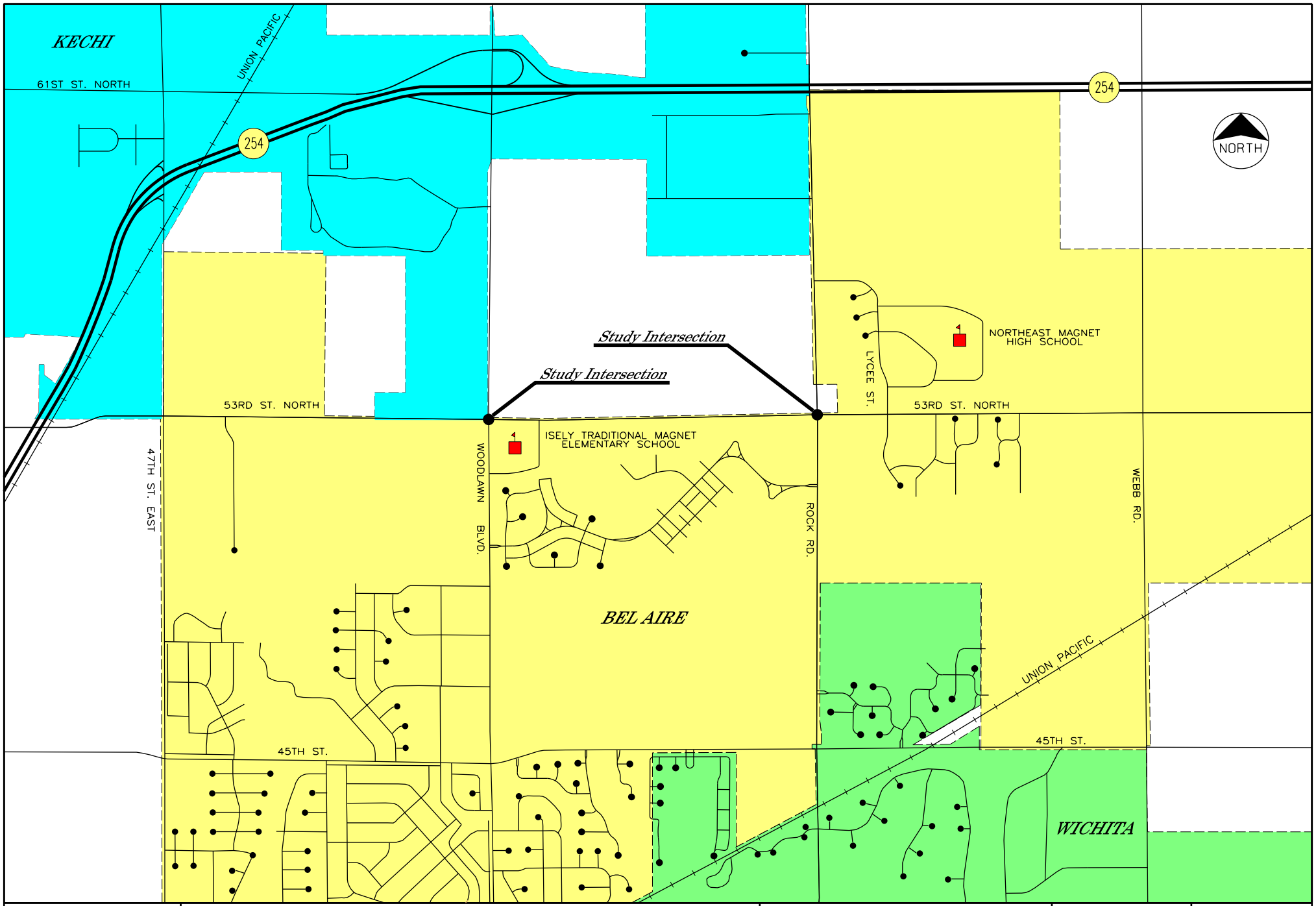

TranSystems	LOCATION MAP	Intersection Analyses Bel Aire, Kansas	August 2021 No Scale	Figure 1

Data Collection

Data collection for this study and the methods used in its collection conform to current *Manual on Uniform Traffic Control Devices* (MUTCD) guidelines and recognized traffic engineering data collection procedures of the Institute of Transportation Engineers (ITE). The MUTCD is the Federal Highway Administration (FHWA) reference adopted as the standard governing the use of traffic control devices in the State of Kansas.

Intersection Characteristics

An aerial image of the study area has been included in the Appendix (Figure A-1). Some pertinent characteristics of the intersections recorded at the time of the site investigation are listed below.

Woodlawn Boulevard and 53rd Street North

- Woodlawn Boulevard has 12-foot lanes and approximately five (5) feet of paved shoulder in both directions, while 53rd Street North has 10-foot lanes and approximately one (1) foot of paved shoulder in both directions. In advance of the intersection, the east leg of 53rd Street North is widened to add a left-turn lane. Since there is no left-turn lane on the west leg, the through lanes for eastbound drivers are offset by approximately ten (10) feet.
- The horizontal and vertical alignments of both roads can generally be characterized as straight and level. The intersection area is relatively flat and free of fixed objects. Foreslopes along the intersection approaches are fairly mild, though steeper slopes exist along the west leg of the intersection.

- Both roadways are marked with center lines and edge lines. A stop line is in place on the east leg, but not the west leg. At the time of data collection (March of 2021), the stop line and left-turn lane markings on the east leg were mostly faded. The Stop (MUTCD No. R1-1) signs currently in use on 53rd Street North have a 30" x 30" size for single-lane conventional roads. A Stop Ahead (MUTCD No. W3-1, 30" x 30" size) sign is posted for both stopped approaches. The posted speed limit on Woodlawn Boulevard is 55 m.p.h. north of the intersection, and 40 m.p.h. south of the intersection. The posted speed limit on both 53rd Street North intersection approaches is 40 m.p.h. Neither road has a reduced school speed limit zone. All signs were found to be in good condition.

- There are two (2) driveways for the elementary school near the intersection; one is located 500 feet south of the intersection on Woodlawn Boulevard, and the other is located 750 feet to the east on 53rd Street North. Based on the school layout, it appeared that the main access to the school is via Woodlawn Boulevard.
- Continuous lighting is provided on the south and east intersection approaches, and a single luminaire is located on the northeast corner of the intersection.

Rock Road and 53rd Street North

- The characteristics of the Rock Road and 53rd Street North intersection are generally similar to those of the Woodlawn Boulevard and 53rd Street North intersection. Rock Road has 12-foot lanes and approximately three (3) feet of mild turf shoulder in both directions, while 53rd Street North has 10-foot lanes and approximately one (1) foot of paved shoulder in both directions. In advance of the intersection, the east leg of 53rd Street North is widened to add a left-turn lane. Since there is no left-turn lane on the west leg, the through lanes for eastbound drivers are offset by approximately ten (10) feet.
- The horizontal and vertical alignments of both roads can generally be characterized as straight and level. The intersection area is relatively flat and free of fixed objects. There are a few utility poles near the intersection, but they are located approximately 30 feet from the Rock Road edge of travel. Foreslopes at the intersection are fairly mild.

- Both roadways are marked with center lines and edge lines. A stop line is in place on the east leg, but not the west leg. At the time of data collection (March of 2021), the center line markings on the west leg were mostly faded. The Stop (MUTCD No. R1-1) signs currently in use on 53rd Street North have a 30" x 30" size for single lane conventional roads. A "Cross Traffic Does Not Stop" (MUTCD No. W4-4P, 24" x 12" size) sign is posted below each stop sign, and a Stop Ahead (MUTCD No. W3-1, 30" x 30" size) sign is posted for both stopped approaches as well. The posted speed on Rock Road is 55 m.p.h north of the intersection, and 45 m.p.h. south of the intersection. The posted speed limit on both 53rd Street North intersection approaches is 40 m.p.h. All signs were found to be in good condition.

- There are three (3) driveways in the vicinity, located approximately 200, 300 and 450 feet east of the intersection. The nearest driveway is for a medical office, while the other two form a loop driveway for a residence.
- Continuous street lighting is provided along all intersection approaches, and a luminaire is located on the northeast and southwest corners of the intersection.

Machine Traffic Volume Counts

TranSystems placed machine traffic volume counters on each approach to the study intersections to determine 24-hour two-way traffic flow characteristics over a typical weekday. The counters were in place between Tuesday, March 30, 2021, and Thursday, April 1, 2021. The counts were tabulated in 15-minute intervals by direction of travel and are included in the Appendix (Pages A-2 to A-9). The 24-hour traffic volumes recorded at each of the counter locations are summarized below in Table 1.

Table 1
24-Hour Approach Volumes

Location	Intersection Approach Volume				Total Volume
	NB	SB	EB	WB	
Woodlawn Boulevard and 53rd Street North	1,908	1,353	747	929	**4,937**
Rock Road and 53rd Street North	2,060	1,456	671	1,363	**5,550**

The 24-hour counts shown in Table 1 indicate moderate traffic volumes at the study intersections, with heavier volumes on the north/south routes. At Woodlawn Boulevard and 53rd Street North, north/south traffic accounts for 66 percent of the overall intersection volume, while at Rock Road and 53rd Street North, the north/south traffic accounts for 63 percent of the overall intersection volume. These findings support the current prioritization of north/south traffic at these two-way stop controlled intersections.

Manual Traffic Volume Counts

TranSystems conducted manual traffic volume counts at the study intersections during typical weekday morning and afternoon peak periods. These data were collected on Wednesday, March 31, 2021. At Woodlawn Boulevard and 53rd Street North, count times were 7:00 A.M. to 9:00 A.M. and 3:00 P.M. to 6:00 P.M. At Rock Road and 53rd Street North, count times were 7:00 A.M. to 9:00 A.M. and 2:00 P.M. to 6:00 P.M. A longer afternoon count time at this intersection was used in order to capture traffic associated with high school dismissal which occurs at 2:10 P.M. The peak hours occurred between 7:15 A.M. and 8:15 A.M. for the morning peak at both intersections, but varied for the afternoon peak (3:45 P.M. to 4:45 P.M. at Woodlawn Boulevard and 53rd Street North, 4:30 P.M. to 5:30 P.M. at Rock Road and 53rd Street North). The turning movement volumes recorded during each of the intersection peak hours are shown in the Appendix (Figure A-10). Pertinent observations recorded at the time of our counts are summarized below:

Woodlawn Boulevard and 53rd Street North

- As shown on Figure A-10, traffic volumes during the morning peak hour were heavier on Woodlawn Boulevard, particularly for through traffic. North/south traffic accounted for roughly 65% of all entering vehicles during the peak hour. On the 53rd Street North approaches, about half of the traffic turned onto Woodlawn Boulevard, most of which traveled south towards the more developed areas of Bel Aire and the Wichita metro area. Fairly low volumes of traffic on Woodlawn Boulevard turned onto 53rd Street North during the morning peak time.
- Traffic patterns during the afternoon peak hour were generally similar to those in the morning peak hour, and north/south traffic on Woodlawn Boulevard accounted for roughly 70% of all entering vehicles during the peak hour. Through traffic on Woodlawn Boulevard accounted for the highest individual volumes, though there were over twice as many vehicles on Woodlawn Boulevard that turned onto 53rd Street North during the afternoon peak hour. One noticeable increase was for northbound drivers on Woodlawn Boulevard turning right onto eastbound 53rd Street North, an increase from 10 vehicles in the morning to 76 in the afternoon. The combined traffic volumes on the 53rd Street North approaches during the peak hours were nearly identical, 158 vehicles in the morning versus 162 in the afternoon.

- Minimal delay and vehicle queuing was observed on the 53rd Street North approaches during the count periods (no more than 2-3 vehicles typically), as drivers were able to find frequent gaps in traffic on Woodlawn Boulevard to depart the intersection. A few incomplete/rolling stops were observed at random times, but all drivers on 53rd Street North were observed to recognize and react to the stop control at the intersection.
- Some longer vehicle queues were observed on 53rd Street North between Woodlawn Boulevard and the elementary school entrance (~750' east of the intersection) both before and after school as parents arrived for student drop-off and pick-up. School traffic primarily circulates in a clockwise pattern, with drivers entering via 53rd Street North and exiting via Woodlawn Boulevard. Vehicles in the queue would sometimes come to a stop as traffic at the school entrance became congested, but overall these would form and dissipate over the course of about ten (10) minutes, and they did not impact operations at the intersection with Woodlawn Boulevard. Eastbound through traffic on 53rd Street North was generally minimal during this period, but a few drivers were observed driving in the left-turn lane for westbound traffic to bypass the slow/stopped vehicles. Conditions on the school site were not documented but may be contributing to these delays. Given the relatively short duration of this congestion, on site improvements should be considered initially before more extensive geometric improvements on 53rd Street North, such as construction of a right-turn auxiliary lane for the school drive.
- Minimal pedestrian/bicyclist activity was observed at the intersection. One (1) pedestrian was observed walking along Woodlawn Boulevard during the morning count period, and one (1) bicyclist was observed on Woodlawn Boulevard during the afternoon count period.

Rock Road and 53rd Street North

- As shown on Figure A-10, traffic volumes were fairly balanced between the two roads during the morning peak hour. Combined approach volumes on Rock Road totaled 210 vehicles (about 55% of all entering vehicles), compared to 175 vehicles on the 53rd Street North approaches. Through movements were the primary traffic pattern on most intersection approaches, but turning traffic accounted for a meaningful portion of the total volume, particularly on the east/west approaches. Traffic volumes on 53rd Street North between the Rock Road and Woodlawn Boulevard intersections were similar.
- During the afternoon peak hour, traffic traveling northbound on Rock Road approximately doubled compared to the morning peak hour (102 vehicles in the morning versus 206 in the afternoon), and north/south traffic on Rock Road accounted for roughly 60% of all entering vehicles during the peak hour. Increased volumes were also recorded on the southbound and westbound approaches, although they weren't as considerable. Since the afternoon peak hour at the intersection occurred over two (2) hours after dismissal at the nearby high school, the increase in total volume is likely due to commuter traffic.
- During the morning and afternoon peak hours, little delay and vehicle queuing was observed on the 53rd Street North approaches, with only 2 – 4 vehicles typically stopped at one time. Queuing increased immediately following dismissal at the high school, partially due to the presence of school buses in the queue which required longer gaps in traffic along Rock Road in order to cross or enter the traffic stream. Even so, the traffic queues dissipated relatively quickly and drivers did not experience excessive delay.
- During the manual traffic counts, it was observed that all drivers on 53rd Street North recognized and reacted to the stop at Rock Road, but many drivers on the east leg (westbound traffic) would stop beyond the stop line or come to an incomplete/rolling stop before proceeding through the intersection.
- There was no pedestrian activity observed during the count periods, but 3 – 5 bicyclists were observed on random approaches during both the morning and afternoon counts.

Spot Speed Studies

A spot speed study is a typical method used to determine vehicle speed characteristics along a particular roadway segment. One of the more important statistics obtained from a spot speed study is the 85th percentile speed. This statistic represents the speed at which 85 percent of the observed vehicles are traveling at or below and it is generally regarded as the speed considered reasonable and appropriate by most drivers. A spot speed study was conducted to determine vehicle speeds on each of the intersection approaches using the speed recording function of the machine traffic counters. The results of the study for data collected on Wednesday, March 31, 2021, are summarized on the following page in Table 2. Relative frequency distributions for these data have also been prepared and are included in the Appendix (Pages A-11 to A-18).

Table 2
Spot Speed Study Results

Location		Posted Speed, m.p.h.	85th Percentile Speed, m.p.h.
53rd Street North	500' East of Woodlawn Blvd.	40	45.9
53rd Street North	800' West of Woodlawn Blvd.	40	48.7
Woodlawn Blvd.	700' North of 53rd Street North	55	54.8
Woodlawn Blvd.	200' South of 53rd Street North	40	45.4
53rd Street North	500' East of Rock Road	40	40.5
53rd Street North	600' West of Rock Road	40	49.8
Rock Road	600' North of 53rd Street North	55	55.3
Rock Road	300' South of 53rd Street North	45	48.5

The 85th percentile speeds shown in Table 2 indicate varying levels of motorist compliance with the posted speed limits. Driver speeds on the uncontrolled approaches of Woodlawn Boulevard and Rock Road were within five (5) m.p.h. of the posted speed, and in one location the 85th percentile speed was just below the posted speed. This suggests that the speed limits on Woodlawn Boulevard and Rock Road are appropriate for current conditions. For Rock Road, this finding is notable as the city had a question about reducing the speed limit on Rock Road between 53rd Street North and Lycee Street from 55 m.p.h. to 45 m.p.h. The above findings indicate that the current 55 m.p.h. speed limit should remain in place.

Motorist compliance with the speed limits on 53rd Street North show a larger variation. At most locations, 85th percentile speeds exceed the 40 m.p.h. posted speed by approximately 5 – 10 m.p.h. In only one location, east of Rock Road, were driver speeds consistent with the posted speed. This suggests that an increase to the posted speed on segments of 53rd Street North could be supported by the observed 85th percentile speeds. Drivers may consider the slightly higher speeds reasonable due to the rural setting, low access density and generally clear roadside along sections of 53rd Street North.

Intersection Sight Distance

Intersection sight distance is provided at intersections to allow the drivers of stopped vehicles to depart from their approach and enter or cross the major road. Intersection sight distances along Woodlawn Boulevard and Rock Road for the 53rd Street North approaches were measured in accordance with AASHTO Green Book criteria. The intersection sight distances measured for each of the approaches are shown below in Table 3.

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Table 3
Intersection Sight Distances

53rd Street North Approach	Direction Looking Along Woodlawn Boulevard	Approximate Sight Distance (feet)	
		Measured	Recommended *
Eastbound	North	>1,000	530 - 610
	South	>1,000	480 - 555
Westbound	North	>1,000	530 - 610
	South	>1,000	480 - 555
53rd Street North Approach	**Direction Looking Along Rock Road**	**Approximate Sight Distance (feet)**	
		Measured	**Recommended ***
Eastbound	North	>1,000	530 - 610
	South	>1,000	480 - 555
Westbound	North	>1,000	530 - 610
	South	>1,000	480 - 555

* Sight distance based on AASHTO criteria for the approach speed along the uncontrolled cross street. When looking north, values are shown for a 55 m.p.h. approach speed. When looking south, values are shown for a 50 m.p.h. approach speed. The lower value in the range is the sight distance for a right-turn or crossing maneuver, while the upper value is the sight distance for a left-turn maneuver.

