

MISSOURI TRAFFIC ENGINEERING ASSISTANCE PROGRAM

INTERSECTION ANALYSES Crooked Road and National Drive

Prepared for
CITY OF PARKVILLE

By



April 2019



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April 11, 2019

Ms. Aysen Abel, P.E.
Director of Public Works
8880 Clark Ave
Parkville, MO 64152

Re: **Intersection Analyses
Crooked Road and National Drive
Parkville, Missouri**


Dear Ms. Abel:

In accordance with your request, TranSystems Corporation has prepared the following analyses for the Crooked Road at River Hills/National Drive and the National Drive at River Hills/National Drive intersections in Parkville, Missouri. In general, the study focused on a review of the operational and safety conditions as well as a sight distance review at each intersection to determine improvement recommendations to address existing deficiencies. The review also included traffic volume projections for when the nearby residential development is fully built out. Our data collection efforts, results, and recommendations are summarized in the attached report.

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

Sincerely,

TranSystems

By: 
Addison Miller, EIT

By: 
Jeffrey J. Wilke., PE, PTOE

JJW:ARM:P101180266

Introduction

TranSystems Corporation has prepared the following analyses for the Crooked Road at River Hills/National Drive and the National Drive at River Hills/National Drive intersections in Parkville, Missouri. In general, the study focused on a review of the operational and safety conditions at the intersections to determine improvement recommendations to address any existing deficiencies. The review also included traffic volume projections for conditions when the nearby residential development is completed. The study intersection locations and surrounding street system are shown on Figure 1. This study was requested by Ms. Alysén Abel, Director of Public Works, under the Traffic Engineering Assistance Program (TEAP), administered by the Missouri Department of Transportation (MoDOT).

Study Purpose

City staff is concerned about safety and operations at the two study intersections as traffic volumes in the area increase due to nearby residential home development. Concerns have also been expressed that sight distances may be limited due to obstructions and/or the vertical curvature of the roadway. City staff would also like a recommendation for long-term intersection control at the National Drive at River Hills/National Drive intersection.

As a result of these concerns, the city has requested a review of the existing intersection conditions to determine mitigation measures that address existing safety and operational deficiencies observed, as well as any projected deficiencies once the nearby residential development is completed.

Scope of Study



The following program was developed to complete the analysis:

1. Conduct manual traffic volume and pedestrian counts at the study intersections during typical weekday morning and afternoon peak periods (7-9 A.M. and 3-6 P.M.).
2. Conduct 24-hour traffic volume counts for each of the intersection approaches over a typical weekday period.
3. Review recent crash experience at the study intersections and evaluate using Highway Safety Manual (HSM) procedures.
4. Inventory existing signing and pavement markings to document all traffic control devices.
5. Measure and evaluate intersection sight distances. The evaluation is based on criteria in *A Policy on Geometric Design of Highways and Streets* (2011 Edition), also referred to as the AASHTO Green Book) published by the American Association of State Highway and Transportation Officials (AASHTO).
6. Conduct level of service analyses to evaluate existing intersection operations and the operational impacts of added residential development traffic.
7. Identify potential operational and safety improvements for the intersections based on findings from the data collection. Options to address deficiencies could include modifications to the existing intersection control, modifications to the existing signage, or use of other traffic control devices such as flashing beacons. Geometric modifications may be considered as well.
8. Prepare a report documenting our data collection, analysis, and recommendations.

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 Missouri.

LEGEND

-  - STUDY INTERSECTION
-  - FUTURE RESIDENTIAL DEVELOPMENT AREA

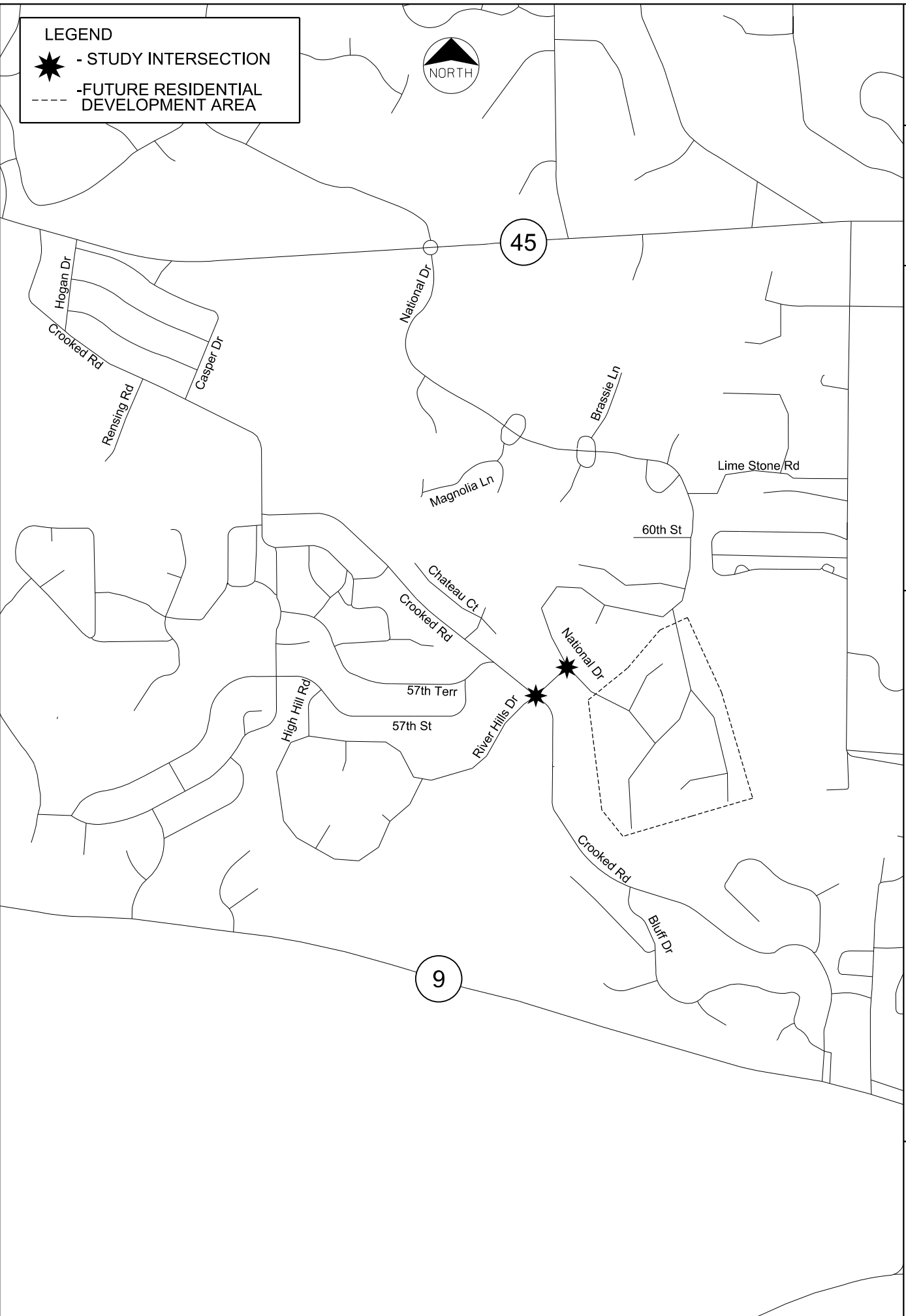


Figure 1

April 2019
No Scale

Intersection Analyses
Crooked Road and National Drive
Parkville, MO

LOCATION MAP



Intersection Characteristics

An aerial photo of the study intersections that includes roadway widths and existing traffic control is included in the Appendix (Figure A-1). Some pertinent characteristics of the intersections recorded at the time of the site investigation are listed below:

- Crooked Road is a northwest/southeast aligned two-lane secondary arterial roadway. There are curbs and gutters along each side of the street near the study intersection, and a posted speed limit of 25 m.p.h. There is no sidewalk along Crooked Road. Beginning approximately 165 feet north of River Hills/National Drive, Crooked Road begins to narrow and no longer has curb. Similarly, south of River Hills/National Drive approximately 750 feet, Crooked Road narrows and no longer has curb. North of River Hills/National Drive, there is an uphill vertical grade when traveling southbound. South of River Hills/National Drive, the roadway is generally level. For the purpose of this study, the directions of travel along Crooked Road will be referred to as either north or south.
- River Hills/National Drive is a northeast/southwest aligned two-lane roadway. There are curbs and gutters along each side of the street with sidewalk along the south side, west of Crooked Road. There is no posted speed limit. To the west of Crooked Road, this street is named River Hills Drive and is classified as a local street. Approximately 165 feet east of Crooked Road, the street intersects with National Drive. This eastern street segment is also named National Drive. To the east and west of Crooked Road, there is an uphill vertical grade when traveling eastbound or westbound toward Crooked Road. For the purpose of this study, the directions of travel along these segments of River Hills/National Drive will be referred to as either east or west.
- National Drive is a northwest/southeast aligned two-lane collector roadway at the intersection with River Hills/National Drive. There are curbs and gutters along each side of the street and a posted speed limit of 25 m.p.h. There is sidewalk along each side of the road south of the intersection, but only along the west side of the road north of the intersection. To the north and south of River Hills/National Drive, there is a slight uphill vertical grade along National Drive when approaching River Hills/National Drive. For the purpose of this study, the directions of travel along National Drive will be referred to as either north or south.
- As shown on Figure A-1, the only pavement markings in the study area are centerline markings along Crooked Road, a stop line for eastbound River Hills Drive and edge line markings on Crooked Road north of the study intersections. Most pavement markings, at and near the intersection, appeared to be in relatively good condition at the time of the site investigation (February 2019). The stop line for eastbound River Hills Drive is visible but is beginning to fade.
- Several signs were identified in the vicinity of the study intersections that are not installed in conformance with criteria set forth in the most recent edition of the MUTCD. These deficiencies, including incorrect sign sizes and mounting heights, are summarized below:
 - As shown on Figure A-1, there are Intersection Warning signs (MUTCD No. W2-1, 24" x 24" size) posted north and south of the Crooked Road and River Hills/National Drive intersection. This sign size is less than the standard size stated in the MUTCD. The standard size for this sign on this type of roadway is 30" x 30". The longitudinal placement and mounting heights of these signs meet MUTCD standards.
 - The Yield signs (MUTCD No. R1-2, 30" x 30" x 30" size) posted for motorists on National Drive are less than the standard size stated in the MUTCD. The standard size for this sign on this type of roadway is 36" x 36" x 36". The longitudinal placement and mounting heights of these signs meet MUTCD standards.
 - The Stop signs (MUTCD No. R1-1, 30" x 30" size) posted for motorists approaching Crooked Road meet MUTCD criteria for size and placement, but the eastbound sign on the west side of the Crooked Road and River Hills/National Drive intersection is mounted below the minimum height stated in the MUTCD. The minimum height measured vertically from the bottom of the sign to the top of the curb should be 7 feet, but the current height is approximately 3 feet.

Machine Traffic Volume Counts

Machine traffic volume counters were placed on each approach to the study intersections to determine traffic flow characteristics along these streets over a typical day. The counters were in place for a between Monday, February 25, 2019, and Wednesday, February 27, 2019. The counts for each approach have been summarized in 15-minute intervals by direction of travel and are included in the Appendix (Pages A-2 to A-7). A summary of the 24-hour traffic volumes recorded at each of the counter locations is shown in Table 1.

Intersection	Northbound	Southbound	Eastbound	Westbound	Total
Crooked Road & River Hills/National Drive	1,033	1,061	358	653	3,105
National Drive & River Hills/National Drive	53	635	600	---	1,288

Spot Speed Study

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 is generally regarded as the speed considered reasonable or appropriate by most drivers. For Crooked Road, a spot speed study was conducted for vehicles north and south of the intersection with River Hills/National Drive by using the speed recording function of the machine traffic counters. The results of the study are shown below in Table 2. Relative frequency distributions for the data have also been prepared and are included in the Appendix (Pages A-8 and A-9)

Intersection Approach	Number of Observations	85th Percentile Speed, m.p.h.
Northbound Crooked Road	1,579	33.6
Southbound Crooked Road	2,073	35.1

The 85th percentile speeds shown in Table 2 indicate that drivers approaching the Crooked Road and River Hills/National Drive intersection generally travel at speeds between 33 and 35 m.p.h., which is well above the existing posted speed limit (25 m.p.h.). These findings suggest that analysis of the intersection should be based on an 85th percentile speed of 35 m.p.h. rather than the 25 m.p.h. posted speed limit on Crooked Road.

Manual Traffic Volume Counts

TranSystems conducted manual turning movement counts at both study intersections on Tuesday, February 26, 2019, during the morning (7:00 to 9:00 a.m.) and during the afternoon (3:00 to 6:00 p.m.) The counts provided us with the current peak hour turning movement patterns at the intersections on a typical weekday and have been illustrated in the Appendix (Figure A-10). Pedestrian patterns were also observed during the peak hours. Some findings and other observations made during the count periods are summarized below:

- In general, very few queues were observed on the stop-sign controlled approaches during either count period. A maximum queue of 3 vehicles was observed. No queues were observed at the yield controlled approaches.

- Traffic volumes during the A.M. peak hour were heaviest in the southbound direction at the Crooked Road and River Hills/National Drive intersection and eastbound at the National Drive and River Hills/National Drive intersection. This is consistent with commuter traffic leaving residential areas.
- Traffic volumes during the P.M. peak hour were heaviest in the northbound direction at the Crooked Road and River Hills/National Drive intersection and southbound at the National Drive and River Hills/National Drive intersection. This is consistent with commuter traffic returning to residential areas.
- Almost all traffic during both peak periods at the National Drive and River Hills/National Drive intersection traveled to/from the north and west directions. There are currently very few houses south of this intersection along National Drive, which results in a low volume of vehicles.
- Pedestrian volumes were low during both count periods. Only one pedestrian was observed during the morning count period and two during the afternoon count period at the Crooked Road and River Hills/National Drive intersection. These pedestrians were exercising adults. No pedestrians were observed at the National Drive and River Hills/National Drive intersection.
- Traffic along National Drive at the National Drive and River Hills/National Drive intersection was observed to come to either a complete stop or nearly a complete stop a majority of the time, even though the posted yield signs do not require a stop.
- Westbound right-turning traffic along River Hills/National Drive appeared to have little difficulty viewing traffic along Crooked Road before completing their maneuver. Left-turning and through movement traffic were observed to pull farther forward, closer to the intersection, in order to view any conflicting traffic.

Intersection Sight Distance

Intersection sight distance is provided at intersections to allow drivers to perceive the presence of potentially conflicting vehicles. The driver of a vehicle approaching an intersection should have an unobstructed view of the entire intersection, including any traffic control devices, and sufficient lengths along the intersecting roadway to permit the driver to anticipate and avoid potential collisions. In stop-controlled conditions, a driver must have sufficient sight distance to depart from their approach and enter or cross the major road. For yield-controlled conditions, a driver must have sufficient sight distance in order to complete their maneuver without stopping, assuming the driver slows as they approach the intersection.

Intersection sight distances along Crooked Road for the River Hills/National Drive approaches, as well as all three approaches at the National Drive and River Hills/National Drive approaches were measured in accordance with AASHTO Green Book criteria. Sight distances along Crooked Road for the yield controlled condition were not measured as a cursory observation showed that sight distance would fall well below the recommended distances. The intersection sight distances measured for each approach are shown in Table 3.

**Table 3
Intersection Sight Distances**

Approach	Street	Direction Looking	Sight Distance, feet			
			Stop Controlled		Yield Controlled	
			Measured	Recommended	Measured	Recommended
EB	River Hills/National Dr at Crooked Rd	North	485	390	N/A	N/A
		South	420	390		
WB	River Hills/National Dr at Crooked Rd	North	450	390	N/A	N/A
		South	800	390		
EB	River Hills/National Dr at National Rd	North	315	280	250	295
		South	>1000	280	160	295
NB	National Dr at River Hills/National Dr	West	185	280	185	295
SB	National Dr at River Hills/National Dr	West	185	280	185	295

The eastbound approach looking to the south and the westbound approach looking to the north for the River Hills/National Drive and Crooked Road intersection were measured from a closer location to the edge of Crooked Road than the AASHTO recommended distance. This was due to observations of driver behavior showing that motorists looking along Crooked Road in these directions in order to make a left-turn or crossing maneuver would generally stop their vehicles closer to the intersection than those making a right-turn maneuver. There is a decorative fence in the northeast quadrant and several trees and bushes in the southwest quadrant that would obstruct the view of left-turning and crossing vehicles if drivers stopped further from the intersection.

The data in Table 3 indicates that the measured intersection sight distances for most approaches exceed the recommended AASHTO values. The exceptions are the National Drive approaches to River Hills/National Drive. Because of the vertical profile of River Hills/National Drive, drivers on National Drive cannot see further than Crooked Road, which is a shorter distance than recommended by AASHTO. However, drivers are likely driving less than 25 m.p.h. on this short street segment.

Vehicle Delays

Delay is an average measure of the time a vehicle is standing still while waiting in the approach to an intersection. A high level of delay can result in increased travel time, excessive fuel consumption, driver discomfort and frustration. Level of service (LOS) describes the quality of traffic operating conditions at an intersection based on delay, and is rated from "A" to "F". LOS A represents the most desirable condition with free-flow movement of traffic and minimal delays. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in the average stopped delay per vehicle. Table 4 shows the upper limit of delay associated with each level of service for unsignalized intersections.

Level of Service (LOS)	Unsignalized
A	≤ 10 Seconds
B	≤ 15 Seconds
C	≤ 25 Seconds
D	≤ 35 Seconds
E	≤ 50 Seconds
F	> 50 Seconds

Delay at the study intersections was calculated using *Highway Capacity Manual* methods and the Synchro analysis program. This program uses a complex function that depends on a number of variables. Synchro input data included the traffic volumes and lane configurations that were collected. The average delay per vehicle and the corresponding levels of service during the peak hours are summarized in Table 5. The detailed outputs from the Synchro analysis for the existing conditions are included in the Appendix (Pages A-12 to A-15).

Table 5
Intersection Operational Analysis
Existing Conditions

Intersection <i>Movement</i>	A.M. Peak Hour		P.M. Peak Hour	
	LOS ¹	Delay ²	LOS ¹	Delay ²
Crooked Rd. and River Hills/National Dr.				
<i>Northbound Left-Turn</i>	A	7.4	A	7.4
<i>Southbound Left-Turn</i>	A	7.3	A	7.6
<i>Eastbound</i>	A	9.8	B	10.6
<i>Westbound</i>	B	10.2	B	10.3
National Dr. and River Hills/National Dr.				
<i>Northbound</i>	A	9.8	A	0.0
<i>Southbound</i>	A	8.5	A	8.6

1 – Level of Service

2 – Delay in seconds per vehicle

The results of the analysis shown in Table 5 indicate that during the peak hours, the intersections currently operate with excellent levels of service during both peak hours with a minimal amount of delay. These findings are consistent with our observations of minimal queueing and little to no delays.

Crash Experience

Crash records for the area surrounding the two study intersections for the time period between January 1, 2015, and December 31, 2018 were requested to identify any crash patterns or tendencies that might exist. During this 36-month analysis period, no crashes were reported at or near the study intersections.