Of note in Table 3 is that recommended sight distances are given for two approach speeds; 55 m.p.h. when looking north, and 50 m.p.h. when looking south. These speeds are used to account for the 85th percentile speed of vehicles on the north and south approaches of the intersections. While a 45 m.p.h. speed could potentially be used for the south approach at Woodlawn Boulevard and 53rd Street North based on the 85th percentile speed, 50 m.p.h. was chosen to provide a more conservative value for the recommended sight distances.

The data in Table 3 indicate that the measured intersection sight distances are well above the recommended AASHTO values (reference: Chapter 9 of the AASHTO Green Book) for all maneuvers at the study intersections. In fact, in some directions drivers on the 53rd Street north approaches can see more than twice the recommended AASHTO value for some maneuvers.

Crash Experience

Crash records for the study intersections were requested from the city of Bel Aire for the time period between January 1, 2018 and March 1, 2021. Over this 38-month time period, there were three (3) crashes at the intersection of Woodlawn Boulevard and 53rd Street North and 13 crashes at the intersection of Rock Road and 53rd Street North. An additional two (2) crash reports were provided, but they involved single vehicle lane departure crashes on Rock Road near 53rd Street North and information in the reports indicated these were not intersection related.

Woodlawn Boulevard and 53rd Street North

Three (3) crashes over the 38-month analysis period corresponds to a crash frequency of 0.95 crashes per year and a crash rate of 3.3 crashes/tmev using current traffic volume information. For reference, a typical crash rate along the Kansas state highway system is 5.0 crashes/tmev for rural intersections and 10.0 crashes/tmev for urban intersections. A summary of each of the three (3) crashes is included below:

- On August 16, 2018, at 8:35 A.M., a rear-end crash occurred on northbound Woodlawn Boulevard as a driver was waiting for southbound vehicles to pass before turning left onto 53rd Street North. The stopped driver was struck from behind by another northbound vehicle. Inattentive driving was cited as the cause of the crash. No injuries were reported.
- On February 17, 2020, at 1:32 P.M., a crash occurred when a vehicle traveling westbound on 53rd Street North turned left onto southbound Woodlawn Boulevard and collided with a northbound vehicle. Although the crash report did not identify the apparent causes for the crash, the westbound driver was issued a citation for running the stop sign. Minor injuries were reported as a result of the crash.
- On November 11, 2020, at 5:42 P.M., a crash occurred when a vehicle turning left from northbound Woodlawn Boulevard to westbound 53rd Street North collided with a motorcycle stopped on the eastbound approach. The driver stated that they did not see the motorcyclist and "cut the corner" of the eastbound lane, resulting in the crash. The motorcyclist reported minor injuries from the event.

The above findings indicate no readily apparent crash patterns at the Woodlawn Boulevard and 53rd Street North intersection. It is also encouraging that the intersection has a low crash frequency and a crash rate that is well below the typical crash rate for rural and urban intersections along the Kansas state highway system.

Rock Road and 53rd Street North

Thirteen (13) crashes over the 38-month analysis period corresponds to a crash frequency of 4.11 crashes per year and using current traffic volume information, a crash rate of 12.8 crashes/tmev. As previously noted, a typical crash rate along the Kansas state highway system is 5.0 crashes/tmev for rural intersections and 10.0 crashes/tmev for urban intersections. Using information from the crash reports that were provided, a collision diagram was prepared for the 13 intersection crashes and is included in the Appendix (Figure A-19). Some general statistics and/or patterns identified from the diagram or crash reports are summarized below:

- There were six (6) injury crashes during the analysis period and zero (0) fatalities.

- Eleven (11) of the 13 total crashes were angle collisions. Seven (7) involved a westbound driver on 53rd Street North that either failed to stop entirely (3 occurrences) or failed to yield to oncoming traffic after stopping (4 occurrences). Four (4) involved an eastbound driver on 53rd Street North, and in three (3) of these, the eastbound driver failed to stop entirely. The other two (2) crashes were left-turn collisions involving drivers on northbound Rock Road who failed to yield to southbound traffic.

- In three (3) of the angle collisions, the reports cited that drivers on 53rd Street North thought that the intersection was a multiway stop, which is why they proceeded into oncoming traffic. It is unusual to see this statement made in multiple reports, as there are signs on the 53rd Street North approaches stating "Cross Traffic Does Not Stop" posted below the stop sign. While it's not clear how long these signs have been in place, it may suggest that some drivers are confusing the intersection with others in the region with multiway stop control.

- While a few crash reports stated that drivers "did not see" oncoming vehicles on Rock Road, the reports did not indicate any physical sight line limitations, such as vegetation or vertical curvature, which could contribute to a driver's inability to identify oncoming traffic.

- Despite the intersection's proximity to a high school, there were only two (2) crashes that occurred during times around school start and dismissal. Neither of these involved high school students.

- Nearly all crashes occurred during daylight hours, with only one (1) crash occurring at nighttime. Sun glare was not reported as a factor in any of the crashes, and none occurred in hours where sun glare would have been a significant factor for the motorists involved.

- There were three (3) crashes in which the pavement was wet, though wet/icy pavement was thought to be a contributing factor in only one (1) of the crashes.

The above information indicates that the intersection of Rock Road and 53rd Street North has a moderate frequency of crashes and a crash rate that is above average when compared to the average rural or urban intersection along the state highway system in Kansas. Of primary concern is that angle collisions are the predominant type of crash at this intersection, and several have resulted in injuries. The reports for these offer limited information that might explain their occurrence; however, about half involved drivers on 53rd Street North who failed to stop entirely. It is also concerning that a few drivers confused the two-way stop sign control for multiway stop control, despite signage indicating that traffic on Rock Road is uncontrolled. These findings suggest that some other form of intersection control may be appropriate to mitigate these crashes.

Analysis

Based on the data that were collected, the intersection of Woodlawn Boulevard and 53rd Street North appears to be operating in a relatively efficient and safe manner. Minimal delay and vehicle queuing was observed on the 53rd Street North approaches, sight lines are adequate, and the crash rate is well below statewide averages. Conditions are generally similar at the intersection of Rock Road and 53rd Street North, with the exception that the intersection crash rate exceeds statewide averages and there is a frequent occurrence of angle collisions at the intersection. Angle collisions are of concern since these tend to be more severe than other crash types. At the request of the city of Bel Aire, modifications to the intersection control at both study intersections have been evaluated.

Multiway Stop Control

Multiway stop control can be useful as a safety measure at intersections where certain conditions exist, particularly where the volume of traffic on the intersecting roads is approximately equal. However, a multiway stop is the most restrictive form of intersection control since all vehicles at the intersection are required to stop, regardless of the situation, which has an adverse impact on efficiency and fuel consumption. This would be a significant change from the current conditions on Woodlawn Boulevard and Rock Road at their intersections with 53rd Street North, which have likely been uninterrupted roadways for many years, and a change to multiway stop control may be viewed by drivers as unreasonable, particularly during off-peak time periods. Unnecessary traffic control devices can lead to driver frustration, an attitude of disrespect in motorists, and may lead to violations.

When evaluating the use of multiway stop control, the MUTCD states that the following criteria should be considered in the engineering study for a multiway stop sign installation:

A. Where traffic control signals are justified, the multiway stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

B. Five (5) or more reported crashes in a 12-month period that are susceptible to correction by a multiway stop installation. Such crashes include right- and left-turn collisions as well as right-angle collisions.

C. Minimum volumes:
   1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any eight (8) hours of an average day; and
   2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same eight (8) hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but
   3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 miles per hour, the minimum vehicular volume warrants are 70 percent of the above values.

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criteria C.3 is excluded from the condition.

Woodlawn Boulevard and 53rd Street North

Based on the data collection for the Woodlawn Boulevard and 53rd Street North intersection, none of the multiway stop control criteria are fully satisfied at this time. Traffic volumes on Woodlawn Boulevard for the highest eight (8) hours average 265 vehicles per hour, with 139 vehicles per hour on 53rd Street North during the same hours. While these volumes approximately equal or exceed the thresholds established by Criteria C.3 (210 vehicles per hour on the major street, and 140 vehicles per hour on the minor street), cursory observations of delay at the intersection did not indicate an average delay exceeding 30 seconds per vehicle. Lastly, only one (1) of the three (3) crashes at the intersection would be susceptible to correction by installing a multiway stop.

While the traffic volumes at the intersection approximately satisfy the thresholds for multiway stop control, the intersection appears to operating in a satisfactory manner with the current two-way stop control at this time and there are no compelling reasons to convert it to a multiway stop. Another consideration is that the traffic flows are generally imbalanced with 66 percent of the traffic on Woodlawn Boulevard in comparison to 34 percent on 53rd Street North. Multiway stop control is typically most effective at locations where traffic volumes are relatively balanced on all approaches. If traffic volumes on 53rd Street North increase due to continued development in the vicinity, or if a correctable crash pattern forms, multiway stop control should be re-evaluated as a potential future modification to the intersection control.

Rock Road and 53rd Street North

Based on the data collected for the Rock Road and 53rd Street North intersection, Criteria B and the volume component of Criteria C.3 are satisfied. The intersection has experienced multiple 12-month periods with five (5) or more crashes susceptible to correction by the installation of multiway stop control. The intersection has an average of 245 vehicles per hour on Rock Road during the highest eight (8) hours of traffic, with 162 vehicles per hour on 53rd Street North during the same hours. While driver delay was not formally measured, cursory observations of delay at the intersection did not indicate an average delay exceeding 30 seconds per vehicle.

Multiway stop control would likely be effective in reducing the number of angle collisions occurring at the intersection of Rock Road and 53rd Street North, as studies have shown up to a 48-percent reduction in crashes when converting two-way stop control to multiway stop control. Traffic volumes are also somewhat balanced during the heaviest hours of traffic at the intersection (roughly 60 percent on Rock Road and 40 percent on 53rd Street North), and multiway stop control should enhance operations on 53rd Street North after dismissal at the nearby high school. For these reasons, multiway stop control could be used at the intersection of Rock Road and 53rd Street North. While a multiway stop would be less convenient for drivers on Rock Road, drivers are already required to stop at the adjacent section line road intersections located one (1) mile to the north and south (Kansas Highway 254 and 45th Street North, respectively).

Traffic Signal Control

The use of traffic signal control can be an effective means of assigning right-of-way to various movements at an intersection, thereby providing for the orderly movement of traffic. These devices can increase the traffic-handling capacity of an intersection while also reducing the frequency and severity of certain types of crashes, especially angle collisions. However, installing a traffic signal without proper justification can result in disadvantages as well, such as higher overall intersection delay, higher vehicle emissions, noncompliance of control, increased use of other routes to avoid the signal, and an increase in the frequency of other types of crashes, particularly rear-end collisions.

The most current version of the MUTCD outlines nine warrants that justify the need for a traffic signal. It also states that the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal. The nine warrants are listed below.

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicular Volume
- Warrant 3: Peak Hour
- Warrant 4: Pedestrian Volume
- Warrant 5: School Crossing
- Warrant 6: Coordinated Signal System
- Warrant 7: Crash Experience
- Warrant 8: Roadway Network
- Warrant 9: Intersection Near an At-Grade Rail Crossing

Woodlawn Boulevard and 53rd Street North

In evaluating each of these MUTCD warrants for the Woodlawn Boulevard and 53rd Street North intersection, we found that the intersection does not fully satisfy the requirements of any warrant at this time. Completed worksheets for the traffic signal volume warrants (Warrants 1, 2 and 3) have been included in the Appendix (Pages A-20 and A-21). Only one (1) of the eight (8) hours with the highest traffic volume totals meet the traffic volume thresholds of Warrant 1, Condition A, and no hours meet the thresholds for Warrant 1, Condition B. There are no hours that satisfy the requirements of Warrants 2 or 3. Warrants 5, 6, 8 and 9 do not apply at this location, and the intersection has not experienced the number of crashes required to satisfy Warrant 7 as identified in the MUTCD (five or more reported crashes in a 12-month period that are susceptible to correction by a traffic control signal). Based on these findings, traffic signal control is not recommended at the intersection of Woodlawn Boulevard and 53rd Street North at this time.

Rock Road and 53rd Street North

When evaluating the MUTCD warrants for traffic signal control at the Rock Road and 53rd Street North intersection, we found that the intersection does not fully satisfy the requirements of any warrant at this time. Completed worksheets for the traffic signal volume warrants (Warrants 1, 2 and 3) have been included in the Appendix (Pages A-22 and A-23). None of the eight (8) hours with the highest traffic volume totals meet the traffic volume thresholds of Warrant 1, Condition A or Condition B. Only one (1) of the required four (4) hours with the highest traffic volume totals satisfy the requirements of Warrant 2, and no hours satisfy the requirements of Warrant 3. Warrants 5, 6, 8 and 9 do not apply at this location. Warrant 7 applies, and while there is a frequency of correctible crashes that satisfies the crash experience component of the warrant, there is insufficient traffic volume to meet the Warrant 7 requirements. Based on these findings, traffic signal control is not recommended at the intersection of Rock Road and 53rd Street North at this time.

Roundabout Control

Another potential form of control for these intersections that could be implemented is roundabout control. Over the last two decades, roundabout use has grown significantly throughout the United States, especially throughout the state of Kansas, and has proven to be effective in improving both intersection safety and efficiency. Roundabouts operate by gap acceptance, in that drivers approaching the roundabout must yield to traffic already circulating within the roundabout. Yield control is much less restrictive when compared to stop control, thereby reducing delays and improving overall operations. Another design feature of roundabouts is that they slow and deflect approaching traffic. The slow speeds combined with one-way circular flow have been proven to reduce the frequency and severity of crashes at roundabout intersections, especially angle collisions. Another feature of a roundabout is the flared entry, a widening of the approach at the entry. This allows vehicles to enter the roundabout easily and it can be used to provide one or two additional roundabout entry lanes, thus increasing its capacity and improving overall performance.

Guidance for the use and design of roundabouts has been published by the state of Kansas in the document, the *Kansas Roundabout Guide*, which is intended to be a companion document to NCHRP Report 672, *Roundabouts: An Informational Guide*. These documents outline various characteristics of roundabouts and provide direction regarding the planning, design, construction, maintenance, and operation of roundabouts.

Woodlawn Boulevard and 53rd Street North

While the construction of a roundabout at the intersection of Woodlawn Boulevard and 53rd Street North could be expected to provide positive safety and operational benefits, the intersection already appears to be operating in a relatively efficient and safe manner at this time. As a result, roundabout control would be an appropriate future alternative for this intersection as the surrounding area begins to develop and traffic volumes increase. According to the city's 2014 Comprehensive Plan Update, Woodlawn Boulevard and 53rd Street North are planned as four-lane roadways in the future. While these planned improvements would suggest the future need for a multilane roundabout at the intersection due to the four-lane configuration, it is likely that a single lane roundabout would operate efficiently at the intersection for several years. Studies have shown that single-lane roundabouts provide sufficient capacity for typical daily volumes as high as 20,000 vehicles per day. With a current intersection volume of approximately 5,000 vehicles per day, traffic at this location would have to increase significantly before reaching the capacity of a single lane roundabout. To account for the potential need for multilane approaches in the future, the roundabout could be designed to allow for internal widening.

Rock Road and 53rd Street North

Based on the frequency and types of crashes at the intersection of Rock Road and 53rd Street North, we would consider this location to be a good candidate for roundabout control. All of the 13 crashes that have occurred at this intersection in recent years have been angle or left-turn collisions, crash types that are greatly reduced or eliminated by roundabout control. In addition, a roundabout at this location would likely enhance operations both before and after school, when larger amounts of traffic are present at the intersection over a short period, including younger drivers. A roundabout at this location may also assist in reinforcing the speed change on Rock Road from 55 m.p.h. to 45 m.p.h. as drivers experience a transition from a rural setting to a more urban environment entering the city limits. Similar to a potential roundabout at Woodlawn Boulevard and Rock Road, a roundabout at this intersection could be constructed with single-lane entries that could be widened for increased capacity if necessary in the future.

A conceptual layout for a single-lane roundabout at the intersection of Rock Road and 53rd Street North has been prepared and is shown on Figure 2. The roundabout should be designed with an outside diameter of approximately 160 feet, or 180 – 190 feet if accommodations will be made for a future multilane configuration. Drainage modifications and utility relocations would be required as part of the roundabout construction, and right-of-way acquisition may also be required based on the diameter of the roundabout. Access management is an important consideration in the design of a roundabout. As shown on Figure 2, there are two (2) options illustrated for the existing driveway on 53rd Street North. The first option shows the splitter island on the east leg of the roundabout passing through the medical building driveway, allowing only right-turns in and out of the driveway. To maintain full access to the property, a second "right-in-right-out" driveway is shown on Rock Road. This allows for traffic to enter and exit the driveways in all directions when paired with the roundabout. This option is the preferred design alternative. Longer splitter islands are important on higher speed roundabout approaches in order to reduce driver speeds prior to entering the roundabout. If full access must be maintained at the existing driveway on 53rd Street North, the splitter island could be shortened and a short left-turn lane into the driveway could be provided, as shown in a second option on Figure 2 in the lower right inset.

Intersection Control Recommendations

Woodlawn Boulevard and 53rd Street North

The above analysis has indicated that the existing two-way stop control at the intersection of Woodlawn Boulevard and 53rd Street North should remain in place with no modifications to the existing intersection traffic control devices. If traffic volumes on 53rd Street North increase due to continued development in the vicinity, or if a correctable crash pattern forms, the existing conditions should be reevaluated to determine the need for an intersection control modification. Roundabout control would be preferred over multiway stop or traffic signal control for this location given the proven safety and operational performance of roundabouts throughout the state of Kansas. To support this future alternative, it may be beneficial for the city to reserve right-of way in the intersection quadrants prior to additional development of the adjacent land.