To further evaluate the existing safety characteristics of each intersection, TranSystems used procedures outlined in the Highway Safety Manual (HSM) to determine the predicted average crash frequency (crashes per year) for both locations. This procedure accounts for variables such as the intersection type, if left or right-turn lanes are provided, number of pedestrians and if street lighting is provided, among others. This method indicated a predicted average crash frequency of 0.7 crashes per year for an intersection with similar characteristics to the Crooked Road and River Hills/National Drive intersection and a predicted crash frequency of 0.1 crashes per year for an intersection with similar characteristics to the National Drive and River Hills/National Drive intersection. These findings indicate that the study intersections have experienced fewer crashes during the analysis period than would be expected.

Analysis

Based on the data collected, the study intersections can be described as generally operating safely and efficiently. Vehicle delays and crash frequency are both low. Even so, there were several deficiencies identified during our site visit. These concerns include signing that either doesn't meet MUTCD standards for size or mounting height as well as limited sight distance on the National Drive approaches to River Hills/National Drive. Recommendations have been made to address these deficiencies.

Future Traffic Projections

Due to the ongoing residential construction in the area, a projection of future traffic volumes and patterns was made to include traffic generated from the currently under construction residential units to the south and east of the study area. Trip generation estimates were prepared using the Institute of Transportation Engineer's *Trip Generation* 10th Edition. Table 6 shows the expected trips to be generated by the residential development. Additional information related to trip generation is included in Appendix B.

**Table 6
Development Trip Generation**

Land Use	Intensity	ITE Code	Average Weekday	A.M. Peak Hour			P.M. Peak Hour		
				Total	In	Out	Total	In	Out
Single-Family Detached Housing	58 units	210	630	46	11	35	60	38	22

The estimated trips generated by the residential development were distributed onto the street system based on the trip distributions summarized in Table 7. These distributions are based on existing travel patterns in the area and engineering judgment. The detailed distribution patterns through the study intersections are shown in Appendix B.

**Table 7
Trip Distribution**

Direction To/From	Percentage
North on Crooked Road	25%
South on Crooked Road	25%
East on National Drive	50%
Total	100%

Similar to the existing conditions, the Synchro analysis program was used to determine the average delay per vehicle and corresponding levels of service during the peak hours with the added development traffic. This data is summarized in Table 8. The detailed outputs from the Synchro analysis for the existing plus development conditions are included in the Appendix (Pages A-16 to A-19).

**Table 8
Intersection Operational Analysis
Existing plus Development Conditions**

Intersection <i>Movement</i>	A.M. Peak Hour		P.M. Peak Hour	
	LOS ¹	Delay ²	LOS ¹	Delay ²
Crooked Rd. and River Hills/National Dr.				
<i>Northbound Left-Turn</i>	A	7.4	A	7.4
<i>Southbound Left-Turn</i>	A	7.4	A	7.6
<i>Eastbound</i>	A	9.8	B	10.9
<i>Westbound</i>	B	10.3	B	10.6
National Dr. and River Hills/National Dr.				
<i>Northbound</i>	A	10.0	B	10.4
<i>Southbound</i>	A	8.5	A	8.6

1 – Level of Service

2 – Delay in seconds per vehicle

As shown in the table, all movements at the intersections are projected to operate at the same levels of service as in the Existing Conditions scenario except for northbound National Drive during the P.M. peak hour. This is due to there being no existing traffic along that approach during that time period. All levels of service are projected to continue to be excellent with the addition of residential development traffic.

Intersection Control Recommendations

When determining the need for control signing at the study intersections, important considerations are the sight distance for vehicles approaching the intersection as well as the traffic volumes on each approach. The intersection sight distance data collected as well as traffic volumes show that the current two-way stop control at the Crooked Road and River Hills/National Drive intersection to be the correct form of control. However, the measured sight distances and projected volumes at the National Drive and River Hills/National Drive intersection show that the current form of control may not be appropriate given the sight distance measurements.

As shown in Figure A-11, with the addition of projected development traffic, the combined volumes during the peak hours along each National Drive approach will be larger than the single River Hills/National Drive eastbound approach. Also, typical practice at T-intersections is for the driver on the street which ends to yield right-of-way to vehicles on the through street. These factors as well as limited sight distance for the National Drive approaches indicate National Drive should have the right-of-way and the River Hills/National Drive eastbound approach should be controlled and considered the minor roadway. Based on the measured sight distances show in Table 3, a Stop sign (MUTCD No. R1-1, 30" x 30" size) should be installed on the River Hills/National Drive eastbound approach, and the Yield signs on the National Drive approaches should be removed. Yield sign control is not appropriate for the eastbound approach since there is not enough sight distance to meet the recommended distance in the MUTCD for yield control.

An operational analysis was performed in Synchro using the recommended stop sign control for the eastbound approach at the National Drive and River Hills/National Drive intersection. The results are shown in Table 9. The detailed outputs from the Synchro analysis for these modifications are included in the Appendix (Pages A-20 and A-21).

Table 9
Intersection Operational Analysis
Existing plus Development Conditions, Eastbound Stop Control

Intersection	Movement	A.M. Peak Hour		P.M. Peak Hour	
		LOS ¹	Delay ²	LOS ¹	Delay ²
National Dr. and River Hills/National Dr.	Northbound Left-Turn	A	6.2	A	7.4
	Eastbound	A	9.1	A	9.1

1 – Level of Service
2 – Delay in seconds per vehicle

As shown in Table 9, the National Drive and River Hills/National Drive intersection with the aforementioned change in control is projected to operate more efficiently with slightly less delay than the projected intersection operations under the current form of control, as shown previously in this report in Table 8. Further, many eastbound vehicles were observed slowing significantly at the intersection in order to perform turning movements. Therefore, the change is not expected to have a significant impact on driver patterns or tendencies.

Pavement Marking and Signing Recommendations

As previously stated in the "Intersection Characteristics" section, there were some signing and pavement marking deficiencies observed along the roadway segments near the study intersections. We have prepared Figure 2, which identifies recommended improvements to signing and pavement markings in the area. Most of these improvements are recommended to achieve compliance with the current edition of the MUTCD. These improvements are listed below:

- Replace the current fading stop line pavement marking on eastbound River Hills/National Drive at Crooked Road. Install a new stop line for the westbound approach.
- Replace the existing Intersection Warning signs (MUTCD No. W2-1) with new signs that are the MUTCD standard size (30" x 30") on the northbound and southbound Crooked Road approaches.
- Mount the existing Stop sign (MUTCD No. R1-1, 30" x 30" size) at the MUTCD compliant height of a minimum of 7 feet from the top of the curb for eastbound traffic on River Hills Drive at Crooked Road. The existing sign post will likely need to be replaced to reach the minimum mounting height.



LEGEND

- ▬ Sign
- * Existing Sign (Use in Place)
- ✕ Remove Sign

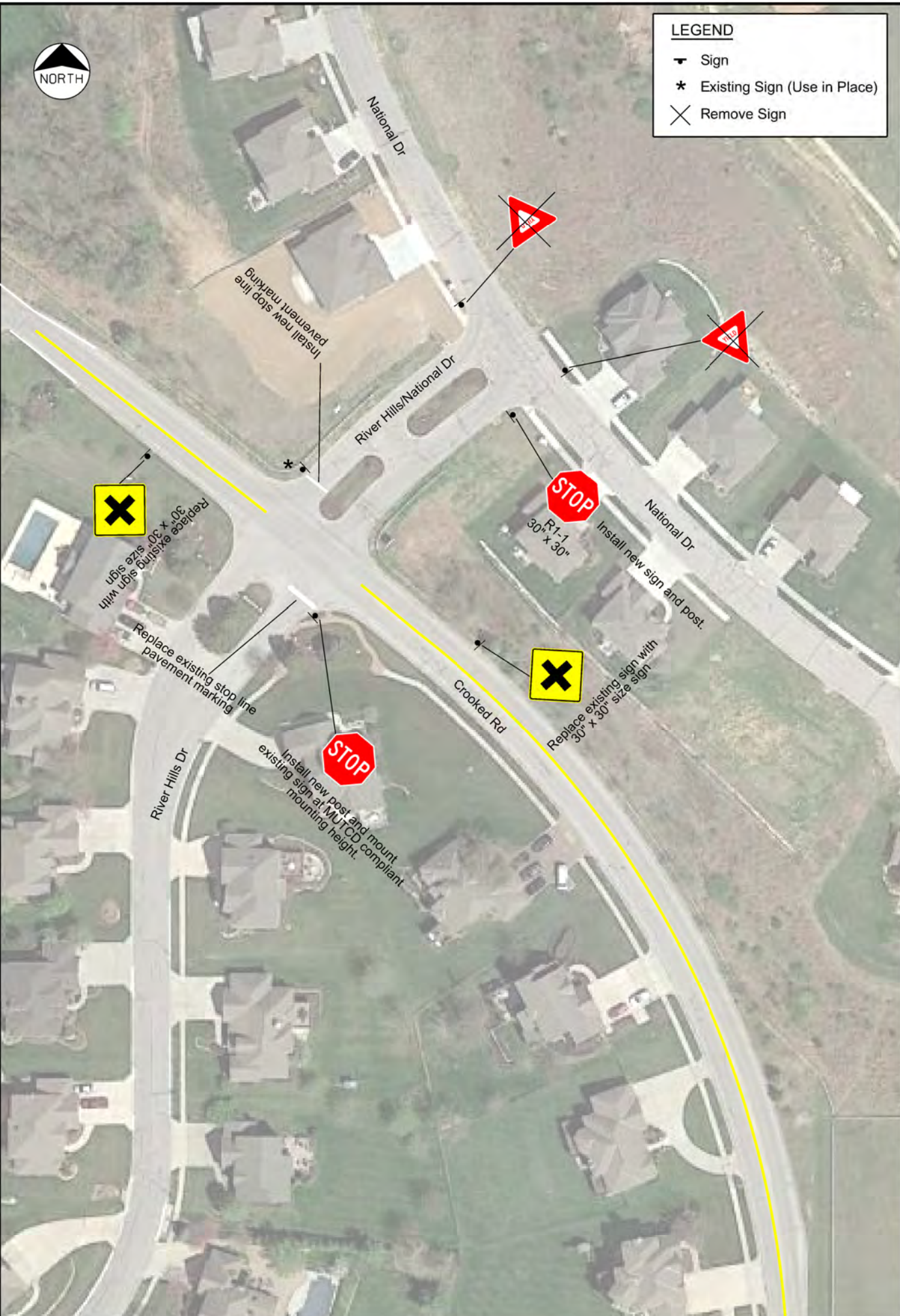


Figure 2

April 2019
No Scale

Intersection Analyses
Parkville, Missouri

PROPOSED IMPROVEMENTS



Conclusion

The above study has focused on a review of the operational and safety conditions at the intersections of Crooked Road and River Hills/National Drive and National Drive and River Hills/National Drive in Parkville, Missouri to determine improvement recommendations that address existing deficiencies. The general procedures and analyses for this study were based on criteria set forth in the AASHTO Green Book as well as 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 Missouri.

Based on the data that were collected, the following signing and pavement marking improvements are recommended at the study intersections:

- Replace the current fading stop line pavement marking of eastbound River Hills/National Drive at Crooked Road and install a new stop line for the westbound approach.
- Replace the existing Intersection Warning signs (MUTCD No. W2-1) with new signs that are the MUTCD standard size (30" x 30") on the northbound and southbound Crooked Road approaches.
- Mount the existing Stop sign (MUTCD No. R1-1, 30" x 30" size) at the MUTCD compliant height of a minimum of 7 feet from the top of the curb for eastbound traffic on River Hills Drive at Crooked Road.

Also, based on our review of the existing intersection sight distances as well as projected traffic volumes, we determined that the eastbound approach at the National Drive and River Hills/National Drive intersection should operate with stop-sign control and the northbound and southbound approaches along National Drive should be uncontrolled. When implementing this change in control, the existing Yield signs (MUTCD No. R1-2) on the National Drive approaches should be removed and a Stop sign (MUTCD No. R1-1, 30" x 30" size) should be installed on the eastbound River Hills/National Drive approach. This recommendation as well as previously mentioned signing and marking improvements are shown on Figure 2.

Appendix A

Study Area Sketch.....	Figure A-1
Machine Traffic Volume Counts.....	A-2 to A-7
Spot Speed Study Results.....	A-8 to A-9
Existing and Projected Peak Hour Turning Movement Counts	Figures A-10 and A-11
Synchro Analysis for Existing Conditions	A-12 to A-15
Synchro Analysis for Existing plus Development Conditions	A-16 to A-19
Synchro Analysis for Proposed Conditions.....	A-20 to A-21