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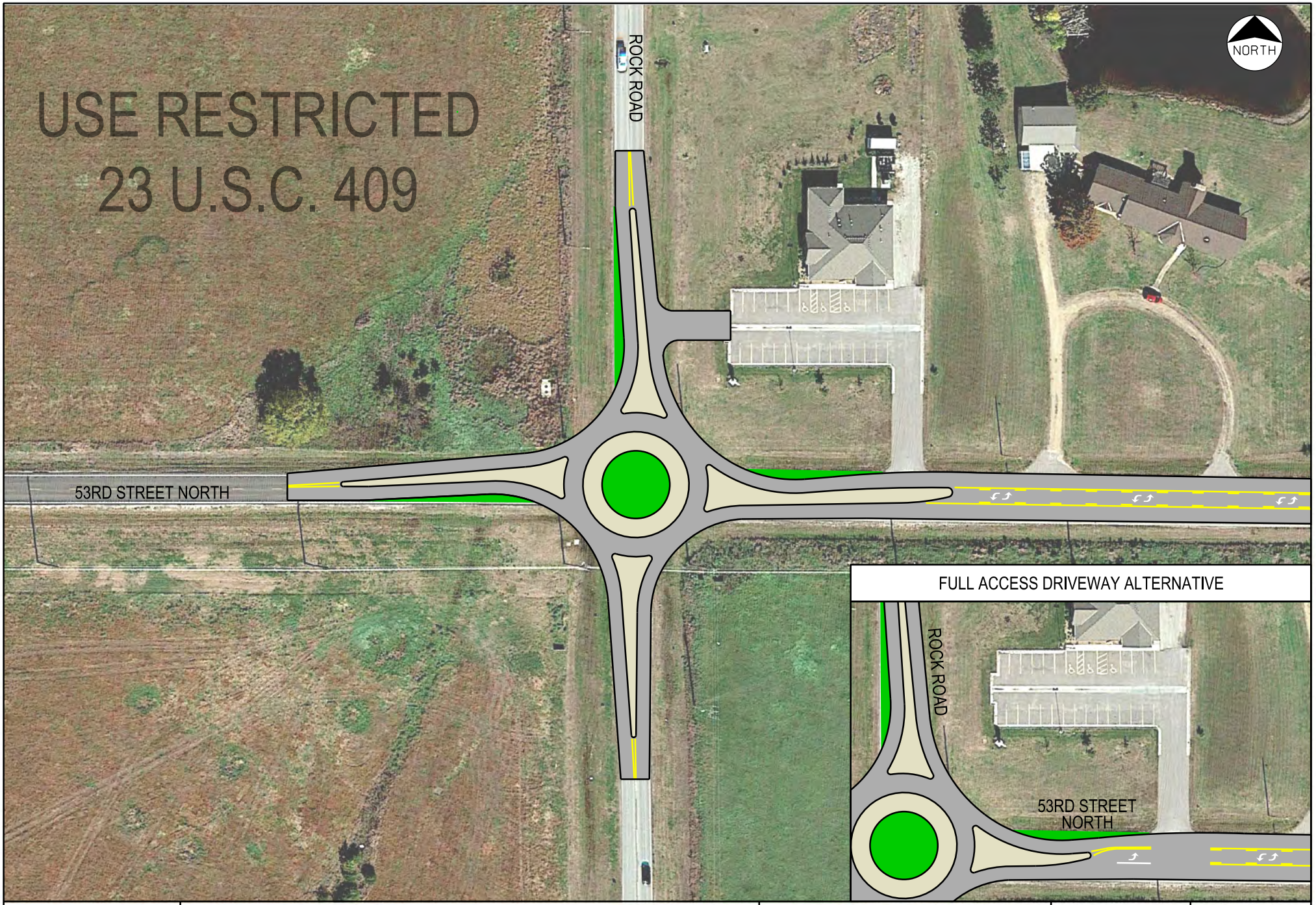

TranSystems	ROUNDABOUT IMPROVEMENT CONCEPT ROCK ROAD AND 53RD STREET NORTH	Intersection Analyses Bel Aire, Kansas	August 2021 No Scale	Figure 2

Rock Road and 53rd Street North

Analysis of the data collected at the intersection of Rock Road and 53rd Street North has identified that either multiway stop control or roundabout control could be implemented to address the crash patterns at the intersection. In considering the best alternative for the intersection, an important consideration for the city is the cost associated with the alternatives. Multiway stop control is a low cost alternative that could be implemented rather quickly. The costs involved would generally be associated with additional signage and would likely be no more than $5,000 – $10,000. In contrast, costs associated with roundabout installation would be much higher since this will require the complete reconstruction of the intersection, property acquisition, and utility relocation. A typical construction cost for a roundabout of this size would range between approximately $2,000,000 and $2,500,000 based on costs for roundabouts in other similar locations throughout Kansas.

Based on all factors, we would initially recommend that the city install multiway stop control at this intersection, but at the same time, plan for installation of a roundabout as the safest and most efficient long-term form of control to implement when funding becomes available. Interim use of multiway stop control offers a potential solution to address the crash history at the intersection, and it can be implemented rather quickly and at a relatively low cost. However, roundabout control is the preferred long-term modification for this location since this form of control should provide much more efficient operations than multiway stop control while also eliminating the angle and left-turn collisions that have been occurring at this location. In conjunction with this, we would recommend that the city reserve right-of way in the intersection quadrants prior to any additional development of the adjacent land.

While there may be some concerns about drivers on Rock Road who might not obey the new stop sign control, measures can and should be taken to educate drivers about the proposed change. The city should utilize various media outlets (newspaper, internet, etc.) to publicize the new type of control. With this advance notification and most importantly, proper device placement, drivers on Rock Road should not have difficulty recognizing and complying with the stop signs. The following traffic control device improvements are also recommended as part of implementing the change to multiway stop control:

- Install a Stop (MUTCD No. R1-1, 36” x 36” size) sign with ALL WAY (MUTCD No. R1-3P, 18” x 6” size) plaque for each approach. A slightly larger size is recommended for all of the Stop signs at this intersection since just over half of the angle collisions have involved drivers on 53rd Street North who failed to stop entirely. The existing Cross Traffic Does Not Stop plaques will need to be removed. To enhance motorist recognition of the Stop signs, retroreflective strips are recommended as an additional traffic control device for the Stop sign posts (an example is shown in the image at right). The red retroreflective strips should be at least two inches in width and placed the full length of the support from the sign to within two feet above the edge of the roadway.

- Given the change in intersection control, a Stop Ahead (MUTCD No. W3-1, 30” x 30” size) sign should be installed on each Rock Road approach along with two (2) orange or fluorescent red-orange flags (16” x 16” minimum size) above each new Stop and Stop Ahead sign as a temporary supplement to further emphasize the change in control. The flags should remain in place for an adequate time period (roughly 3 – 6 months) so that familiar drivers can become accustomed to the new intersection control. The city should ensure that the flags do not block any of the sign faces.

- Install a 24” solid white stop line for each intersection approach. A stop line is already in place on the east leg, but it would be appropriate to provide these pavement markings for all intersection approaches. A long-life pavement marking material, such as thermoplastic, is recommended to enhance durability and longevity of the markings.

Following the change to multiway stop control, the city should closely monitor operational conditions, driver behavior, and crash experience at this location to determine whether additional treatments should be considered. Options could include installing secondary left-side stop sign assemblies, increasing the size of the stop signs, or the installation of flashing beacons.

Conclusion

The above study has focused on the need for intersection control modifications to enhance safety at Woodlawn Boulevard and 53rd Street North; and, Rock Road and 53rd Street North in the city of Bel Aire, Kansas. The general procedures and analysis for this study were based on criteria set forth in the current edition of the *Manual on Uniform Traffic Control Devices* (MUTCD), the Federal Highway Administration (FHWA) reference adopted as the standard governing the use of traffic control devices in the State of Kansas.

Based on the data that were collected, the intersection of Woodlawn Boulevard and 53rd Street North appears to be operating in a relatively efficient and safe manner. Minimal delay and vehicle queuing was observed on the 53rd Street North approaches, sight lines are adequate, and the crash rate is well below statewide averages. Conditions are generally similar at the intersection of Rock Road and 53rd Street North, with the exception that the intersection crash rate exceeds statewide averages and there is a frequent occurrence of angle collisions at the intersection. Angle collisions are of concern since these tend to be more severe than other crash types.

Additional analyses of various intersection control types has indicated that the existing two-way stop control at Woodlawn Boulevard and 53rd Street North should remain in place with no modifications to the existing intersection traffic control devices. If traffic volumes on 53rd Street North increase due to continued development in the vicinity, or if a correctable crash pattern forms, the existing conditions should be reevaluated to determine the need for an intersection control modification. Roundabout control would be preferred over multiway stop or traffic signal control for this location given the proven safety and operational performance of roundabouts throughout the state of Kansas. To support this future alternative, it may be beneficial for the city to reserve right-of way in the intersection quadrants prior to additional development of the adjacent land.

Analysis of the data collected at the intersection of Rock Road and 53rd Street North has identified that either multiway stop control or roundabout control could be implemented to address the crash patterns at the intersection. In considering all factors, we have initially recommended that the city install multiway stop control at the intersection, while at the same time planning for long-term installation of a roundabout as the safest and most efficient long-term form of control to implement when funding becomes available. Interim use of multiway stop control offers a potential solution to address the crash history at the intersection, and it can be implemented rather quickly and at a relatively low cost. However, roundabout control is the preferred long-term modification for this location since this form of control should provide much more efficient operations than multiway stop control while also eliminating the angle and left-turn collisions that have been occurring at this location. In conjunction with this, we would recommend that the city reserve right-of way in the intersection quadrants prior to any additional development of the adjacent land.

Appendix

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TranSystems	STUDY AREA	Intersection Analyses Bel Aire, Kansas	August 2021 No Scale	Figure A-1

Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

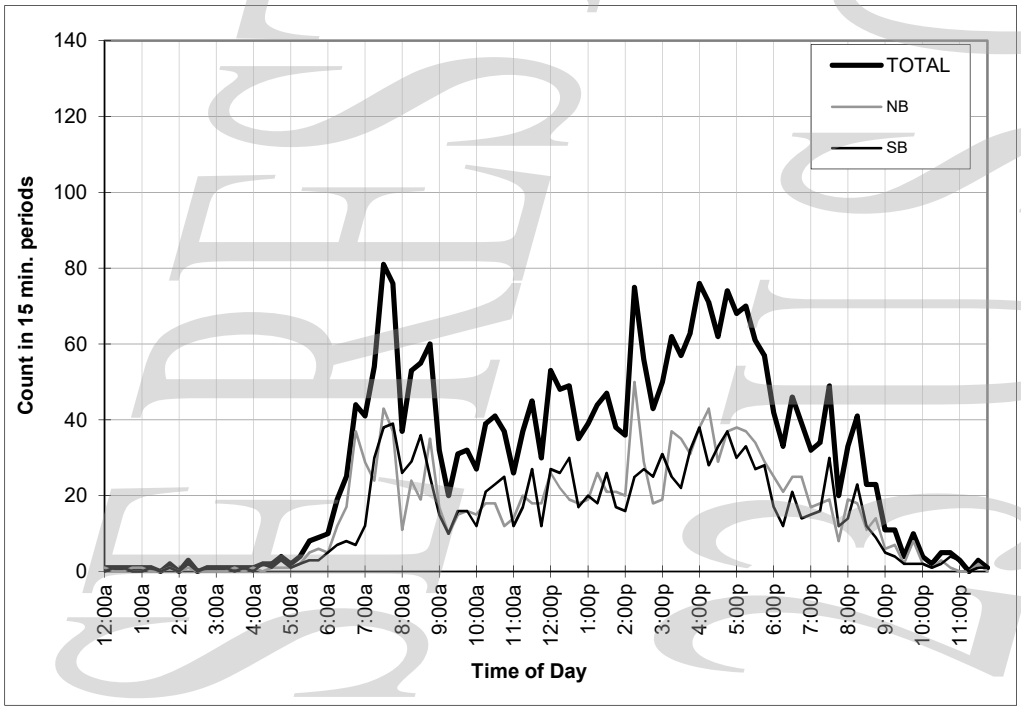
Location: **Woodlawn Blvd. 700' North of 53rd St. North**

Period Start	NB	SB	TOTAL
12:00a	1	0	1
12:15a	0	1	1
12:30a	0	1	1
12:45a	1	0	1
1:00a	1	0	1
1:15a	0	1	1
1:30a	0	0	0
1:45a	1	1	2
2:00a	0	0	0
2:15a	1	2	3
2:30a	0	0	0
2:45a	0	1	1
3:00a	0	1	1
3:15a	0	1	1
3:30a	1	0	1
3:45a	0	1	1
4:00a	1	0	1
4:15a	0	2	2
4:30a	1	1	2
4:45a	1	3	4
5:00a	1	1	2
5:15a	2	2	4
5:30a	5	3	8
5:45a	6	3	9

Period Start	NB	SB	TOTAL
6:00a	5	5	10
6:15a	12	7	19
6:30a	17	8	25
6:45a	37	7	44
7:00a	29	12	41
7:15a	24	30	54
7:30a	43	38	81
7:45a	37	39	76
8:00a	11	26	37
8:15a	24	29	53
8:30a	19	36	55
8:45a	35	25	60
9:00a	17	15	32
9:15a	10	10	20
9:30a	15	16	31
9:45a	16	16	32
10:00a	15	12	27
10:15a	18	21	39
10:30a	18	23	41
10:45a	12	25	37
11:00a	14	12	26
11:15a	20	17	37
11:30a	18	27	45
11:45a	18	12	30

Period Start	NB	SB	TOTAL
12:00p	26	27	53
12:15p	22	26	48
12:30p	19	30	49
12:45p	18	17	35
1:00p	19	20	39
1:15p	26	18	44
1:30p	21	26	47
1:45p	21	17	38
2:00p	20	16	36
2:15p	50	25	75
2:30p	29	27	56
2:45p	18	25	43
3:00p	19	31	50
3:15p	37	25	62
3:30p	35	22	57
3:45p	31	32	63
4:00p	38	38	76
4:15p	43	28	71
4:30p	29	33	62
4:45p	37	37	74
5:00p	38	30	68
5:15p	37	33	70
5:30p	34	27	61
5:45p	29	28	57

Period Start	NB	SB	TOTAL
6:00p	25	17	42
6:15p	21	12	33
6:30p	25	21	46
6:45p	25	14	39
7:00p	17	15	32
7:15p	18	16	34
7:30p	19	30	49
7:45p	8	12	20
8:00p	19	14	33
8:15p	18	23	41
8:30p	11	12	23
8:45p	14	9	23
9:00p	6	5	11
9:15p	7	4	11
9:30p	2	2	4
9:45p	8	2	10
10:00p	2	2	4
10:15p	1	1	2
10:30p	3	2	5
10:45p	1	4	5
11:00p	0	3	3
11:15p	0	0	0
11:30p	2	1	3
11:45p	0	1	1



HOURLY TOTALS

Period Start	NB	SB	TOTAL
12:00a	2	2	4
1:00a	2	2	4
2:00a	1	3	4
3:00a	1	3	4
4:00a	3	6	9
5:00a	14	9	23
6:00a	71	27	98
7:00a	133	119	252
8:00a	89	116	205
9:00a	58	57	115
10:00a	63	81	144
11:00a	70	68	138
12:00p	85	100	185
1:00p	87	81	168
2:00p	117	93	210
3:00p	122	110	232
4:00p	147	136	283
5:00p	138	118	256
6:00p	96	64	160
7:00p	62	73	135
8:00p	62	58	120
9:00p	23	13	36
10:00p	7	9	16
11:00p	2	5	7

Approach	Count Date	AM Peak 7:00a - 8:00a	Noon Peak 1:45p - 2:45p	PM Peak 4:00p - 5:00p	Totals
Northbound	3/31/21 Wed	133	120	147	**1,455**
Southbound	3/31/21 Wed	119	85	136	**1,353**
TOTAL	3/31/21 Wed	252	205	283	**2,808**

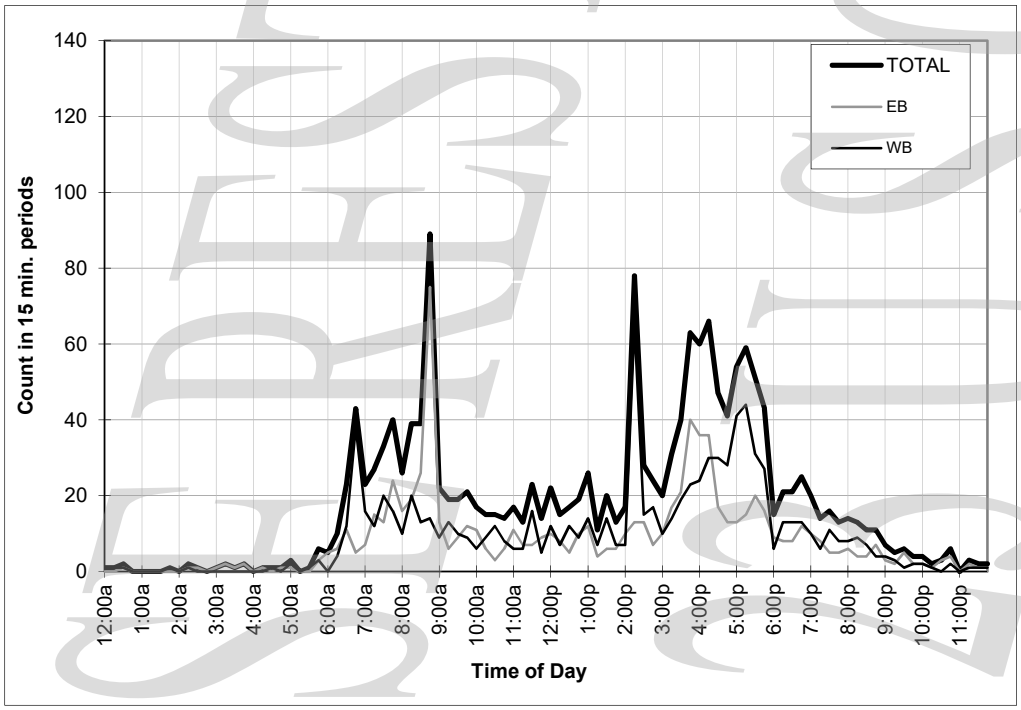
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **53rd St. North 500' East of Woodlawn Blvd.**

Period Start	EB	WB	TOTAL
12:00a	0	1	1
12:15a	0	1	1
12:30a	1	1	2
12:45a	0	0	0
1:00a	0	0	0
1:15a	0	0	0
1:30a	0	0	0
1:45a	0	1	1
2:00a	0	0	0
2:15a	1	1	2
2:30a	1	0	1
2:45a	0	0	0
3:00a	1	0	1
3:15a	2	0	2
3:30a	1	0	1
3:45a	2	0	2
4:00a	0	0	0
4:15a	1	0	1
4:30a	0	1	1
4:45a	1	0	1
5:00a	1	2	3
5:15a	0	0	0
5:30a	0	1	1
5:45a	3	3	6
6:00a	5	0	5
6:15a	6	4	10
6:30a	11	12	23
6:45a	5	38	43
7:00a	7	16	23
7:15a	15	12	27
7:30a	13	20	33
7:45a	24	16	40
8:00a	16	10	26
8:15a	19	20	39
8:30a	26	13	39
8:45a	75	14	89
9:00a	13	9	22
9:15a	6	13	19
9:30a	9	10	19
9:45a	12	9	21
10:00a	11	6	17
10:15a	6	9	15
10:30a	3	12	15
10:45a	6	8	14
11:00a	11	6	17
11:15a	7	6	13
11:30a	7	16	23
11:45a	9	5	14
12:00p	10	12	22
12:15p	8	7	15
12:30p	5	12	17
12:45p	10	9	19
1:00p	12	14	26
1:15p	4	7	11
1:30p	6	14	20
1:45p	6	7	13
2:00p	10	7	17
2:15p	13	65	78
2:30p	13	15	28
2:45p	7	17	24
3:00p	10	10	20
3:15p	17	14	31
3:30p	21	19	40
3:45p	40	23	63
4:00p	36	24	60
4:15p	36	30	66
4:30p	17	30	47
4:45p	13	28	41
5:00p	13	41	54
5:15p	15	44	59
5:30p	20	31	51
5:45p	16	27	43
6:00p	9	6	15
6:15p	8	13	21
6:30p	8	13	21
6:45p	12	13	25
7:00p	10	10	20
7:15p	8	6	14
7:30p	5	11	16
7:45p	5	8	13
8:00p	6	8	14
8:15p	4	9	13
8:30p	4	7	11
8:45p	7	4	11
9:00p	3	4	7
9:15p	2	3	5
9:30p	5	1	6
9:45p	2	2	4
10:00p	2	2	4
10:15p	1	1	2
10:30p	3	0	3
10:45p	4	2	6
11:00p	0	0	0
11:15p	2	1	3
11:30p	1	1	2
11:45p	1	1	2



HOURLY TOTALS

Period Start	EB	WB	TOTAL
12:00a	1	3	4
1:00a	0	1	1
2:00a	2	1	3
3:00a	6	0	6
4:00a	2	1	3
5:00a	4	6	10
6:00a	27	54	81
7:00a	59	64	123
8:00a	136	57	193
9:00a	40	41	81
10:00a	26	35	61
11:00a	34	33	67
12:00p	33	40	73
1:00p	28	42	70
2:00p	43	104	147
3:00p	88	66	154
4:00p	102	112	214
5:00p	64	143	207
6:00p	37	45	82
7:00p	28	35	63
8:00p	21	28	49
9:00p	12	10	22
10:00p	10	5	15
11:00p	4	3	7

Approach	Count Date	AM Peak 8:00a - 9:00a	Noon Peak 1:45p - 2:45p	PM Peak 3:45p - 4:45p	Totals
Eastbound	3/31/21 Wed	136	42	129	**807**
Westbound	3/31/21 Wed	57	94	107	**929**
TOTAL	3/31/21 Wed	193	136	236	**1,736**

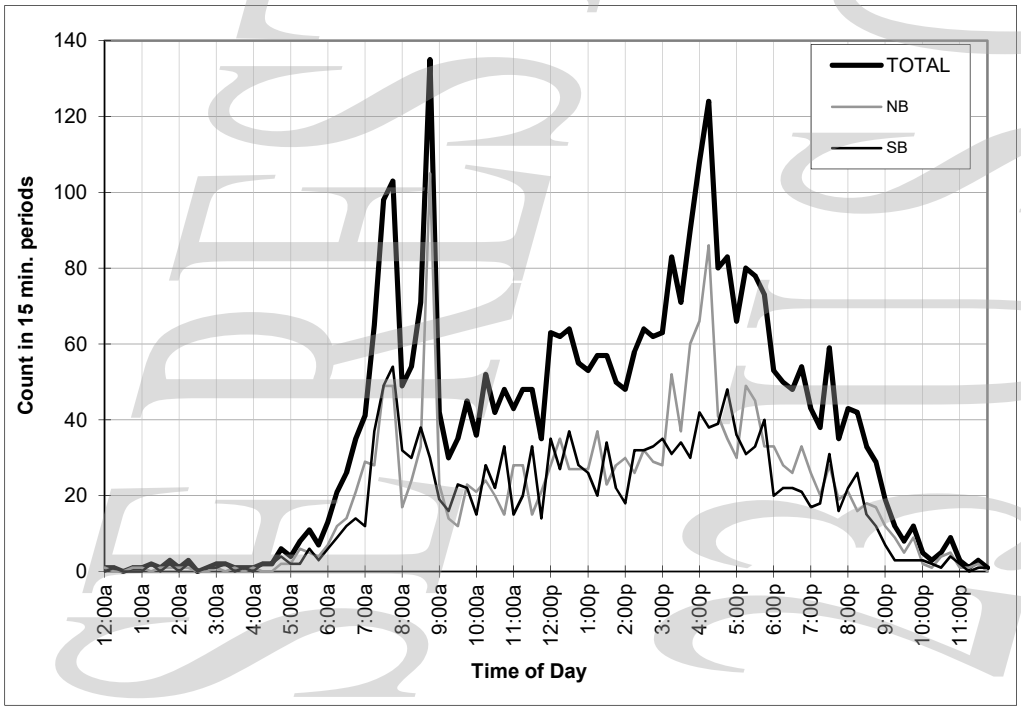
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **Woodlawn Blvd. 200' South of 53rd St. North**

Period Start	NB	SB	TOTAL
12:00a	1	0	1
12:15a	0	1	1
12:30a	0	0	0
12:45a	1	0	1
1:00a	1	0	1
1:15a	0	2	2
1:30a	1	0	1
1:45a	1	2	3
2:00a	1	0	1
2:15a	1	2	3
2:30a	0	0	0
2:45a	0	1	1
3:00a	1	1	2
3:15a	0	2	2
3:30a	1	0	1
3:45a	0	1	1
4:00a	1	0	1
4:15a	0	2	2
4:30a	0	2	2
4:45a	2	4	6
5:00a	2	2	4
5:15a	6	2	8
5:30a	5	6	11
5:45a	4	3	7
6:00a	7	6	13
6:15a	12	9	21
6:30a	14	12	26
6:45a	21	14	35
7:00a	29	12	41
7:15a	28	37	65
7:30a	49	49	98
7:45a	49	54	103
8:00a	17	32	49
8:15a	24	30	54
8:30a	33	38	71
8:45a	105	30	135
9:00a	23	19	42
9:15a	14	16	30
9:30a	12	23	35
9:45a	23	22	45
10:00a	21	15	36
10:15a	24	28	52
10:30a	20	22	42
10:45a	15	33	48
11:00a	28	15	43
11:15a	28	20	48
11:30a	15	33	48
11:45a	21	14	35
12:00p	28	35	63
12:15p	35	27	62
12:30p	27	37	64
12:45p	27	28	55
1:00p	27	26	53
1:15p	37	20	57
1:30p	23	34	57
1:45p	28	22	50
2:00p	30	18	48
2:15p	26	32	58
2:30p	32	32	64
2:45p	29	33	62
3:00p	28	35	63
3:15p	52	31	83
3:30p	37	34	71
3:45p	60	30	90
4:00p	66	42	108
4:15p	86	38	124
4:30p	41	39	80
4:45p	35	48	83
5:00p	30	36	66
5:15p	49	31	80
5:30p	45	33	78
5:45p	33	40	73
6:00p	33	20	53
6:15p	28	22	50
6:30p	26	22	48
6:45p	33	21	54
7:00p	26	17	43
7:15p	20	18	38
7:30p	28	31	59
7:45p	19	16	35
8:00p	21	22	43
8:15p	16	26	42
8:30p	18	15	33
8:45p	17	12	29
9:00p	12	7	19
9:15p	9	3	12
9:30p	5	3	8
9:45p	9	3	12
10:00p	2	3	5
10:15p	1	2	3
10:30p	4	1	5
10:45p	5	4	9
11:00p	1	2	3
11:15p	1	0	1
11:30p	2	1	3
11:45p	0	1	1



HOURLY TOTALS

Period Start	NB	SB	TOTAL
12:00a	2	1	3
1:00a	3	4	7
2:00a	2	3	5
3:00a	2	4	6
4:00a	3	8	11
5:00a	17	13	30
6:00a	54	41	95
7:00a	155	152	307
8:00a	179	130	309
9:00a	72	80	152
10:00a	80	98	178
11:00a	92	82	174
12:00p	117	127	244
1:00p	115	102	217
2:00p	117	115	232
3:00p	177	130	307
4:00p	228	167	395
5:00p	157	140	297
6:00p	120	85	205
7:00p	93	82	175
8:00p	72	75	147
9:00p	35	16	51
10:00p	12	10	22
11:00p	4	4	8

Approach	Count Date	AM Peak 7:15a - 8:15a	Noon Peak 12:00p - 1:00p	PM Peak 3:45p - 4:45p	Totals
Northbound	3/31/21 Wed	143	117	253	**1,908**
Southbound	3/31/21 Wed	172	127	149	**1,669**
TOTAL	3/31/21 Wed	315	244	402	**3,577**

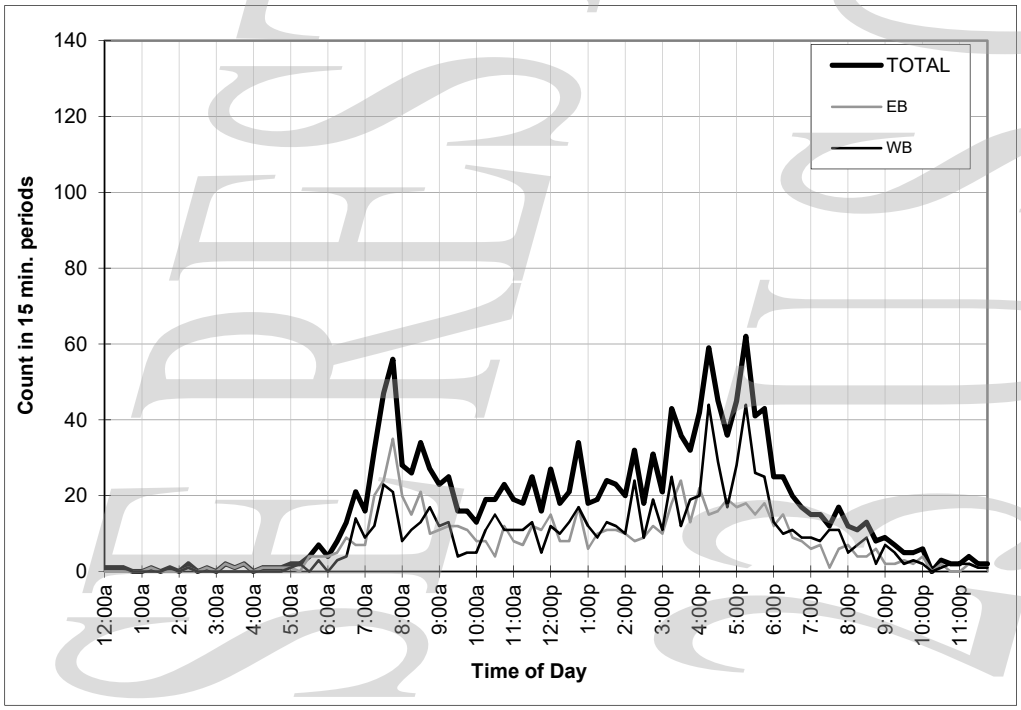
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **53rd St. North 800' West of Woodlawn Blvd.**

Period Start	EB	WB	TOTAL
12:00a	0	1	1
12:15a	0	1	1
12:30a	0	1	1
12:45a	0	0	0
1:00a	0	0	0
1:15a	1	0	1
1:30a	0	0	0
1:45a	0	1	1
2:00a	0	0	0
2:15a	1	1	2
2:30a	0	0	0
2:45a	1	0	1
3:00a	0	0	0
3:15a	2	0	2
3:30a	1	0	1
3:45a	2	0	2
4:00a	0	0	0
4:15a	1	0	1
4:30a	1	0	1
4:45a	1	0	1
5:00a	1	1	2
5:15a	0	2	2
5:30a	4	0	4
5:45a	4	3	7
6:00a	4	0	4
6:15a	5	3	8
6:30a	9	4	13
6:45a	7	14	21
7:00a	7	9	16
7:15a	20	12	32
7:30a	24	23	47
7:45a	35	21	56
8:00a	20	8	28
8:15a	15	11	26
8:30a	21	13	34
8:45a	10	17	27
9:00a	11	12	23
9:15a	12	13	25
9:30a	12	4	16
9:45a	11	5	16
10:00a	8	5	13
10:15a	8	11	19
10:30a	4	15	19
10:45a	12	11	23
11:00a	8	11	19
11:15a	7	11	18
11:30a	12	13	25
11:45a	11	5	16
12:00p	15	12	27
12:15p	8	10	18
12:30p	8	13	21
12:45p	17	17	34
1:00p	6	12	18
1:15p	10	9	19
1:30p	11	13	24
1:45p	11	12	23
2:00p	10	10	20
2:15p	8	24	32
2:30p	9	9	18
2:45p	12	19	31
3:00p	10	11	21
3:15p	18	25	43
3:30p	24	12	36
3:45p	13	19	32
4:00p	22	20	42
4:15p	15	44	59
4:30p	16	29	45
4:45p	19	17	36
5:00p	17	28	45
5:15p	18	44	62
5:30p	15	26	41
5:45p	18	25	43
6:00p	12	13	25
6:15p	15	10	25
6:30p	9	11	20
6:45p	8	9	17
7:00p	6	9	15
7:15p	7	8	15
7:30p	1	11	12
7:45p	6	11	17
8:00p	7	5	12
8:15p	4	7	11
8:30p	4	9	13
8:45p	6	2	8
9:00p	2	7	9
9:15p	2	5	7
9:30p	3	2	5
9:45p	2	3	5
10:00p	4	2	6
10:15p	0	0	0
10:30p	2	1	3
10:45p	0	2	2
11:00p	0	2	2
11:15p	2	2	4
11:30p	1	1	2
11:45p	1	1	2



HOURLY TOTALS

Period Start	EB	WB	TOTAL
12:00a	0	3	3
1:00a	1	1	2
2:00a	2	1	3
3:00a	5	0	5
4:00a	3	0	3
5:00a	9	6	15
6:00a	25	21	46
7:00a	86	65	151
8:00a	66	49	115
9:00a	46	34	80
10:00a	32	42	74
11:00a	38	40	78
12:00p	48	52	100
1:00p	38	46	84
2:00p	39	62	101
3:00p	65	67	132
4:00p	72	110	182
5:00p	68	123	191
6:00p	44	43	87
7:00p	20	39	59
8:00p	21	23	44
9:00p	9	17	26
10:00p	6	5	11
11:00p	4	6	10

Approach	Count Date	AM Peak 7:15a - 8:15a	Noon Peak 12:00p - 1:00p	PM Peak 5:00p - 6:00p	Totals
Eastbound	3/31/21 Wed	99	48	68	**747**
Westbound	3/31/21 Wed	64	52	123	**855**
TOTAL	3/31/21 Wed	163	100	191	**1,602**

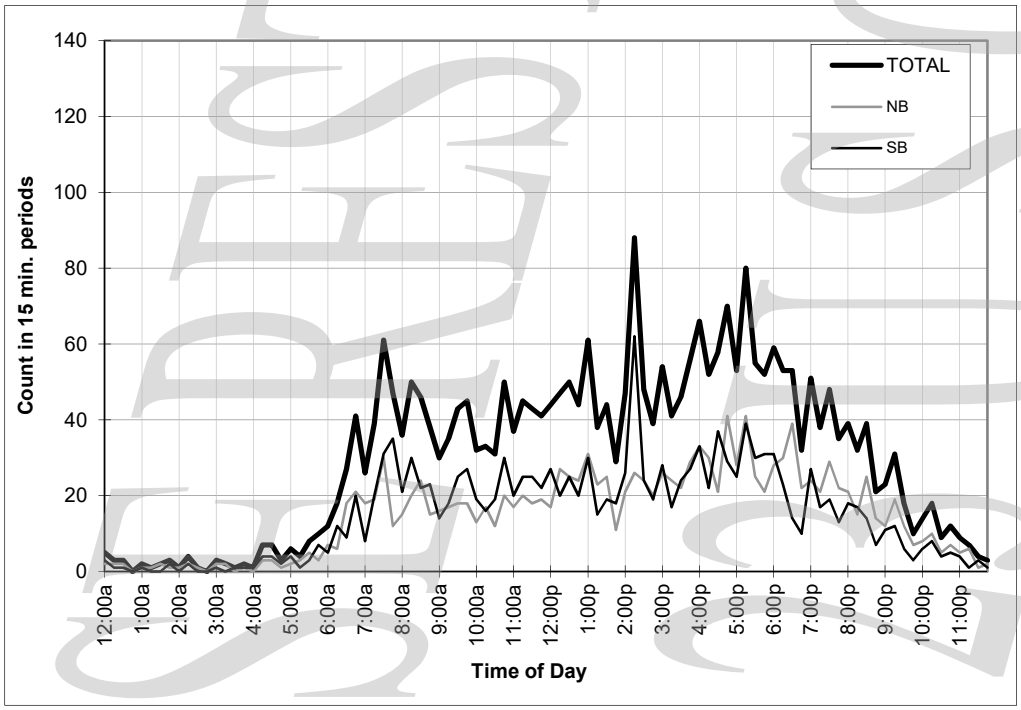
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **Rock Rd. 600' North of 53rd St. North**