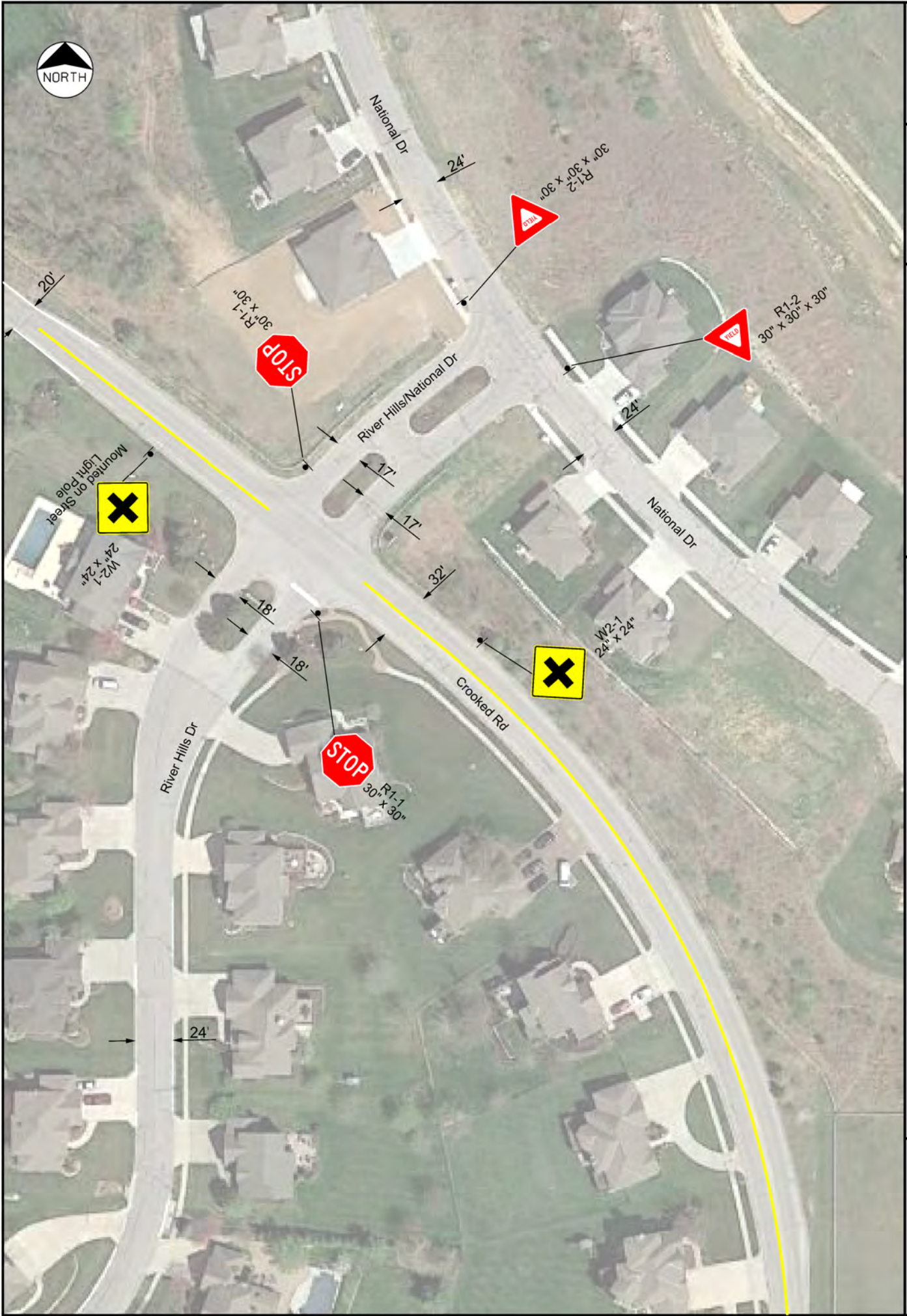


Figure A-1

April 2019

No Scale

Intersection Analyses

Parkville, Missouri

STUDY AREA



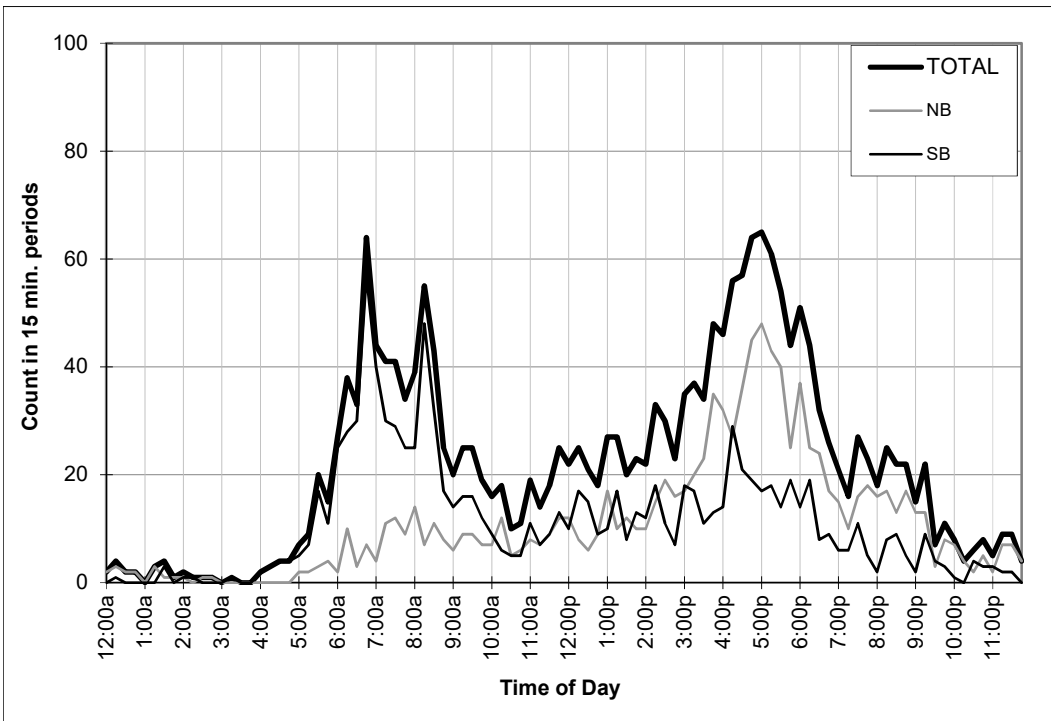
Daily Traffic Count

Missouri Traffic Engineering Assistance Program

Parkville, Missouri

Location: **Crooked Road North of River Hills/National Drive**

Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL
12:00a	2	0	2	6:00a	2	25	27	12:00p	12	10	22	6:00p	37	14	51
12:15a	3	1	4	6:15a	10	28	38	12:15p	8	17	25	6:15p	25	19	44
12:30a	2	0	2	6:30a	3	30	33	12:30p	6	15	21	6:30p	24	8	32
12:45a	2	0	2	6:45a	7	57	64	12:45p	9	9	18	6:45p	17	9	26
1:00a	0	0	0	7:00a	4	40	44	1:00p	17	10	27	7:00p	15	6	21
1:15a	3	0	3	7:15a	11	30	41	1:15p	10	17	27	7:15p	10	6	16
1:30a	1	3	4	7:30a	12	29	41	1:30p	12	8	20	7:30p	16	11	27
1:45a	1	0	1	7:45a	9	25	34	1:45p	10	13	23	7:45p	18	5	23
2:00a	1	1	2	8:00a	14	25	39	2:00p	10	12	22	8:00p	16	2	18
2:15a	0	1	1	8:15a	7	48	55	2:15p	15	18	33	8:15p	17	8	25
2:30a	1	0	1	8:30a	11	32	43	2:30p	19	11	30	8:30p	13	9	22
2:45a	1	0	1	8:45a	8	17	25	2:45p	16	7	23	8:45p	17	5	22
3:00a	0	0	0	9:00a	6	14	20	3:00p	17	18	35	9:00p	13	2	15
3:15a	0	1	1	9:15a	9	16	25	3:15p	20	17	37	9:15p	13	9	22
3:30a	0	0	0	9:30a	9	16	25	3:30p	23	11	34	9:30p	3	4	7
3:45a	0	0	0	9:45a	7	12	19	3:45p	35	13	48	9:45p	8	3	11
4:00a	0	2	2	10:00a	7	9	16	4:00p	32	14	46	10:00p	7	1	8
4:15a	0	3	3	10:15a	12	6	18	4:15p	27	29	56	10:15p	4	0	4
4:30a	0	4	4	10:30a	5	5	10	4:30p	36	21	57	10:30p	2	4	6
4:45a	0	4	4	10:45a	6	5	11	4:45p	45	19	64	10:45p	5	3	8
5:00a	2	5	7	11:00a	8	11	19	5:00p	48	17	65	11:00p	2	3	5
5:15a	2	7	9	11:15a	7	7	14	5:15p	43	18	61	11:15p	7	2	9
5:30a	3	17	20	11:30a	9	9	18	5:30p	40	14	54	11:30p	7	2	9
5:45a	4	11	15	11:45a	12	13	25	5:45p	25	19	44	11:45p	4	0	4



HOURLY TOTALS

Period Start	NB	SB	TOTAL
12:00a	9	1	10
1:00a	5	3	8
2:00a	3	2	5
3:00a	0	1	1
4:00a	0	13	13
5:00a	11	40	51
6:00a	22	140	162
7:00a	36	124	160
8:00a	40	122	162
9:00a	31	58	89
10:00a	30	25	55
11:00a	36	40	76
12:00p	35	51	86
1:00p	49	48	97
2:00p	60	48	108
3:00p	95	59	154
4:00p	140	83	223
5:00p	156	68	224
6:00p	103	50	153
7:00p	59	28	87
8:00p	63	24	87
9:00p	37	18	55
10:00p	18	8	26
11:00p	20	7	27

Approach	Count Date	AM Peak 6:45a - 7:45a	Noon Peak 1:45p - 2:45p	PM Peak 4:30p - 5:30p	Totals
Northbound	2/26/19 Tue	34	54	172	1,058
Southbound	2/26/19 Tue	156	54	75	1,061
TOTAL	2/26/19 Tue	190	108	247	2,119



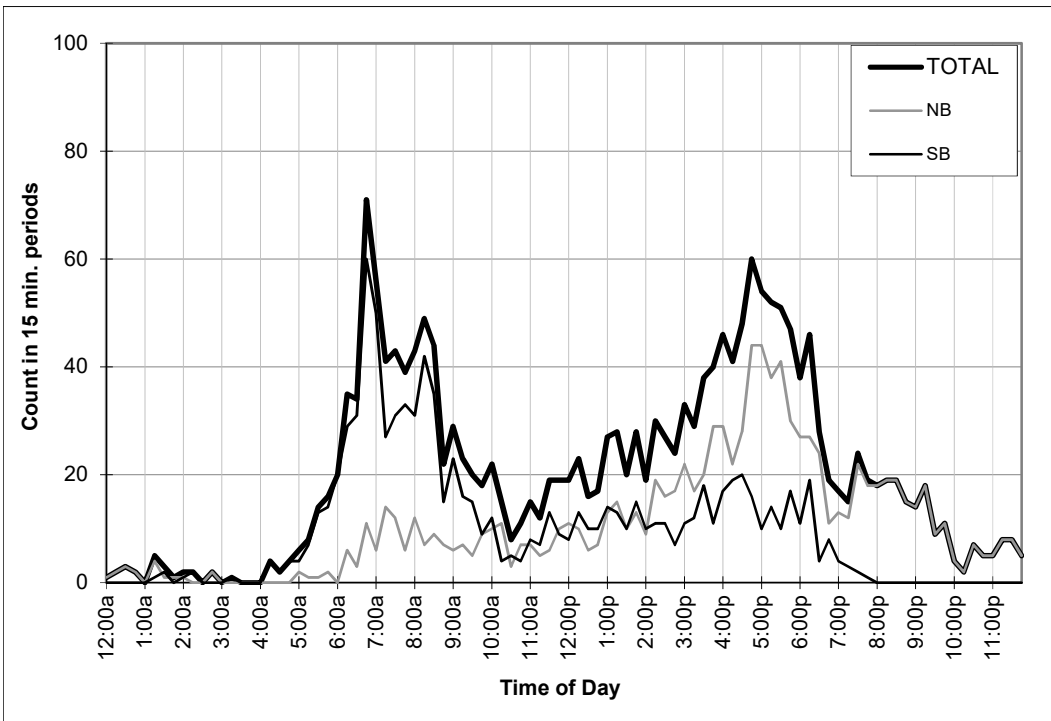
Daily Traffic Count

Missouri Traffic Engineering Assistance Program

Parkville, Missouri

Location: **Crooked Road South of River Hills/National Drive**

Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL
12:00a	1	0	1	6:00a	0	20	20	12:00p	11	8	19	6:00p	27	11	38
12:15a	2	0	2	6:15a	6	29	35	12:15p	10	13	23	6:15p	27	19	46
12:30a	3	0	3	6:30a	3	31	34	12:30p	6	10	16	6:30p	24	4	28
12:45a	2	0	2	6:45a	11	60	71	12:45p	7	10	17	6:45p	11	8	19
1:00a	0	0	0	7:00a	6	50	56	1:00p	13	14	27	7:00p	13	4	17
1:15a	4	1	5	7:15a	14	27	41	1:15p	15	13	28	7:15p	12	3	15
1:30a	1	2	3	7:30a	12	31	43	1:30p	10	10	20	7:30p	22	2	24
1:45a	1	0	1	7:45a	6	33	39	1:45p	13	15	28	7:45p	18	1	19
2:00a	1	1	2	8:00a	12	31	43	2:00p	9	10	19	8:00p	18	0	18
2:15a	0	2	2	8:15a	7	42	49	2:15p	19	11	30	8:15p	19	0	19
2:30a	0	0	0	8:30a	9	35	44	2:30p	16	11	27	8:30p	19	0	19
2:45a	2	0	2	8:45a	7	15	22	2:45p	17	7	24	8:45p	15	0	15
3:00a	0	0	0	9:00a	6	23	29	3:00p	22	11	33	9:00p	14	0	14
3:15a	0	1	1	9:15a	7	16	23	3:15p	17	12	29	9:15p	18	0	18
3:30a	0	0	0	9:30a	5	15	20	3:30p	20	18	38	9:30p	9	0	9
3:45a	0	0	0	9:45a	9	9	18	3:45p	29	11	40	9:45p	11	0	11
4:00a	0	0	0	10:00a	10	12	22	4:00p	29	17	46	10:00p	4	0	4
4:15a	0	4	4	10:15a	11	4	15	4:15p	22	19	41	10:15p	2	0	2
4:30a	0	2	2	10:30a	3	5	8	4:30p	28	20	48	10:30p	7	0	7
4:45a	0	4	4	10:45a	7	4	11	4:45p	44	16	60	10:45p	5	0	5
5:00a	2	4	6	11:00a	7	8	15	5:00p	44	10	54	11:00p	5	0	5
5:15a	1	7	8	11:15a	5	7	12	5:15p	38	14	52	11:15p	8	0	8
5:30a	1	13	14	11:30a	6	13	19	5:30p	41	10	51	11:30p	8	0	8
5:45a	2	14	16	11:45a	10	9	19	5:45p	30	17	47	11:45p	5	0	5



Period Start	NB	SB	TOTAL
12:00a	8	0	8
1:00a	6	3	9
2:00a	3	3	6
3:00a	0	1	1
4:00a	0	10	10
5:00a	6	38	44
6:00a	20	140	160
7:00a	38	141	179
8:00a	35	123	158
9:00a	27	63	90
10:00a	31	25	56
11:00a	28	37	65
12:00p	34	41	75
1:00p	51	52	103
2:00p	61	39	100
3:00p	88	52	140
4:00p	123	72	195
5:00p	153	51	204
6:00p	89	42	131
7:00p	65	10	75
8:00p	71	0	71
9:00p	52	0	52
10:00p	18	0	18
11:00p	26	0	26

Approach	Count Date	AM Peak 6:45a - 7:45a	Noon Peak 1:45p - 2:45p	PM Peak 4:45p - 5:45p	Totals
Northbound	2/26/19 Tue	43	57	167	1,033
Southbound	2/26/19 Tue	168	47	50	943
TOTAL	2/26/19 Tue	211	104	217	1,976