Period Start	NB	SB	TOTAL
12:00a	2	3	5
12:15a	2	1	3
12:30a	2	1	3
12:45a	0	0	0
1:00a	1	1	2
1:15a	1	0	1
1:30a	2	0	2
1:45a	1	2	3
2:00a	1	0	1
2:15a	2	2	4
2:30a	1	0	1
2:45a	0	0	0
3:00a	2	1	3
3:15a	2	0	2
3:30a	0	1	1
3:45a	1	1	2
4:00a	0	1	1
4:15a	3	4	7
4:30a	3	4	7
4:45a	1	2	3
5:00a	2	4	6
5:15a	3	1	4
5:30a	5	3	8
5:45a	3	7	10
6:00a	7	5	12
6:15a	6	12	18
6:30a	18	9	27
6:45a	21	20	41
7:00a	18	8	26
7:15a	19	20	39
7:30a	30	31	61
7:45a	12	35	47
8:00a	15	21	36
8:15a	20	30	50
8:30a	24	22	46
8:45a	15	23	38
9:00a	16	14	30
9:15a	17	18	35
9:30a	18	25	43
9:45a	18	27	45
10:00a	13	19	32
10:15a	17	16	33
10:30a	12	19	31
10:45a	20	30	50
11:00a	17	20	37
11:15a	20	25	45
11:30a	18	25	43
11:45a	19	22	41
12:00p	17	27	44
12:15p	27	20	47
12:30p	25	25	50
12:45p	24	20	44
1:00p	31	30	61
1:15p	23	15	38
1:30p	25	19	44
1:45p	11	18	29
2:00p	21	26	47
2:15p	26	62	88
2:30p	24	24	48
2:45p	20	19	39
3:00p	26	28	54
3:15p	24	17	41
3:30p	22	24	46
3:45p	29	27	56
4:00p	33	33	66
4:15p	30	22	52
4:30p	21	37	58
4:45p	41	29	70
5:00p	28	25	53
5:15p	41	39	80
5:30p	25	30	55
5:45p	21	31	52
6:00p	28	31	59
6:15p	30	23	53
6:30p	39	14	53
6:45p	22	10	32
7:00p	24	27	51
7:15p	21	17	38
7:30p	29	19	48
7:45p	22	13	35
8:00p	21	18	39
8:15p	15	17	32
8:30p	25	14	39
8:45p	14	7	21
9:00p	12	11	23
9:15p	19	12	31
9:30p	12	6	18
9:45p	7	3	10
10:00p	8	6	14
10:15p	10	8	18
10:30p	5	4	9
10:45p	7	5	12
11:00p	5	4	9
11:15p	6	1	7
11:30p	1	3	4
11:45p	2	1	3



HOURLY TOTALS

Period Start	NB	SB	TOTAL
12:00a	6	5	11
1:00a	5	3	8
2:00a	4	2	6
3:00a	5	3	8
4:00a	7	11	18
5:00a	13	15	28
6:00a	52	46	98
7:00a	79	94	173
8:00a	74	96	170
9:00a	69	84	153
10:00a	62	84	146
11:00a	74	92	166
12:00p	93	92	185
1:00p	90	82	172
2:00p	91	131	222
3:00p	101	96	197
4:00p	125	121	246
5:00p	115	125	240
6:00p	119	78	197
7:00p	96	76	172
8:00p	75	56	131
9:00p	50	32	82
10:00p	30	23	53
11:00p	14	9	23

Approach	Count Date	AM Peak 7:30a - 8:30a	Noon Peak 1:45p - 2:45p	PM Peak 4:30p - 5:30p	Totals
Northbound	3/31/21 Wed	77	82	131	**1,449**
Southbound	3/31/21 Wed	117	130	130	**1,456**
TOTAL	3/31/21 Wed	194	212	261	**2,905**

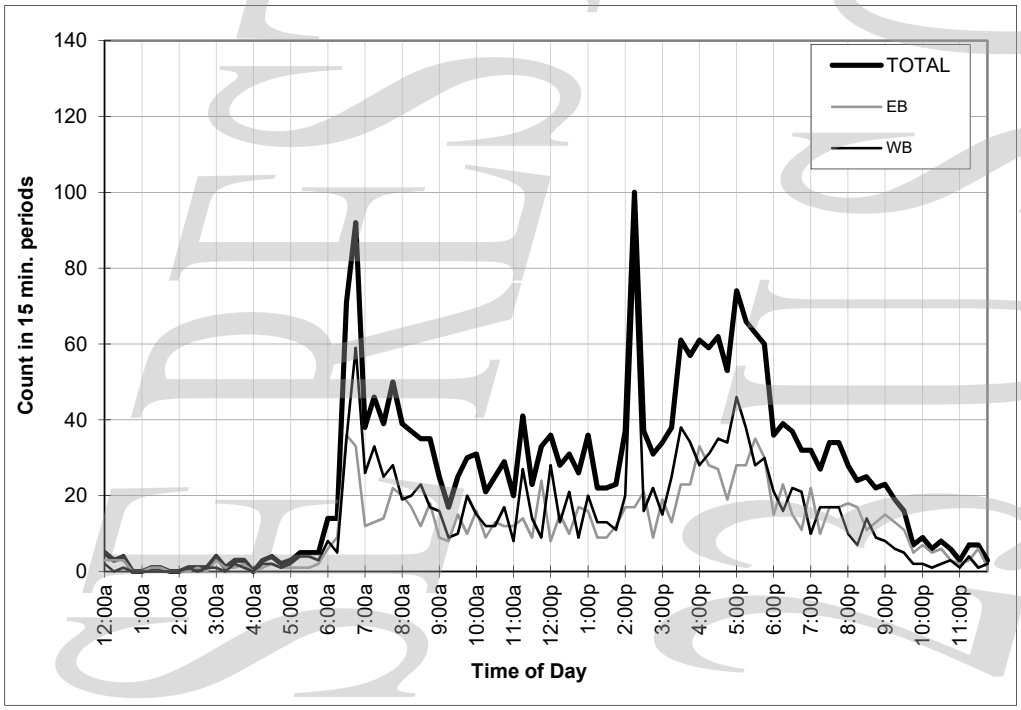
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **53rd St. North 500' East of Rock Rd.**

Period Start	EB	WB	TOTAL
12:00a	3	2	5
12:15a	3	0	3
12:30a	3	1	4
12:45a	0	0	0
1:00a	0	0	0
1:15a	1	0	1
1:30a	1	0	1
1:45a	0	0	0
2:00a	0	0	0
2:15a	0	1	1
2:30a	1	0	1
2:45a	0	1	1
3:00a	3	1	4
3:15a	1	0	1
3:30a	1	2	3
3:45a	2	1	3
4:00a	0	0	0
4:15a	1	2	3
4:30a	2	2	4
4:45a	1	1	2
5:00a	1	2	3
5:15a	1	4	5
5:30a	1	4	5
5:45a	2	3	5
6:00a	6	8	14
6:15a	9	5	14
6:30a	36	35	71
6:45a	33	59	92
7:00a	12	26	38
7:15a	13	33	46
7:30a	14	25	39
7:45a	22	28	50
8:00a	20	19	39
8:15a	17	20	37
8:30a	12	23	35
8:45a	18	17	35
9:00a	9	16	25
9:15a	8	9	17
9:30a	15	10	25
9:45a	10	20	30
10:00a	16	15	31
10:15a	9	12	21
10:30a	13	12	25
10:45a	12	17	29
11:00a	12	8	20
11:15a	14	27	41
11:30a	9	14	23
11:45a	24	9	33
12:00p	8	28	36
12:15p	15	13	28
12:30p	10	21	31
12:45p	17	9	26
1:00p	16	20	36
1:15p	9	13	22
1:30p	9	13	22
1:45p	12	11	23
2:00p	17	20	37
2:15p	17	83	100
2:30p	21	16	37
2:45p	9	22	31
3:00p	19	15	34
3:15p	13	25	38
3:30p	23	38	61
3:45p	23	34	57
4:00p	33	28	61
4:15p	28	31	59
4:30p	27	35	62
4:45p	19	34	53
5:00p	28	46	74
5:15p	28	38	66
5:30p	35	28	63
5:45p	30	30	60
6:00p	15	21	36
6:15p	23	16	39
6:30p	15	22	37
6:45p	11	21	32
7:00p	22	10	32
7:15p	10	17	27
7:30p	17	17	34
7:45p	17	17	34
8:00p	18	10	28
8:15p	17	7	24
8:30p	11	14	25
8:45p	13	9	22
9:00p	15	8	23
9:15p	13	6	19
9:30p	11	5	16
9:45p	5	2	7
10:00p	7	2	9
10:15p	5	1	6
10:30p	6	2	8
10:45p	3	3	6
11:00p	2	1	3
11:15p	3	4	7
11:30p	6	1	7
11:45p	1	2	3



HOURLY TOTALS

Period Start	EB	WB	TOTAL
12:00a	9	3	12
1:00a	2	0	2
2:00a	1	2	3
3:00a	7	4	11
4:00a	4	5	9
5:00a	5	13	18
6:00a	84	107	191
7:00a	61	112	173
8:00a	67	79	146
9:00a	42	55	97
10:00a	50	56	106
11:00a	59	58	117
12:00p	50	71	121
1:00p	46	57	103
2:00p	64	141	205
3:00p	78	112	190
4:00p	107	128	235
5:00p	121	142	263
6:00p	64	80	144
7:00p	66	61	127
8:00p	59	40	99
9:00p	44	21	65
10:00p	21	8	29
11:00p	12	8	20

Approach	Count Date	AM Peak 6:30a - 7:30a	Noon Peak 1:45p - 2:45p	PM Peak 5:00p - 6:00p	Totals
Eastbound	3/31/21 Wed	94	67	121	**1,123**
Westbound	3/31/21 Wed	153	130	142	**1,363**
TOTAL	3/31/21 Wed	247	197	263	**2,486**

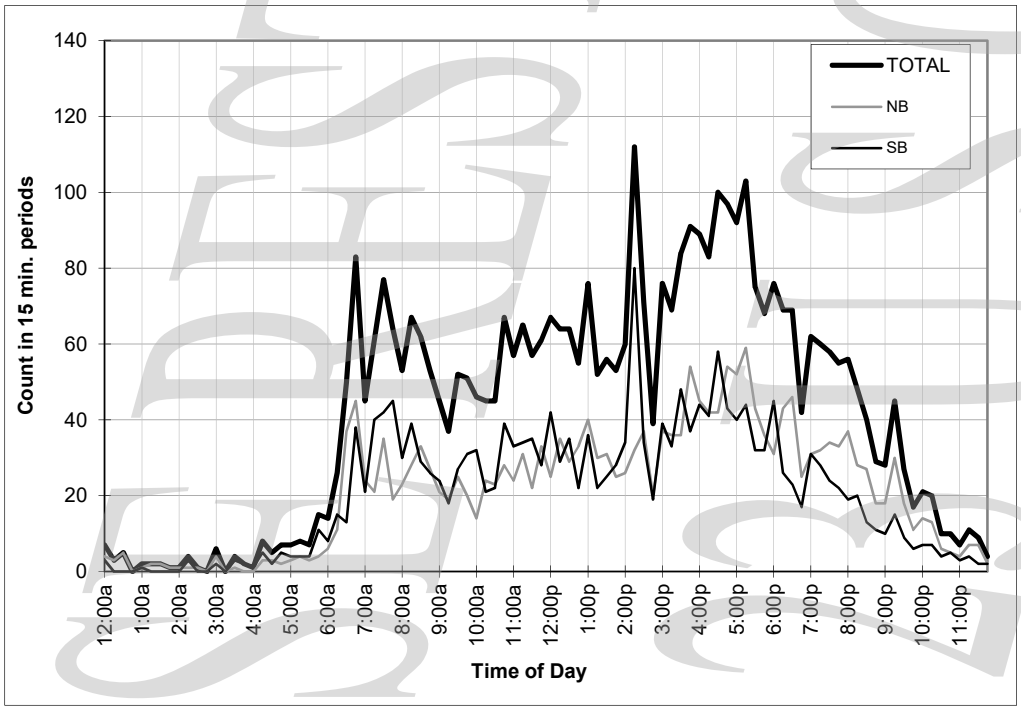
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **Rock Rd. 300' South of 53rd St. North**

Period Start	NB	SB	TOTAL
12:00a	4	3	7
12:15a	3	0	3
12:30a	5	0	5
12:45a	0	0	0
1:00a	1	1	2
1:15a	2	0	2
1:30a	2	0	2
1:45a	1	0	1
2:00a	1	0	1
2:15a	1	3	4
2:30a	1	0	1
2:45a	0	0	0
3:00a	4	2	6
3:15a	0	0	0
3:30a	1	3	4
3:45a	0	2	2
4:00a	0	1	1
4:15a	3	5	8
4:30a	3	2	5
4:45a	2	5	7
5:00a	3	4	7
5:15a	4	4	8
5:30a	3	4	7
5:45a	4	11	15
6:00a	6	8	14
6:15a	11	15	26
6:30a	37	13	50
6:45a	45	38	83
7:00a	24	21	45
7:15a	21	40	61
7:30a	35	42	77
7:45a	19	45	64
8:00a	23	30	53
8:15a	28	39	67
8:30a	33	29	62
8:45a	27	26	53
9:00a	21	24	45
9:15a	19	18	37
9:30a	25	27	52
9:45a	20	31	51
10:00a	14	32	46
10:15a	24	21	45
10:30a	23	22	45
10:45a	28	39	67
11:00a	24	33	57
11:15a	31	34	65
11:30a	22	35	57
11:45a	33	28	61
12:00p	25	42	67
12:15p	35	29	64
12:30p	29	35	64
12:45p	33	22	55
1:00p	40	36	76
1:15p	30	22	52
1:30p	31	25	56
1:45p	25	28	53
2:00p	26	34	60
2:15p	32	80	112
2:30p	37	34	71
2:45p	20	19	39
3:00p	37	39	76
3:15p	36	33	69
3:30p	36	48	84
3:45p	54	37	91
4:00p	45	44	89
4:15p	42	41	83
4:30p	42	58	100
4:45p	54	43	97
5:00p	52	40	92
5:15p	59	44	103
5:30p	43	32	75
5:45p	36	32	68
6:00p	31	45	76
6:15p	43	26	69
6:30p	46	23	69
6:45p	25	17	42
7:00p	31	31	62
7:15p	32	28	60
7:30p	34	24	58
7:45p	33	22	55
8:00p	37	19	56
8:15p	28	20	48
8:30p	27	13	40
8:45p	18	11	29
9:00p	18	10	28
9:15p	30	15	45
9:30p	18	9	27
9:45p	11	6	17
10:00p	14	7	21
10:15p	13	7	20
10:30p	6	4	10
10:45p	5	5	10
11:00p	4	3	7
11:15p	7	4	11
11:30p	7	2	9
11:45p	2	2	4



HOURLY TOTALS

Period Start	NB	SB	TOTAL
12:00a	12	3	15
1:00a	6	1	7
2:00a	3	3	6
3:00a	5	7	12
4:00a	8	13	21
5:00a	14	23	37
6:00a	99	74	173
7:00a	99	148	247
8:00a	111	124	235
9:00a	85	100	185
10:00a	89	114	203
11:00a	110	130	240
12:00p	122	128	250
1:00p	126	111	237
2:00p	115	167	282
3:00p	163	157	320
4:00p	183	186	369
5:00p	190	148	338
6:00p	145	111	256
7:00p	130	105	235
8:00p	110	63	173
9:00p	77	40	117
10:00p	38	23	61
11:00p	20	11	31

Approach	Count Date	AM Peak 6:45a - 7:45a	Noon Peak 1:45p - 2:45p	PM Peak 4:30p - 5:30p	Totals
Northbound	3/31/21 Wed	125	120	207	**2,060**
Southbound	3/31/21 Wed	141	176	185	**1,990**
TOTAL	3/31/21 Wed	266	296	392	**4,050**