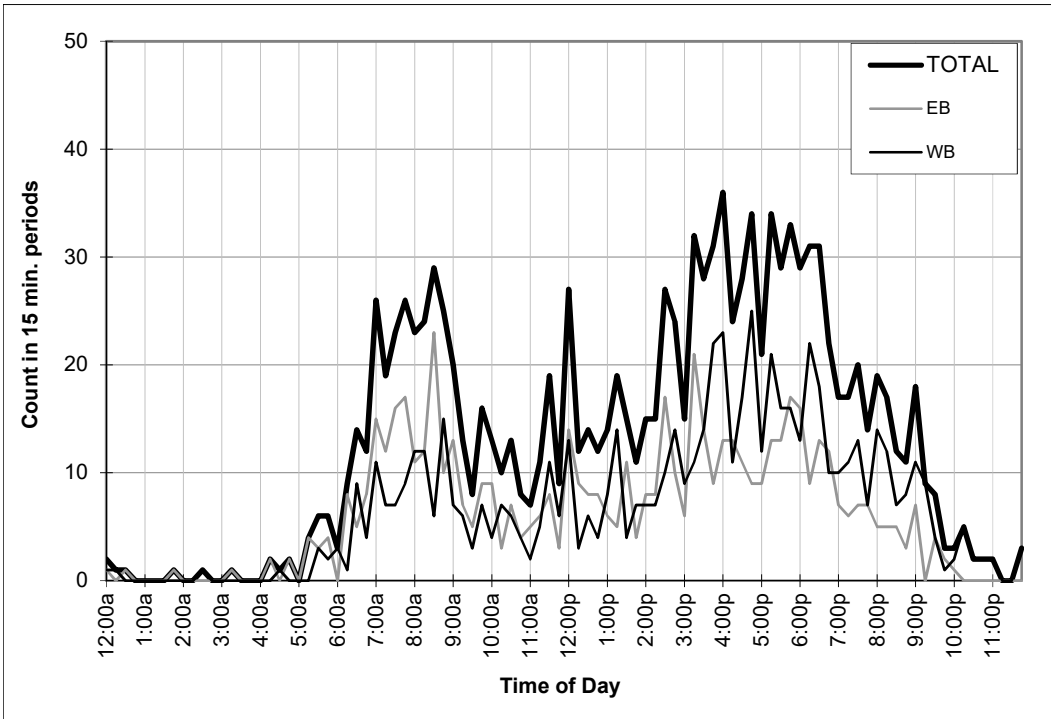
Daily Traffic Count

Missouri Traffic Engineering Assistance Program

Parkville, Missouri

Location: **River Hills/National Drive East of Crooked Road**

Period Start	EB	WB	TOTAL	Period Start	EB	WB	TOTAL	Period Start	EB	WB	TOTAL	Period Start	EB	WB	TOTAL
12:00a	1	1	2	6:00a	0	3	3	12:00p	14	13	27	6:00p	16	13	29
12:15a	0	1	1	6:15a	8	1	9	12:15p	9	3	12	6:15p	9	22	31
12:30a	1	0	1	6:30a	5	9	14	12:30p	8	6	14	6:30p	13	18	31
12:45a	0	0	0	6:45a	8	4	12	12:45p	8	4	12	6:45p	12	10	22
1:00a	0	0	0	7:00a	15	11	26	1:00p	6	8	14	7:00p	7	10	17
1:15a	0	0	0	7:15a	12	7	19	1:15p	5	14	19	7:15p	6	11	17
1:30a	0	0	0	7:30a	16	7	23	1:30p	11	4	15	7:30p	7	13	20
1:45a	1	0	1	7:45a	17	9	26	1:45p	4	7	11	7:45p	7	7	14
2:00a	0	0	0	8:00a	11	12	23	2:00p	8	7	15	8:00p	5	14	19
2:15a	0	0	0	8:15a	12	12	24	2:15p	8	7	15	8:15p	5	12	17
2:30a	0	1	1	8:30a	23	6	29	2:30p	17	10	27	8:30p	5	7	12
2:45a	0	0	0	8:45a	10	15	25	2:45p	10	14	24	8:45p	3	8	11
3:00a	0	0	0	9:00a	13	7	20	3:00p	6	9	15	9:00p	7	11	18
3:15a	1	0	1	9:15a	7	6	13	3:15p	21	11	32	9:15p	0	9	9
3:30a	0	0	0	9:30a	5	3	8	3:30p	14	14	28	9:30p	4	4	8
3:45a	0	0	0	9:45a	9	7	16	3:45p	9	22	31	9:45p	2	1	3
4:00a	0	0	0	10:00a	9	4	13	4:00p	13	23	36	10:00p	1	2	3
4:15a	2	0	2	10:15a	3	7	10	4:15p	13	11	24	10:15p	0	5	5
4:30a	0	1	1	10:30a	7	6	13	4:30p	11	17	28	10:30p	0	2	2
4:45a	2	0	2	10:45a	4	4	8	4:45p	9	25	34	10:45p	0	2	2
5:00a	0	0	0	11:00a	5	2	7	5:00p	9	12	21	11:00p	0	2	2
5:15a	4	0	4	11:15a	6	5	11	5:15p	13	21	34	11:15p	0	0	0
5:30a	3	3	6	11:30a	8	11	19	5:30p	13	16	29	11:30p	0	0	0
5:45a	4	2	6	11:45a	3	6	9	5:45p	17	16	33	11:45p	0	3	3



HOURLY TOTALS

Period Start	EB	WB	TOTAL
12:00a	2	2	4
1:00a	1	0	1
2:00a	0	1	1
3:00a	1	0	1
4:00a	4	1	5
5:00a	11	5	16
6:00a	21	17	38
7:00a	60	34	94
8:00a	56	45	101
9:00a	34	23	57
10:00a	23	21	44
11:00a	22	24	46
12:00p	39	26	65
1:00p	26	33	59
2:00p	43	38	81
3:00p	50	56	106
4:00p	46	76	122
5:00p	52	65	117
6:00p	50	63	113
7:00p	27	41	68
8:00p	18	41	59
9:00p	13	25	38
10:00p	1	11	12
11:00p	0	5	5

Approach	Count Date	AM Peak 7:45a - 8:45a	Noon Peak 1:45p - 2:45p	PM Peak 3:15p - 4:15p	Totals
Eastbound	2/26/19 Tue	63	37	57	600
Westbound	2/26/19 Tue	39	31	70	653
TOTAL	2/26/19 Tue	102	68	127	1,253



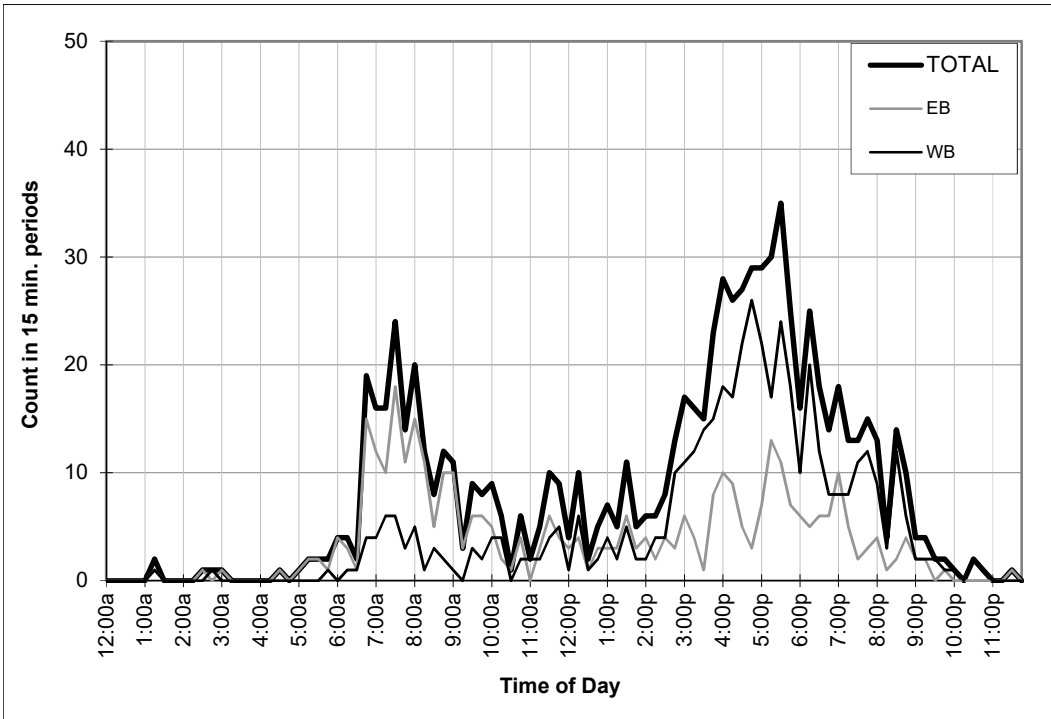
Daily Traffic Count

Missouri Traffic Engineering Assistance Program

Parkville, Missouri

Location: **River Hills/National Drive West of Crooked Road**

Period Start	EB	WB	TOTAL	Period Start	EB	WB	TOTAL	Period Start	EB	WB	TOTAL	Period Start	EB	WB	TOTAL
12:00a	0	0	0	6:00a	4	0	4	12:00p	3	1	4	6:00p	6	10	16
12:15a	0	0	0	6:15a	3	1	4	12:15p	4	6	10	6:15p	5	20	25
12:30a	0	0	0	6:30a	1	1	2	12:30p	1	1	2	6:30p	6	12	18
12:45a	0	0	0	6:45a	15	4	19	12:45p	3	2	5	6:45p	6	8	14
1:00a	0	0	0	7:00a	12	4	16	1:00p	3	4	7	7:00p	10	8	18
1:15a	1	1	2	7:15a	10	6	16	1:15p	3	2	5	7:15p	5	8	13
1:30a	0	0	0	7:30a	18	6	24	1:30p	6	5	11	7:30p	2	11	13
1:45a	0	0	0	7:45a	11	3	14	1:45p	3	2	5	7:45p	3	12	15
2:00a	0	0	0	8:00a	15	5	20	2:00p	4	2	6	8:00p	4	9	13
2:15a	0	0	0	8:15a	11	1	12	2:15p	2	4	6	8:15p	1	3	4
2:30a	1	0	1	8:30a	5	3	8	2:30p	4	4	8	8:30p	2	12	14
2:45a	0	1	1	8:45a	10	2	12	2:45p	3	10	13	8:45p	4	6	10
3:00a	1	0	1	9:00a	10	1	11	3:00p	6	11	17	9:00p	2	2	4
3:15a	0	0	0	9:15a	3	0	3	3:15p	4	12	16	9:15p	2	2	4
3:30a	0	0	0	9:30a	6	3	9	3:30p	1	14	15	9:30p	0	2	2
3:45a	0	0	0	9:45a	6	2	8	3:45p	8	15	23	9:45p	1	1	2
4:00a	0	0	0	10:00a	5	4	9	4:00p	10	18	28	10:00p	0	1	1
4:15a	0	0	0	10:15a	2	4	6	4:15p	9	17	26	10:15p	0	0	0
4:30a	1	0	1	10:30a	1	0	1	4:30p	5	22	27	10:30p	0	2	2
4:45a	0	0	0	10:45a	4	2	6	4:45p	3	26	29	10:45p	0	1	1
5:00a	1	0	1	11:00a	0	2	2	5:00p	7	22	29	11:00p	0	0	0
5:15a	2	0	2	11:15a	3	2	5	5:15p	13	17	30	11:15p	0	0	0
5:30a	2	0	2	11:30a	6	4	10	5:30p	11	24	35	11:30p	1	0	1
5:45a	1	1	2	11:45a	4	5	9	5:45p	7	18	25	11:45p	0	0	0



HOURLY TOTALS

Period Start	EB	WB	TOTAL
12:00a	0	0	0
1:00a	1	1	2
2:00a	1	1	2
3:00a	1	0	1
4:00a	1	0	1
5:00a	6	1	7
6:00a	23	6	29
7:00a	51	19	70
8:00a	41	11	52
9:00a	25	6	31
10:00a	12	10	22
11:00a	13	13	26
12:00p	11	10	21
1:00p	15	13	28
2:00p	13	20	33
3:00p	19	52	71
4:00p	27	83	110
5:00p	38	81	119
6:00p	23	50	73
7:00p	20	39	59
8:00p	11	30	41
9:00p	5	7	12
10:00p	0	4	4
11:00p	1	0	1

Approach	Count Date	AM Peak 6:45a - 7:45a	Noon Peak 11:30a - 12:30p	PM Peak 4:45p - 5:45p	Totals
Eastbound	2/26/19 Tue	55	17	34	358
Westbound	2/26/19 Tue	20	16	89	457
TOTAL	2/26/19 Tue	75	33	123	815



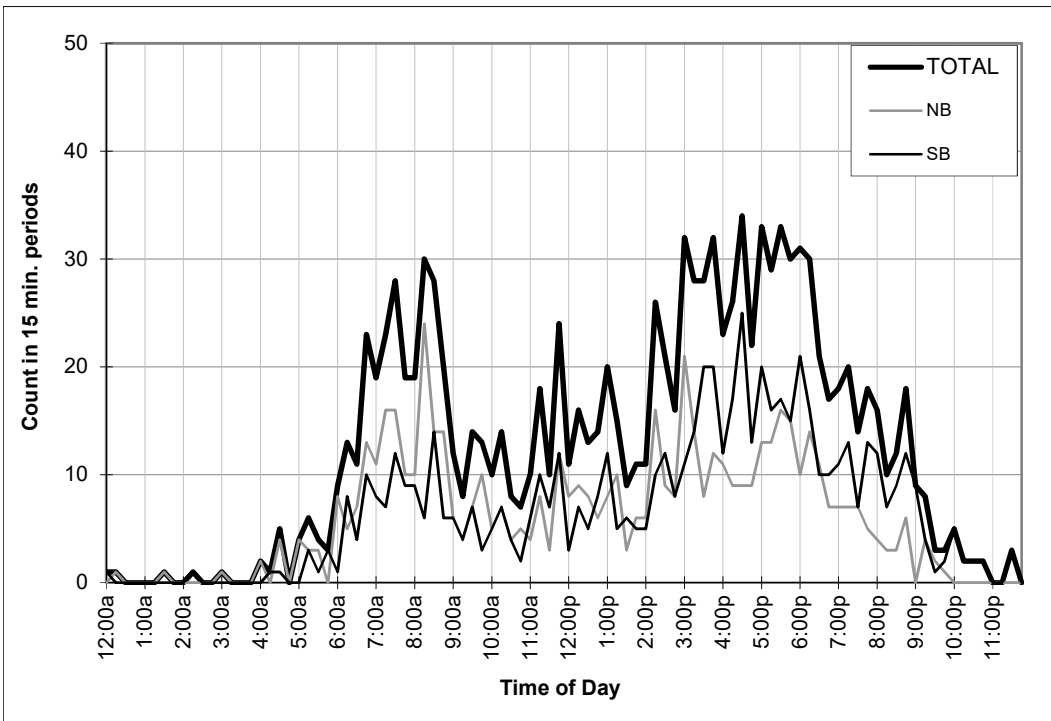
Daily Traffic Count

Missouri Traffic Engineering Assistance Program

Parkville, Missouri

Location: **National Drive North of River Hills/National Drive**

Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL
12:00a	0	1	1	6:00a	8	1	9	12:00p	8	3	11	6:00p	10	21	31
12:15a	1	0	1	6:15a	5	8	13	12:15p	9	7	16	6:15p	14	16	30
12:30a	0	0	0	6:30a	7	4	11	12:30p	8	5	13	6:30p	11	10	21
12:45a	0	0	0	6:45a	13	10	23	12:45p	6	8	14	6:45p	7	10	17
1:00a	0	0	0	7:00a	11	8	19	1:00p	8	12	20	7:00p	7	11	18
1:15a	0	0	0	7:15a	16	7	23	1:15p	10	5	15	7:15p	7	13	20
1:30a	1	0	1	7:30a	16	12	28	1:30p	3	6	9	7:30p	7	7	14
1:45a	0	0	0	7:45a	10	9	19	1:45p	6	5	11	7:45p	5	13	18
2:00a	0	0	0	8:00a	10	9	19	2:00p	6	5	11	8:00p	4	12	16
2:15a	0	1	1	8:15a	24	6	30	2:15p	16	10	26	8:15p	3	7	10
2:30a	0	0	0	8:30a	14	14	28	2:30p	9	12	21	8:30p	3	9	12
2:45a	0	0	0	8:45a	14	6	20	2:45p	8	8	16	8:45p	6	12	18
3:00a	1	0	1	9:00a	6	6	12	3:00p	21	11	32	9:00p	0	9	9
3:15a	0	0	0	9:15a	4	4	8	3:15p	14	14	28	9:15p	4	4	8
3:30a	0	0	0	9:30a	7	7	14	3:30p	8	20	28	9:30p	2	1	3
3:45a	0	0	0	9:45a	10	3	13	3:45p	12	20	32	9:45p	1	2	3
4:00a	2	0	2	10:00a	5	5	10	4:00p	11	12	23	10:00p	0	5	5
4:15a	0	1	1	10:15a	7	7	14	4:15p	9	17	26	10:15p	0	2	2
4:30a	4	1	5	10:30a	4	4	8	4:30p	9	25	34	10:30p	0	2	2
4:45a	0	0	0	10:45a	5	2	7	4:45p	9	13	22	10:45p	0	2	2
5:00a	4	0	4	11:00a	4	6	10	5:00p	13	20	33	11:00p	0	0	0
5:15a	3	3	6	11:15a	8	10	18	5:15p	13	16	29	11:15p	0	0	0
5:30a	3	1	4	11:30a	3	7	10	5:30p	16	17	33	11:30p	0	3	3
5:45a	0	3	3	11:45a	12	12	24	5:45p	15	15	30	11:45p	0	0	0



HOURLY TOTALS

Period Start	NB	SB	TOTAL
12:00a	1	1	2
1:00a	1	0	1
2:00a	0	1	1
3:00a	1	0	1
4:00a	6	2	8
5:00a	10	7	17
6:00a	33	23	56
7:00a	53	36	89
8:00a	62	35	97
9:00a	27	20	47
10:00a	21	18	39
11:00a	27	35	62
12:00p	31	23	54
1:00p	27	28	55
2:00p	39	35	74
3:00p	55	65	120
4:00p	38	67	105
5:00p	57	68	125
6:00p	42	57	99
7:00p	26	44	70
8:00p	16	40	56
9:00p	7	16	23
10:00p	0	11	11
11:00p	0	3	3

Approach	Count Date	AM Peak 8:00a - 9:00a	Noon Peak 1:45p - 2:45p	PM Peak 5:00p - 6:00p	Totals
Northbound	2/26/19 Tue	62	37	57	580
Southbound	2/26/19 Tue	35	32	68	635
TOTAL	2/26/19 Tue	97	69	125	1,215