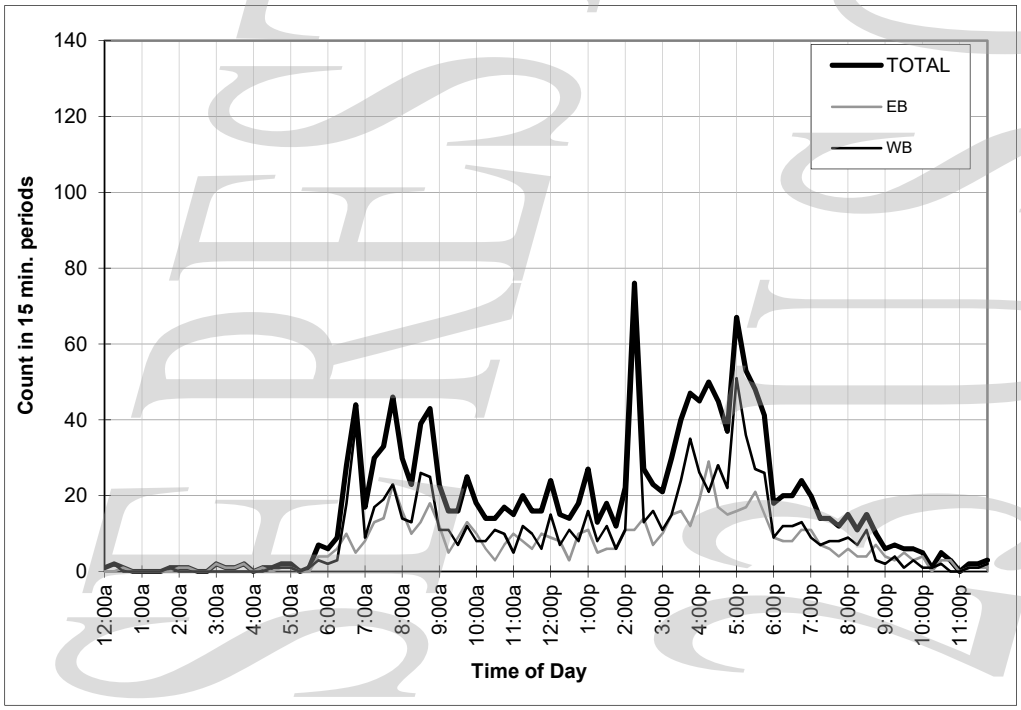
Daily Traffic Count

Kansas Traffic Engineering Assistance Program

Bel Aire, Kansas

Location: **53rd St. North 600' West of Rock Rd.**

Period Start	EB	WB	TOTAL
12:00a	0	1	1
12:15a	0	2	2
12:30a	1	0	1
12:45a	0	0	0
1:00a	0	0	0
1:15a	0	0	0
1:30a	0	0	0
1:45a	0	1	1
2:00a	1	0	1
2:15a	1	0	1
2:30a	0	0	0
2:45a	0	0	0
3:00a	2	0	2
3:15a	1	0	1
3:30a	1	0	1
3:45a	2	0	2
4:00a	0	0	0
4:15a	1	0	1
4:30a	0	1	1
4:45a	1	1	2
5:00a	1	1	2
5:15a	0	0	0
5:30a	0	1	1
5:45a	4	3	7
6:00a	4	2	6
6:15a	6	3	9
6:30a	10	18	28
6:45a	5	39	44
7:00a	8	9	17
7:15a	13	17	30
7:30a	14	19	33
7:45a	23	23	46
8:00a	16	14	30
8:15a	10	13	23
8:30a	13	26	39
8:45a	18	25	43
9:00a	12	11	23
9:15a	5	11	16
9:30a	9	7	16
9:45a	13	12	25
10:00a	10	8	18
10:15a	6	8	14
10:30a	3	11	14
10:45a	7	10	17
11:00a	10	5	15
11:15a	8	12	20
11:30a	6	10	16
11:45a	10	6	16
12:00p	9	15	24
12:15p	8	7	15
12:30p	3	11	14
12:45p	10	8	18
1:00p	11	16	27
1:15p	5	8	13
1:30p	6	12	18
1:45p	6	6	12
2:00p	11	11	22
2:15p	11	65	76
2:30p	14	13	27
2:45p	7	16	23
3:00p	10	11	21
3:15p	15	15	30
3:30p	16	24	40
3:45p	12	35	47
4:00p	19	26	45
4:15p	29	21	50
4:30p	17	28	45
4:45p	15	22	37
5:00p	16	51	67
5:15p	17	36	53
5:30p	21	27	48
5:45p	15	26	41
6:00p	9	9	18
6:15p	8	12	20
6:30p	8	12	20
6:45p	11	13	24
7:00p	11	9	20
7:15p	7	7	14
7:30p	6	8	14
7:45p	4	8	12
8:00p	6	9	15
8:15p	4	7	11
8:30p	4	11	15
8:45p	7	3	10
9:00p	4	2	6
9:15p	3	4	7
9:30p	5	1	6
9:45p	3	3	6
10:00p	4	1	5
10:15p	0	1	1
10:30p	3	2	5
10:45p	3	0	3
11:00p	0	0	0
11:15p	1	1	2
11:30p	1	1	2
11:45p	1	2	3

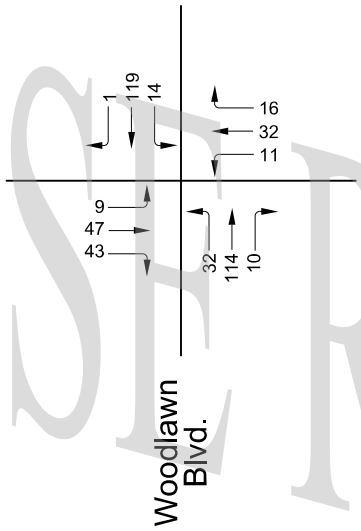


HOURLY TOTALS

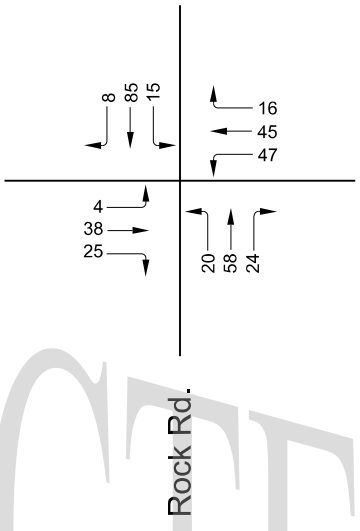
Period Start	EB	WB	TOTAL
12:00a	1	3	4
1:00a	0	1	1
2:00a	2	0	2
3:00a	6	0	6
4:00a	2	2	4
5:00a	5	5	10
6:00a	25	62	87
7:00a	58	68	126
8:00a	57	78	135
9:00a	39	41	80
10:00a	26	37	63
11:00a	34	33	67
12:00p	30	41	71
1:00p	28	42	70
2:00p	43	105	148
3:00p	53	85	138
4:00p	80	97	177
5:00p	69	140	209
6:00p	36	46	82
7:00p	28	32	60
8:00p	21	30	51
9:00p	15	10	25
10:00p	10	4	14
11:00p	3	4	7

Approach	Count Date	AM Peak 7:15a - 8:15a	Noon Peak 1:45p - 2:45p	PM Peak 5:00p - 6:00p	Totals
Eastbound	3/31/21 Wed	66	42	69	**671**
Westbound	3/31/21 Wed	73	95	140	**966**
TOTAL	3/31/21 Wed	139	137	209	**1,637**

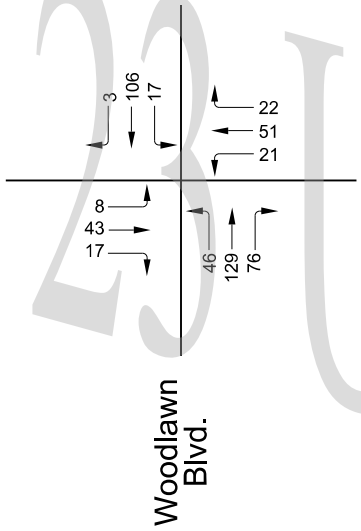
$FILEL$



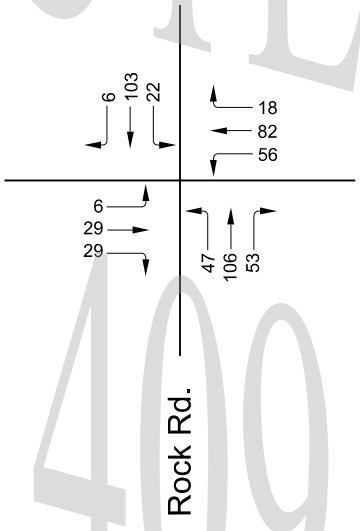
A.M. PEAK HOUR
7:15 A.M. - 8:15 P.M.



A.M. PEAK HOUR
7:15 A.M. - 8:15 P.M.



P.M. PEAK HOUR
3:45 P.M. - 4:45 P.M.



P.M. PEAK HOUR
4:30 P.M. - 5:30 P.M.

TranSystems	EXISTING PEAK HOUR TRAFFIC VOLUMES	Intersection Analyses Bel Aire, Kansas	August 2021 No Scale	Figure A-10

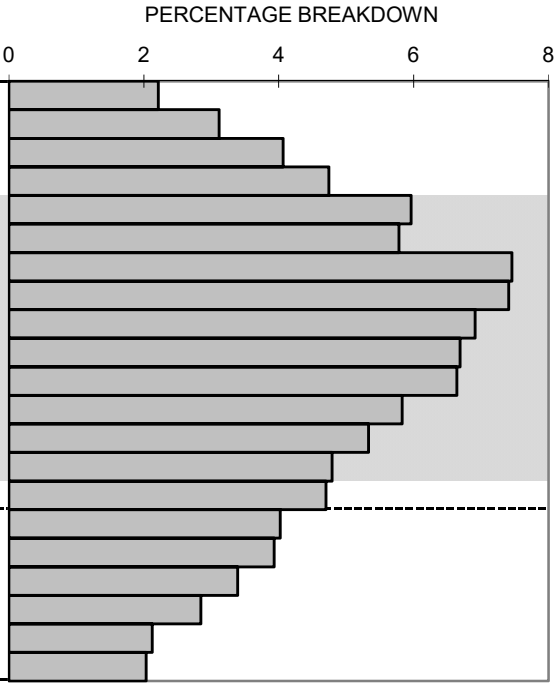
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 55
DIRECTION: NB and SB

LOCATION: Woodlawn Blvd. 700' North of 53rd St. North
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
40	49	49	2.2
41	69	118	5.3
42	90	208	9.4
43	105	313	14.1
44	132	445	20.1
45	128	573	25.9
46	165	738	33.3
47	164	902	40.8
48	153	1055	47.7
49	148	1203	54.4
50	147	1350	61.0
51	129	1479	66.8
52	118	1597	72.2
53	106	1703	77.0
54	104	1807	81.7
55	89	1896	85.7
56	87	1983	89.6
57	75	2058	93.0
58	63	2121	95.8
59	47	2168	98.0
60	45	2213	100.0



AVERAGE SPEED = 49.3
50th PERCENTILE = 48.3
85th PERCENTILE = 54.8
90th PERCENTILE = 56.1
95th PERCENTILE = 57.7

PACE = 44 - 53
VEHICLES IN PACE = 1390
% IN PACE = 62.8
% BELOW PACE = 14.1
% ABOVE PACE = 23.

SAMPLE VARIANCE = 26.0409392
STANDARD DEVIATION = 5.1030324
RANGE 1*S = 67.51017
RANGE 2*S = 97.96656
RANGE 3*S = 100.

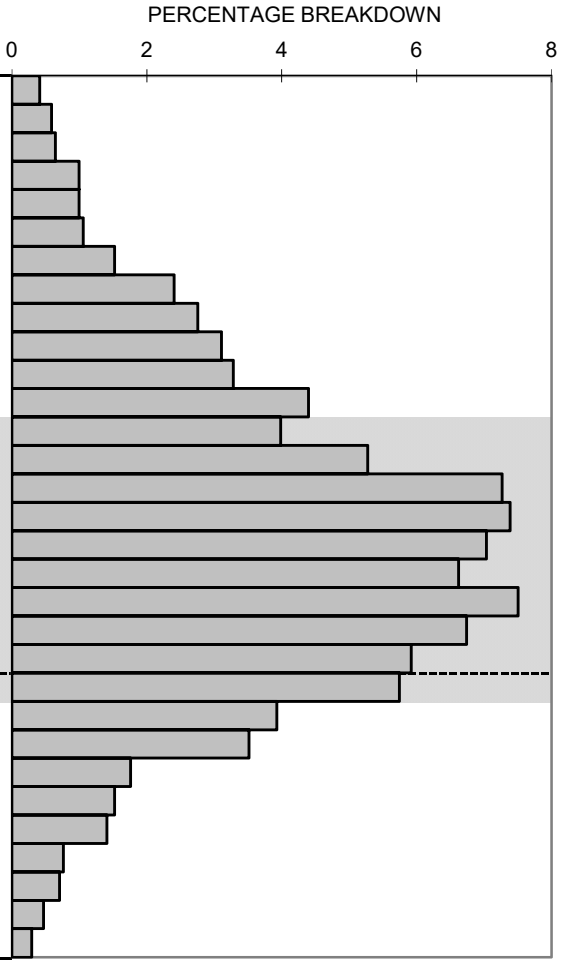
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 40
DIRECTION: EB and WB

LOCATION: 53rd St. North 500' East of Woodlawn Blvd.
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
25	7	7	0.4
26	10	17	1.0
27	11	28	1.6
28	17	45	2.6
29	17	62	3.6
30	18	80	4.7
31	26	106	6.2
32	41	147	8.6
33	47	194	11.4
34	53	247	14.5
35	56	303	17.8
36	75	378	22.2
37	68	446	26.1
38	90	536	31.4
39	124	660	38.7
40	126	786	46.1
41	120	906	53.1
42	113	1019	59.7
43	128	1147	67.2
44	115	1262	74.0
45	101	1363	79.9
46	98	1461	85.6
47	67	1528	89.6
48	60	1588	93.1
49	30	1618	94.8
50	26	1644	96.4
51	24	1668	97.8
52	13	1681	98.5
53	12	1693	99.2
54	8	1701	99.7
55	5	1706	100.0



AVERAGE SPEED = 40.7
50th PERCENTILE = 40.6
85th PERCENTILE = 45.9
90th PERCENTILE = 47.1
95th PERCENTILE = 49.1

PACE = 37 - 46
VEHICLES IN PACE = 1083
% IN PACE = 63.5
% BELOW PACE = 22.2
% ABOVE PACE = 14.4

SAMPLE VARIANCE = 32.0580999
STANDARD DEVIATION = 5.6619873
RANGE 1*S = 71.16061
RANGE 2*S = 95.89684
RANGE 3*S = 100.

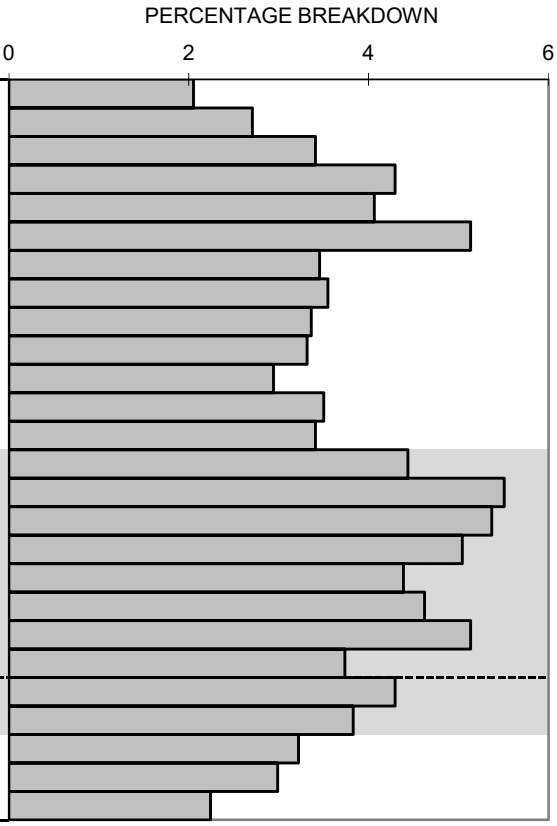
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 40
DIRECTION: NB and SB

LOCATION: Woodlawn Blvd. 200' South of 53rd St. North
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
25	44	44	2.1
26	58	102	4.8
27	73	175	8.2
28	92	267	12.5
29	87	354	16.5
30	110	464	21.7
31	74	538	25.1
32	76	614	28.7
33	72	686	32.0
34	71	757	35.3
35	63	820	38.3
36	75	895	41.8
37	73	968	45.2
38	95	1063	49.6
39	118	1181	55.1
40	115	1296	60.5
41	108	1404	65.5
42	94	1498	69.9
43	99	1597	74.6
44	110	1707	79.7
45	80	1787	83.4
46	92	1879	87.7
47	82	1961	91.5
48	69	2030	94.8
49	64	2094	97.8
50	48	2142	100.0



AVERAGE SPEED = 37.8
50th PERCENTILE = 38.1
85th PERCENTILE = 45.4
90th PERCENTILE = 46.6
95th PERCENTILE = 48.1

PACE = 38 - 47
VEHICLES IN PACE = 993
% IN PACE = 46.4
% BELOW PACE = 45.2
% ABOVE PACE = 8.5

SAMPLE VARIANCE = 49.2922827
STANDARD DEVIATION = 7.0208463
RANGE 1*S = 58.02988
RANGE 2*S = 100.
RANGE 3*S = 100.

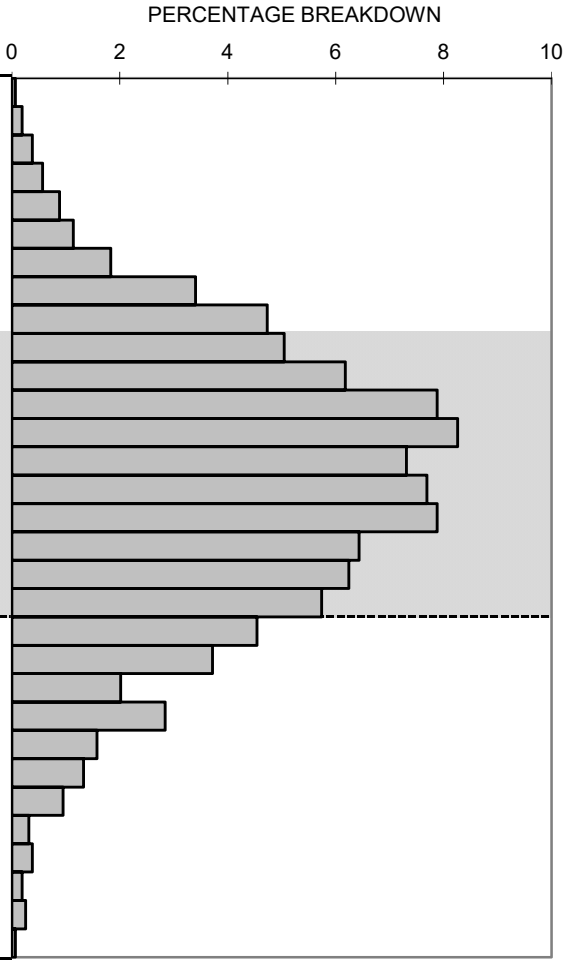
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 40
DIRECTION: EB and WB

LOCATION: 53rd St. North 800' West of Woodlawn Blvd.
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
30	1	1	0.1
31	3	4	0.3
32	6	10	0.6
33	9	19	1.2
34	14	33	2.1
35	18	51	3.2
36	29	80	5.0
37	54	134	8.4
38	75	209	13.2
39	80	289	18.2
40	98	387	24.4
41	125	512	32.3
42	131	643	40.5
43	116	759	47.9
44	122	881	55.5
45	125	1006	63.4
46	102	1108	69.9
47	99	1207	76.1
48	91	1298	81.8
49	72	1370	86.4
50	59	1429	90.1
51	32	1461	92.1
52	45	1506	95.0
53	25	1531	96.5
54	21	1552	97.9
55	15	1567	98.8
56	5	1572	99.1
57	6	1578	99.5
58	3	1581	99.7
59	4	1585	99.9
60	1	1586	100.0



AVERAGE SPEED = 44.
50th PERCENTILE = 43.3
85th PERCENTILE = 48.7
90th PERCENTILE = 50.
95th PERCENTILE = 52.

PACE = 39 - 48
VEHICLES IN PACE = 1089
% IN PACE = 68.7
% BELOW PACE = 13.2
% ABOVE PACE = 18.2

SAMPLE VARIANCE = 24.4283239
STANDARD DEVIATION = 4.9425018
RANGE 1*S = 68.66331
RANGE 2*S = 95.33418
RANGE 3*S = 99.68474

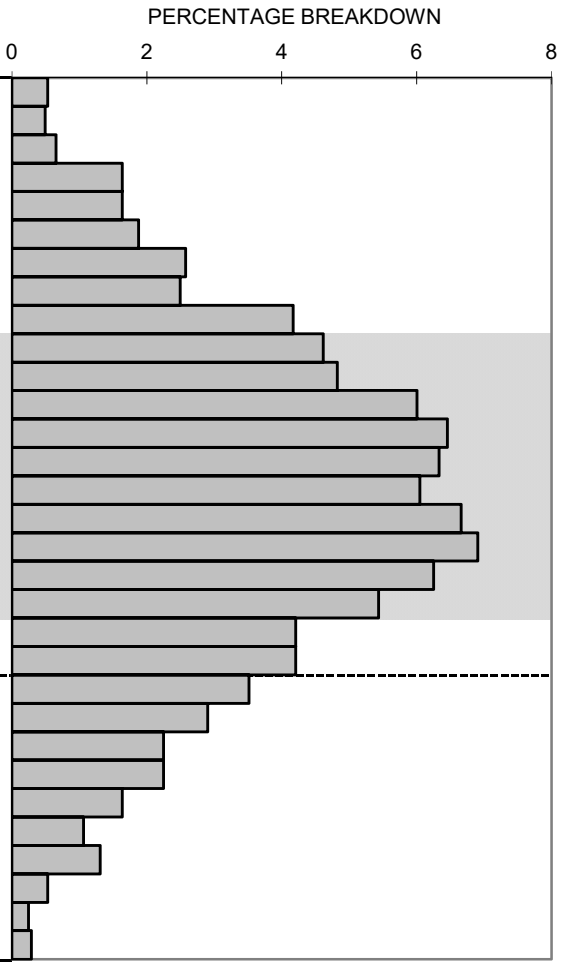
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 55
DIRECTION: NB and SB

LOCATION: Rock Road 600' North of 53rd St. North
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
35	13	13	0.5
36	12	25	1.0
37	16	41	1.7
38	40	81	3.3
39	40	121	4.9
40	46	167	6.8
41	63	230	9.4
42	61	291	11.9
43	102	393	16.1
44	113	506	20.7
45	118	624	25.5
46	147	771	31.5
47	158	929	38.0
48	155	1084	44.3
49	148	1232	50.3
50	163	1395	57.0
51	169	1564	63.9
52	153	1717	70.2
53	133	1850	75.6
54	103	1953	79.8
55	103	2056	84.0
56	86	2142	87.5
57	71	2213	90.4
58	55	2268	92.7
59	55	2323	94.9
60	40	2363	96.6
61	26	2389	97.6
62	32	2421	98.9
63	13	2434	99.5
64	6	2440	99.7
65	7	2447	100.0



AVERAGE SPEED = 49.5
50th PERCENTILE = 48.9
85th PERCENTILE = 55.3
90th PERCENTILE = 56.8
95th PERCENTILE = 59.

PACE = 44 - 53
VEHICLES IN PACE = 1457
% IN PACE = 59.5
% BELOW PACE = 16.1
% ABOVE PACE = 24.4

SAMPLE VARIANCE = 34.944819
STANDARD DEVIATION = 5.9114143
RANGE 1*S = 67.96077
RANGE 2*S = 95.95422
RANGE 3*S = 100.

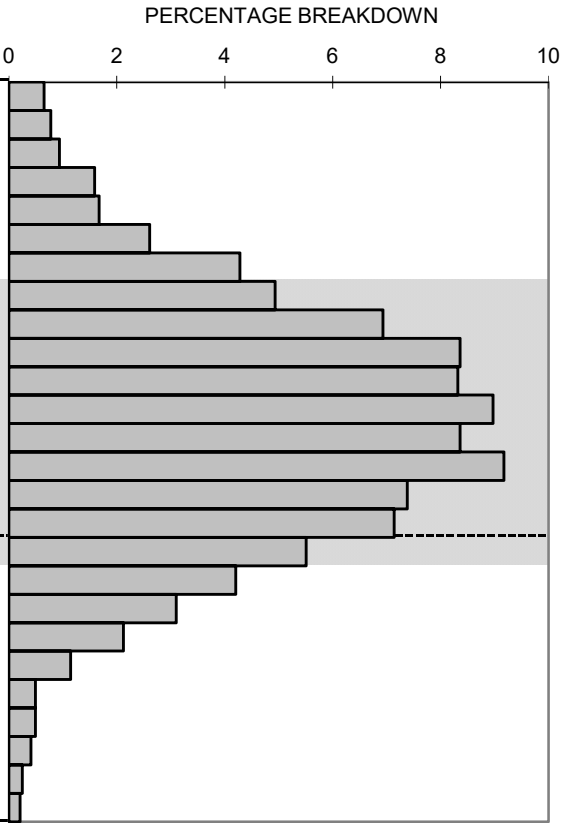
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 40
DIRECTION: EB and WB

LOCATION: 53rd St. North 500' East of Rock Rd.
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
25	16	16	0.7
26	19	35	1.4
27	23	58	2.4
28	39	97	4.0
29	41	138	5.6
30	64	202	8.2
31	105	307	12.5
32	121	428	17.5
33	170	598	24.4
34	205	803	32.7
35	204	1007	41.1
36	220	1227	50.0
37	205	1432	58.4
38	225	1657	67.6
39	181	1838	75.0
40	175	2013	82.1
41	135	2148	87.6
42	103	2251	91.8
43	76	2327	94.9
44	52	2379	97.0
45	28	2407	98.2
46	12	2419	98.7
47	12	2431	99.1
48	10	2441	99.6
49	6	2447	99.8
50	5	2452	100.0



AVERAGE SPEED = 36.5
50th PERCENTILE = 36.
85th PERCENTILE = 40.5
90th PERCENTILE = 41.6
95th PERCENTILE = 43.

PACE = 32 - 41
VEHICLES IN PACE = 1841
% IN PACE = 75.1
% BELOW PACE = 12.5
% ABOVE PACE = 12.4

SAMPLE VARIANCE = 19.1909398
STANDARD DEVIATION = 4.3807465
RANGE 1*S = 69.57586
RANGE 2*S = 95.79935
RANGE 3*S = 99.79609

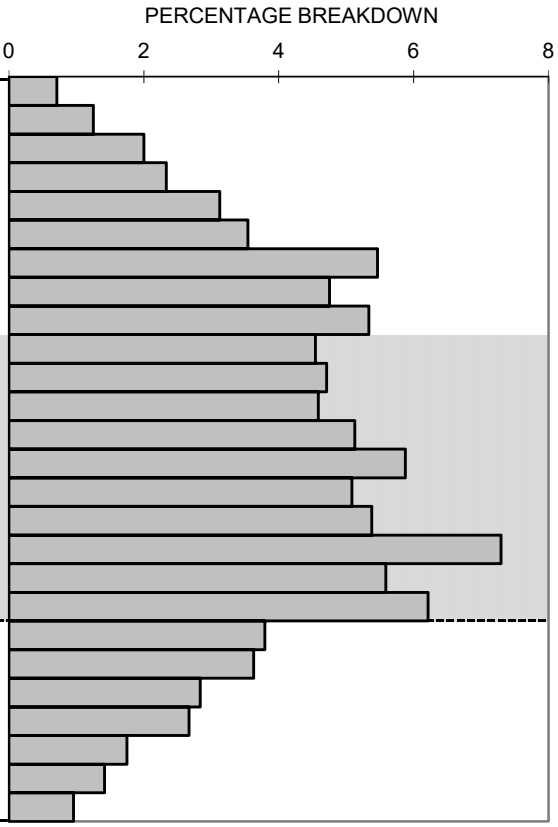
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 45
DIRECTION: NB and SB

LOCATION: Rock Road 300' South of 53rd St. North
TIME START: 12:00 AM
TIME END: 11:59 PM

SPEED	FREQUENCY	ACUM TOTAL	ACUM %
30	17	17	0.7
31	30	47	2.0
32	48	95	4.0
33	56	151	6.3
34	75	226	9.4
35	85	311	13.0
36	131	442	18.4
37	114	556	23.2
38	128	684	28.5
39	109	793	33.1
40	113	906	37.8
41	110	1016	42.4
42	123	1139	47.5
43	141	1280	53.4
44	122	1402	58.5
45	129	1531	63.8
46	175	1706	71.1
47	134	1840	76.7
48	149	1989	82.9
49	91	2080	86.7
50	87	2167	90.4
51	68	2235	93.2
52	64	2299	95.9
53	42	2341	97.6
54	34	2375	99.0
55	23	2398	100.0



AVERAGE SPEED = 42.6
50th PERCENTILE = 42.4
85th PERCENTILE = 48.5
90th PERCENTILE = 49.9
95th PERCENTILE = 51.7

PACE = 39 - 48
VEHICLES IN PACE = 1305
% IN PACE = 54.4
% BELOW PACE = 28.5
% ABOVE PACE = 17.1

SAMPLE VARIANCE = 34.8949886
STANDARD DEVIATION = 5.907198
RANGE 1*S = 64.51209
RANGE 2*S = 98.33195
RANGE 3*S = 100.

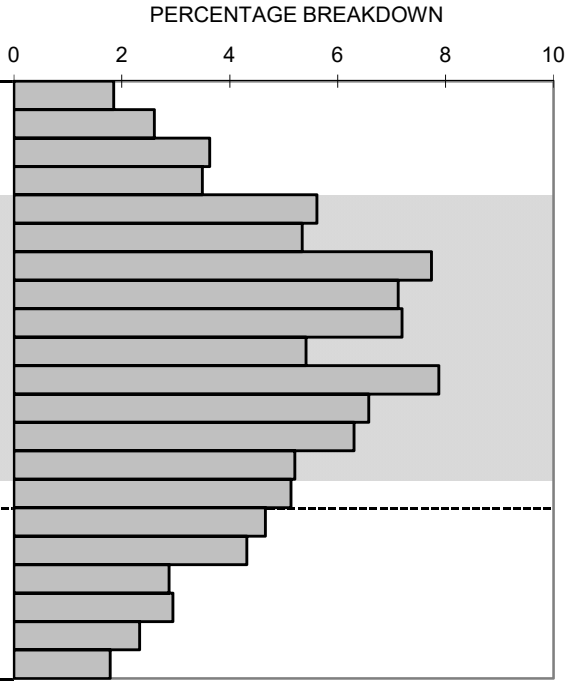
SPOT SPEED STUDY RESULTS
RELATIVE FREQUENCY DISTRIBUTION

CITY: Bel Aire
OBSERVER: Machine
DATE: 3/31/2021

COUNTY: Sedgwick
SPEED LIMIT: 40
DIRECTION: EB and WB

LOCATION: 53rd St. North 600' West of Rock Rd.
TIME START: 12:00 AM
TIME END: 11:59 PM

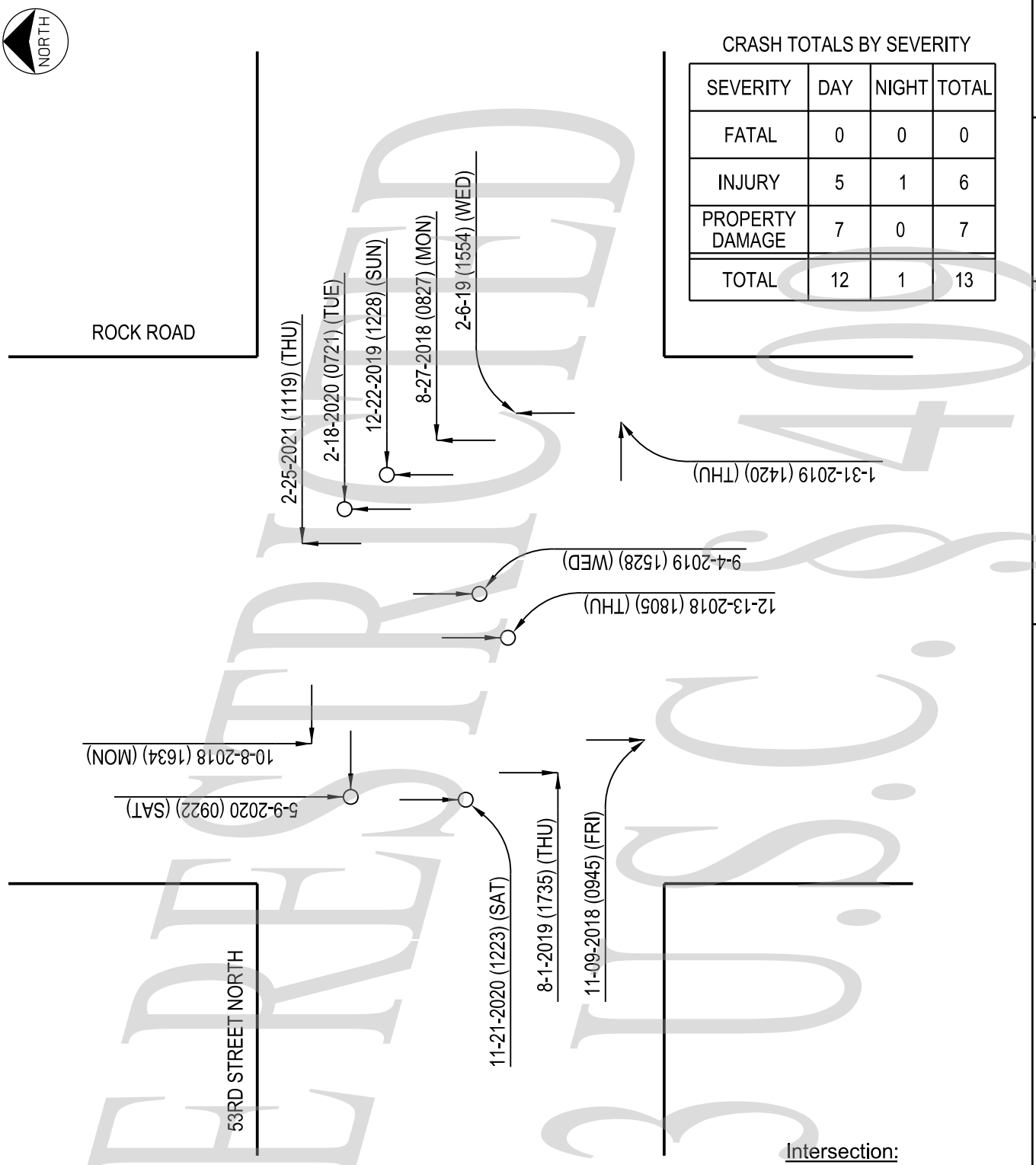
SPEED	FREQUENCY	ACUM TOTAL	ACUM %
35	27	27	1.8
36	38	65	4.5
37	53	118	8.1
38	51	169	11.6
39	82	251	17.2
40	78	329	22.5
41	113	442	30.3
42	104	546	37.4
43	105	651	44.6
44	79	730	50.0
45	115	845	57.9
46	96	941	64.5
47	92	1033	70.8
48	76	1109	76.0
49	75	1184	81.1
50	68	1252	85.8
51	63	1315	90.1
52	42	1357	92.9
53	43	1400	95.9
54	34	1434	98.2
55	26	1460	100.0



AVERAGE SPEED = 44.6
50th PERCENTILE = 44.
85th PERCENTILE = 49.8
90th PERCENTILE = 51.
95th PERCENTILE = 52.7

PACE = 39 - 48
VEHICLES IN PACE = 940
% IN PACE = 64.4
% BELOW PACE = 11.6
% ABOVE PACE = 24.

SAMPLE VARIANCE = 24.7080643
STANDARD DEVIATION = 4.9707207
RANGE 1*S = 63.90411
RANGE 2*S = 98.21918
RANGE 3*S = 100.



CRASH TOTALS BY SEVERITY

SEVERITY	DAY	NIGHT	TOTAL
FATAL	0	0	0
INJURY	5	1	6
PROPERTY DAMAGE	7	0	7
TOTAL	12	1	13

LEGEND

- FATALITY
- PERSONAL INJURY
- REAR END COLLISION
- SIDE SWIPE COLLISION
- OUT OF CONTROL
- MOTOR VEHICLE BACKING
- UNINVOLVED VEHICLE
- P — PEDESTRIAN
- B — BICYCLE
- FIXED OBJECT

Intersection:

Rock Rd & 53rd St. North

City / State:

Bel Aire, Kansas

Time Period:

From: 1-1-2018

To: 3-1-2021

COLLISION DIAGRAM
ROCK ROAD AND 53RD STREET NORTH

Intersection Analyses
Bel Aire, Kansas

August 2021
No Scale

Figure A-19

TranSystems

$FILE1$

Traffic Signal Warrant Analysis

Bel Aire TEAP

Bel Aire, Kansas

Location: **Woodlawn Boulevard & 53rd Street North**

Period From	Period To	Approach to Intersection: Woodlawn Boulevard NB	Woodlawn Boulevard SB	53rd Street North EB	53rd Street North WB	NB +SB	EB +WB	TOTAL
0:00	1:00	2	2	0	3	4	3	7
1:00	2:00	3	2	1	1	5	2	7
2:00	3:00	2	3	2	1	5	3	8
3:00	4:00	2	3	5	0	5	5	10
4:00	5:00	3	6	3	1	9	4	13
5:00	6:00	17	9	9	6	26	15	41
6:00	7:00	54	27	25	54	81	79	160
7:00	8:00	155	119	86	64	274	150	424
8:00	9:00	179	116	66	57	295	123	418
9:00	10:00	72	57	46	41	129	87	216
10:00	11:00	80	81	32	35	161	67	228
11:00	12:00	92	68	38	33	160	71	231
12:00	13:00	117	100	48	40	217	88	305
13:00	14:00	115	81	38	42	196	80	276
14:00	15:00	117	93	39	104	210	143	353
15:00	16:00	177	110	65	66	287	131	418
16:00	17:00	228	136	72	112	364	184	548
17:00	18:00	157	118	68	143	275	211	486
18:00	19:00	120	64	44	45	184	89	273
19:00	20:00	93	73	20	35	166	55	221
20:00	21:00	72	58	21	28	130	49	179
21:00	22:00	35	13	9	10	48	19	67
22:00	23:00	12	9	6	5	21	11	32
23:00	0:00	4	5	4	3	9	7	16

EIGHT-HOUR VEHICULAR VOLUME WARRANT

Condition A: NB+SB> 350	Condition A: EB or WB> 105	Condition A: Both	Condition B: NB+SB> 525	Condition B: EB or WB> 53	Condition B: Both
					X
					X
					X
					X
					X
X	X	X			X
	X				X
1	2	1	0	7	0
Condition A NOT Met			**Condition B NOT Met**		

Peak Hour Totals:

A.M.							
Period Start	8:15	7:15	7:15	6:45	8:00	7:30	7:15
Hour Volume	185	133	99	86	295	160	433
Noon							
Period Start	12:30	12:00	12:00	13:45	12:00	13:30	13:45
Hour Volume	118	100	48	94	217	133	333
P.M.							
Period Start	15:45	16:00	15:15	16:45	15:45	16:30	15:45
Hour Volume	253	136	77	144	384	213	557
Evening							
Period Start	20:00	20:00	20:00	20:00	20:00	20:00	20:00
Hour Volume	72	58	21	28	130	49	179
Daily							
Period Start	15:45	16:00	7:15	16:45	15:45	16:30	15:45
Hour Volume	253	136	99	144	384	213	557

Values used to set warrant thresholds:

Lanes on major st.	**1**
Lanes on minor st.	**1**
Population<10,000 or Speed>40 mph?	**TRUE**
(if TRUE reduce thresholds to 70%)	

Condition A

Lanes Major	Lanes Minor	Total Volume Major St.	Higher Volume Minor Street
1	1	500	150
2+	1	600	150
2+	2+	600	200
1	2+	500	200

Condition B

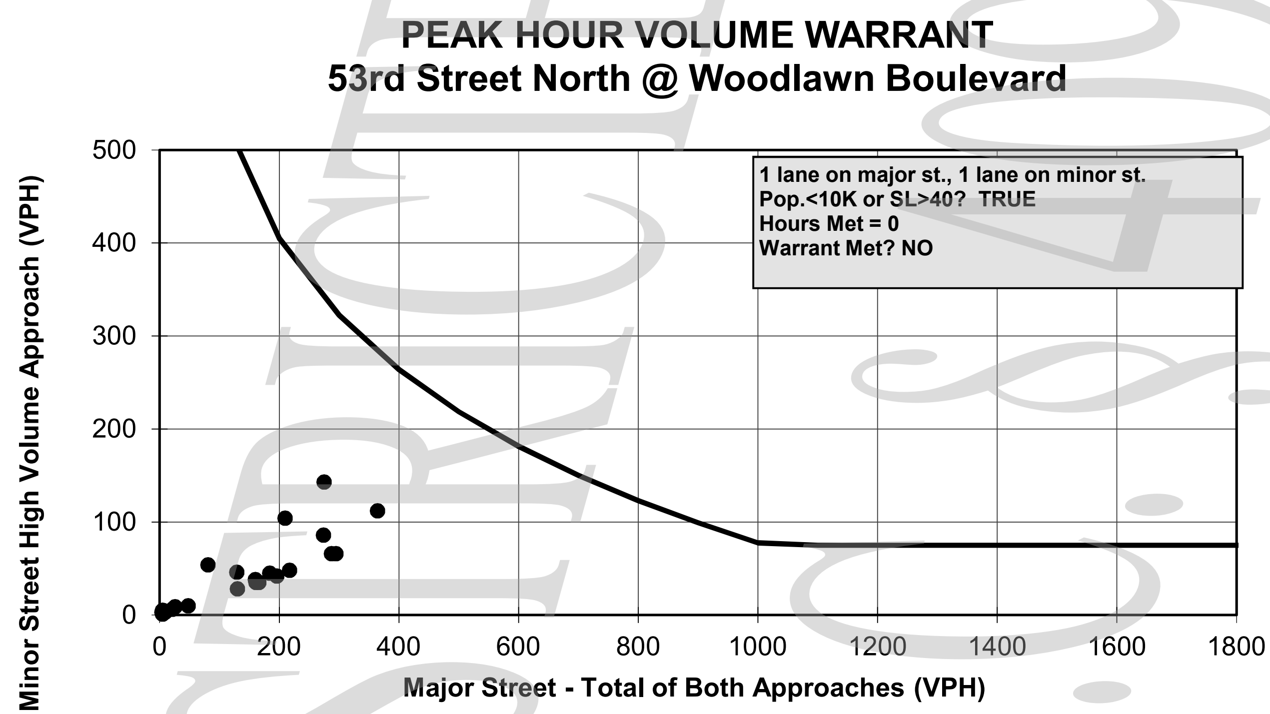
Lanes Major	Lanes Minor	Total Volume Major St.	Higher Volume Minor Street
1	1	750	75
2+	1	900	75
2+	2+	900	100
1	2+	750	100

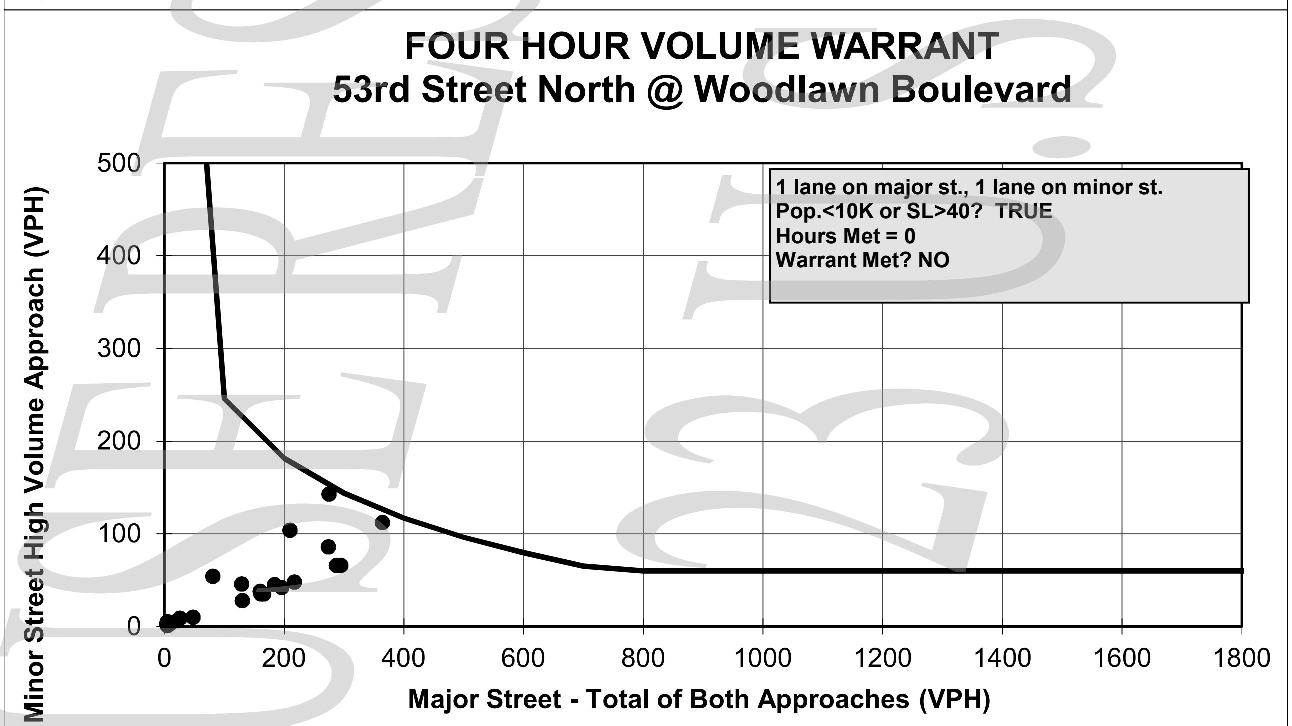
Approach	Start:	Day	Date	Time	Totals	Ref. #
Northbound		Wed	3/31/2021	0:00	1,908	1
Southbound		Wed	3/31/2021	0:00	1,353	2
Eastbound		Wed	3/31/2021	0:00	747	3
Westbound		Wed	3/31/2021	0:00	929	4

Approaches	Totals
NB+SB	3,261
EB+WB	1,676
Intersection	4,937

Traffic Signal Warrant Analysis
Bel Aire TEAP
Bel Aire, Kansas

Location: **Woodlawn Boulevard & 53rd Street North**





Traffic Signal Warrant Analysis
Bel Aire TEAP
Bel Aire, Kansas

Location: **Rock Road & 53rd Street North**

EIGHT-HOUR VEHICULAR VOLUME WARRANT

Period		Approach to Intersection							Condition A			Condition B		
		Rock Road		53rd Street North		NB	EB		NB+	EB or		NB+	EB or	
From	To	NB	SB	EB	WB	+SB	+WB	TOTAL	SB> 350	WB> 105	Both	SB> 525	WB> 53	Both
0:00	1:00	12	5	1	3	17	4	21						
1:00	2:00	6	3	0	0	9	0	9						
2:00	3:00	3	2	2	2	5	4	9						
3:00	4:00	5	3	6	4	8	10	18						
4:00	5:00	8	11	2	5	19	7	26						
5:00	6:00	14	15	5	13	29	18	47						
6:00	7:00	99	46	25	107	145	132	277		X			X	
7:00	8:00	99	94	58	112	193	170	363		X			X	
8:00	9:00	111	96	57	79	207	136	343					X	
9:00	10:00	85	84	39	55	169	94	263					X	
10:00	11:00	89	84	26	56	173	82	255					X	
11:00	12:00	110	92	34	58	202	92	294					X	
12:00	13:00	122	92	30	71	214	101	315					X	
13:00	14:00	126	82	28	57	208	85	293					X	
14:00	15:00	115	131	43	141	246	184	430		X			X	
15:00	16:00	163	96	53	112	259	165	424		X			X	
16:00	17:00	183	121	80	128	304	208	512		X			X	
17:00	18:00	190	125	69	142	315	211	526		X			X	
18:00	19:00	145	78	36	80	223	116	339					X	
19:00	20:00	130	76	28	61	206	89	295					X	
20:00	21:00	110	56	21	40	166	61	227						
21:00	22:00	77	32	15	21	109	36	145						
22:00	23:00	38	23	10	8	61	18	79						
23:00	0:00	20	9	3	8	29	11	40						
									0	6	0	0	14	0
									Condition A NOT Met			Condition B NOT Met		

Peak Hour Totals:

	NB	SB	EB	WB	NB+SB	EB+WB	TOTAL
A.M.							
Period Start	6:30	7:30	7:15	6:30	7:30	6:30	6:45
Hour Volume	127	117	66	153	222	189	387
Noon							
Period Start	12:15	13:45	13:45	13:45	13:45	13:45	13:45
Hour Volume	137	130	42	130	250	172	422
P.M.							
Period Start	16:45	14:15	16:00	16:30	16:30	16:15	16:30
Hour Volume	208	133	80	153	337	223	555
Evening							
Period Start	20:00	20:00	20:00	20:00	20:00	20:00	20:00
Hour Volume	110	56	21	40	166	61	227
Daily							
Period Start	16:45	14:15	16:00	6:30	16:30	16:15	16:30
Hour Volume	208	133	80	153	337	223	555

Values used to set warrant thresholds:

Lanes on major st.	1
Lanes on minor st.	1
Population<10,000 or Speed>40 mph?	TRUE
(if TRUE reduce thresholds to 70%)	

Condition A

Lanes Major	Lanes Minor	Total Volume Major St.	Higher Volume Minor Street
1	1	500	150
2+	1	600	150
2+	2+	600	200
1	2+	500	200

Condition B

Lanes Major	Lanes Minor	Total Volume Major St.	Higher Volume Minor Street
1	1	750	75
2+	1	900	75
2+	2+	900	100
1	2+	750	100

Approach	Start: Day	Date	Time	Totals	Ref. #
Northbound	Wed	3/31/2021	0:00	2,060	1
Southbound	Wed	3/31/2021	0:00	1,456	2
Eastbound	Wed	3/31/2021	0:00	671	3
Westbound	Wed	3/31/2021	0:00	1,363	4

Approaches	Totals
NB+SB	3,516
EB+WB	2,034
Intersection	5,550

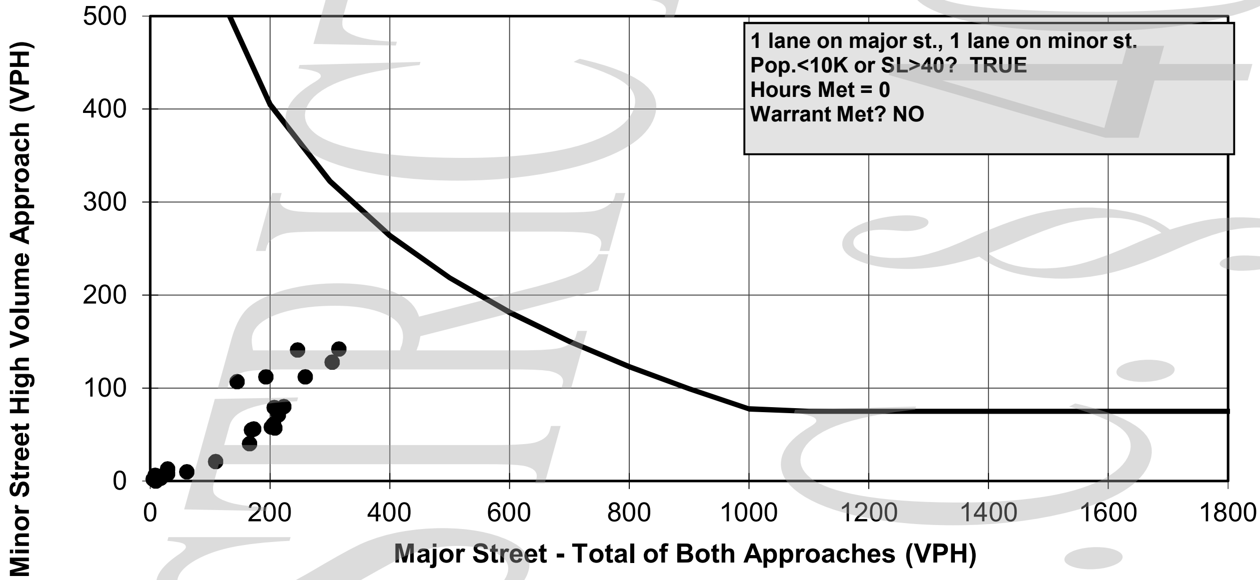
Traffic Signal Warrant Analysis

Bel Aire TEAP

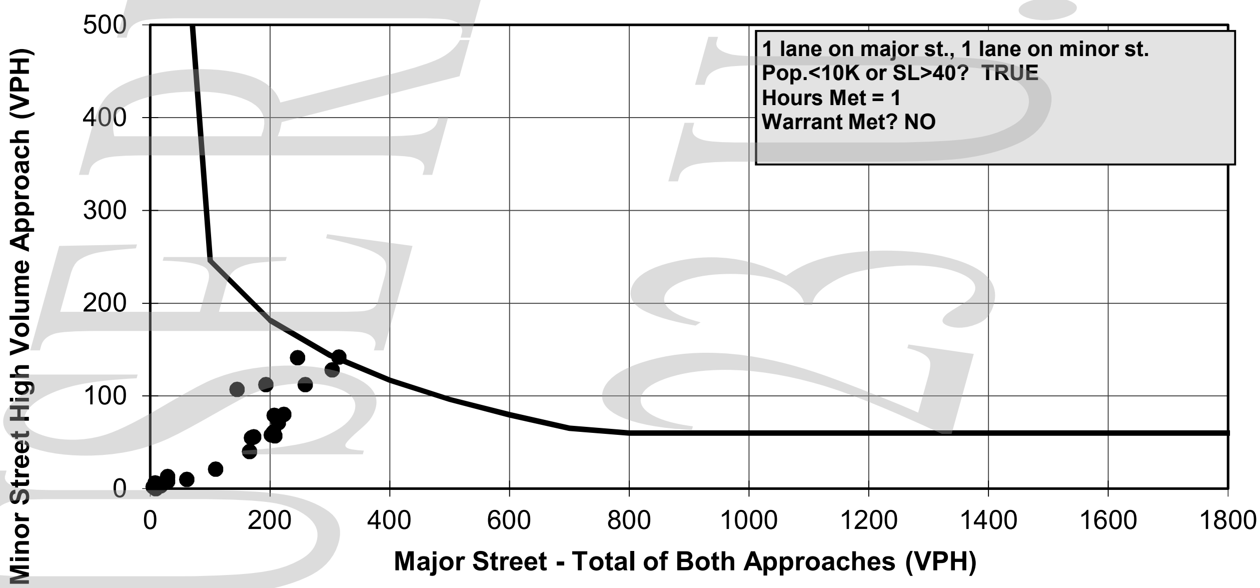
Bel Aire, Kansas

Location: **Rock Road & 53rd Street North**

PEAK HOUR VOLUME WARRANT
53rd Street North @ Rock Road



FOUR HOUR VOLUME WARRANT
53rd Street North @ Rock Road



TEAP STUDY QUESTIONNAIRE

County: _____ City: _____

Location: _____

Submitted by: _____

The Kansas Department of Transportation would appreciate your comments concerning the Traffic Engineering Assistance Program (TEAP). Your comments will be useful in evaluating the effectiveness of the program. A questionnaire is provided below and can be returned by email or mailing to the address below.

1. Did the study address the issues identified in your TEAP application? Yes No

2. Which of the Recommendations have been or will be implemented?

   Low-cost Medium-Cost Project Behavioral

   Specifically what was implemented: _____
   _____
   _____
   _____

   If none, why not? _____
   _____
   _____

3. Would you use the TEAP program again? Yes No

   Why or why not? _____
   _____
   _____

Please add any additional comments you may have. _____
_____
_____
_____
_____

Return to: Bureau of Local Projects
Kansas Department of Transportation
Eisenhower State Office Building
700 SW Harrison, 7th Floor
Topeka, KS 66603-3745
Phone: (785) 296-3861
E-mail address: KDOT.LPePlans@ks.gov