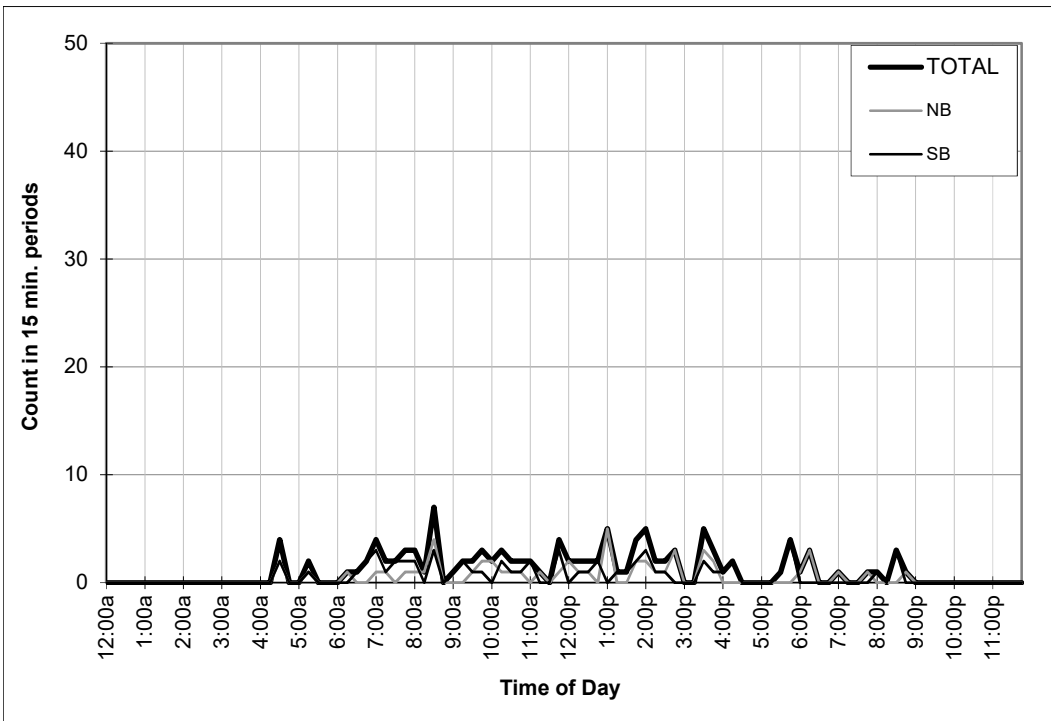
Daily Traffic Count

Missouri Traffic Engineering Assistance Program

Parkville, Missouri

Location: **National Drive South of River Hills/National Drive**

Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL	Period Start	NB	SB	TOTAL
12:00a	0	0	0	6:00a	0	0	0	12:00p	2	0	2	6:00p	1	0	1
12:15a	0	0	0	6:15a	1	0	1	12:15p	1	1	2	6:15p	3	0	3
12:30a	0	0	0	6:30a	0	1	1	12:30p	1	1	2	6:30p	0	0	0
12:45a	0	0	0	6:45a	0	2	2	12:45p	0	2	2	6:45p	0	0	0
1:00a	0	0	0	7:00a	1	3	4	1:00p	5	0	5	7:00p	1	0	1
1:15a	0	0	0	7:15a	1	1	2	1:15p	0	1	1	7:15p	0	0	0
1:30a	0	0	0	7:30a	0	2	2	1:30p	0	1	1	7:30p	0	0	0
1:45a	0	0	0	7:45a	1	2	3	1:45p	2	2	4	7:45p	1	0	1
2:00a	0	0	0	8:00a	1	2	3	2:00p	2	3	5	8:00p	0	1	1
2:15a	0	0	0	8:15a	1	0	1	2:15p	1	1	2	8:15p	0	0	0
2:30a	0	0	0	8:30a	4	3	7	2:30p	1	1	2	8:30p	0	3	3
2:45a	0	0	0	8:45a	0	0	0	2:45p	3	0	3	8:45p	1	0	1
3:00a	0	0	0	9:00a	0	1	1	3:00p	0	0	0	9:00p	0	0	0
3:15a	0	0	0	9:15a	0	2	2	3:15p	0	0	0	9:15p	0	0	0
3:30a	0	0	0	9:30a	1	1	2	3:30p	3	2	5	9:30p	0	0	0
3:45a	0	0	0	9:45a	2	1	3	3:45p	2	1	3	9:45p	0	0	0
4:00a	0	0	0	10:00a	2	0	2	4:00p	0	1	1	10:00p	0	0	0
4:15a	0	0	0	10:15a	1	2	3	4:15p	0	2	2	10:15p	0	0	0
4:30a	2	2	4	10:30a	1	1	2	4:30p	0	0	0	10:30p	0	0	0
4:45a	0	0	0	10:45a	1	1	2	4:45p	0	0	0	10:45p	0	0	0
5:00a	0	0	0	11:00a	0	2	2	5:00p	0	0	0	11:00p	0	0	0
5:15a	1	1	2	11:15a	1	0	1	5:15p	0	0	0	11:15p	0	0	0
5:30a	0	0	0	11:30a	0	0	0	5:30p	0	1	1	11:30p	0	0	0
5:45a	0	0	0	11:45a	1	3	4	5:45p	0	4	4	11:45p	0	0	0



Period Start	NB	SB	TOTAL
12:00a	0	0	0
1:00a	0	0	0
2:00a	0	0	0
3:00a	0	0	0
4:00a	2	2	4
5:00a	1	1	2
6:00a	1	3	4
7:00a	3	8	11
8:00a	6	5	11
9:00a	3	5	8
10:00a	5	4	9
11:00a	2	5	7
12:00p	4	4	8
1:00p	7	4	11
2:00p	7	5	12
3:00p	5	3	8
4:00p	0	3	3
5:00p	0	5	5
6:00p	4	0	4
7:00p	2	0	2
8:00p	1	4	5
9:00p	0	0	0
10:00p	0	0	0
11:00p	0	0	0

Approach	Count Date	AM Peak 7:45a - 8:45a	Noon Peak 1:45p - 2:45p	PM Peak 2:00p - 3:00p	Totals
Northbound	2/26/19 Tue	7	6	7	53
Southbound	2/26/19 Tue	7	7	5	61
TOTAL	2/26/19 Tue	14	13	12	114

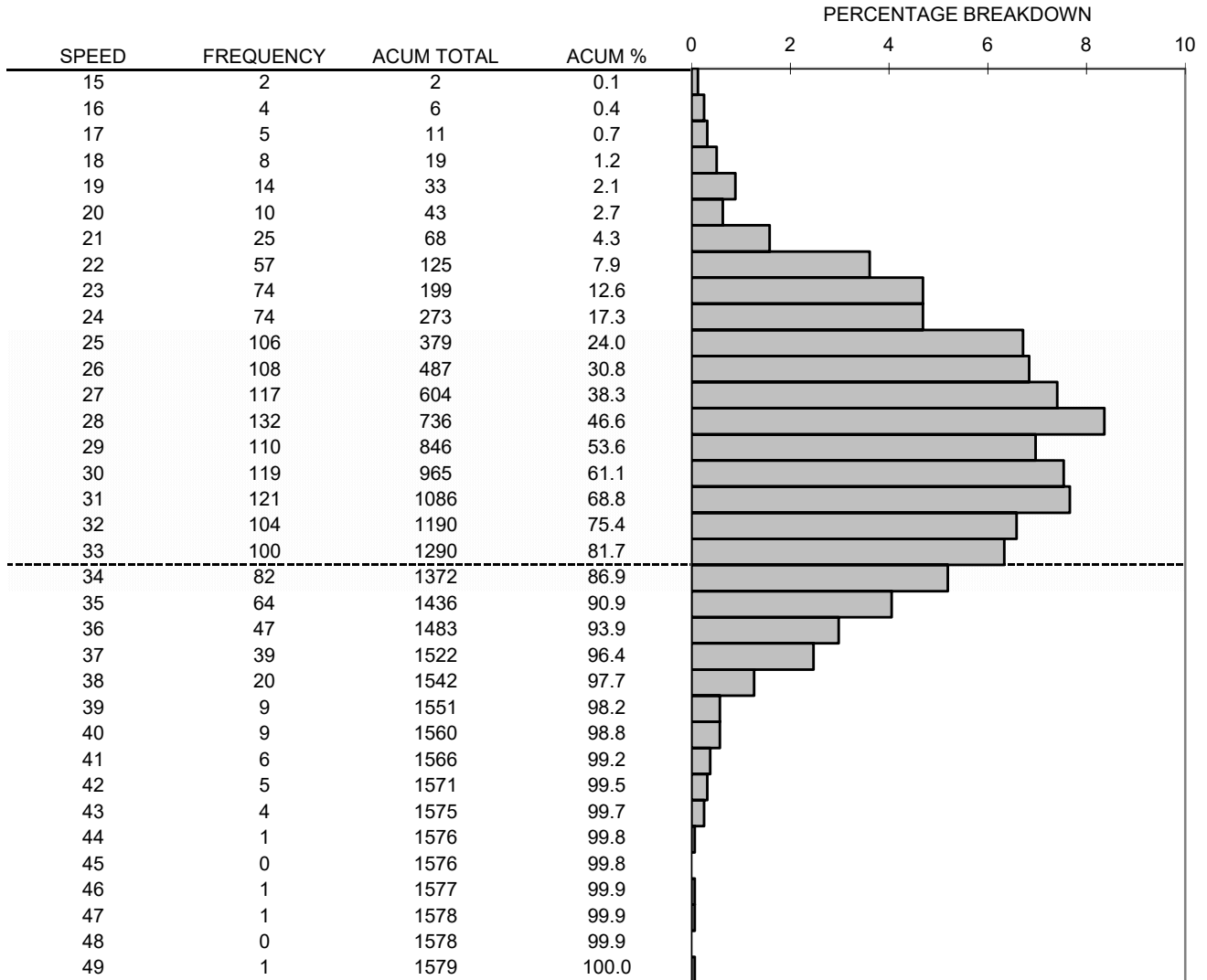


SPOT SPEED STUDY RESULTS RELATIVE FREQUENCY DISTRIBUTION

CITY: Parkville
OBSERVER: ARM
DATE: 2/25/19 to 2/27/19

COUNTY: Platte
SPEED LIMIT: 25
DIRECTION: NB

LOCATION: Crooked Rd south of River Hills/National Drive
TIME START: 11:15 AM 2/25/19
TIME END: 3:30 PM 2/27/19



AVERAGE SPEED = 29.1
50th PERCENTILE = 28.5
85th PERCENTILE = 33.6
90th PERCENTILE = 34.8
95th PERCENTILE = 36.4

PACE = 25 - 34
VEHICLES IN PACE = 1099
% IN PACE = 69.6
% BELOW PACE = 17.3
% ABOVE PACE = 13.1

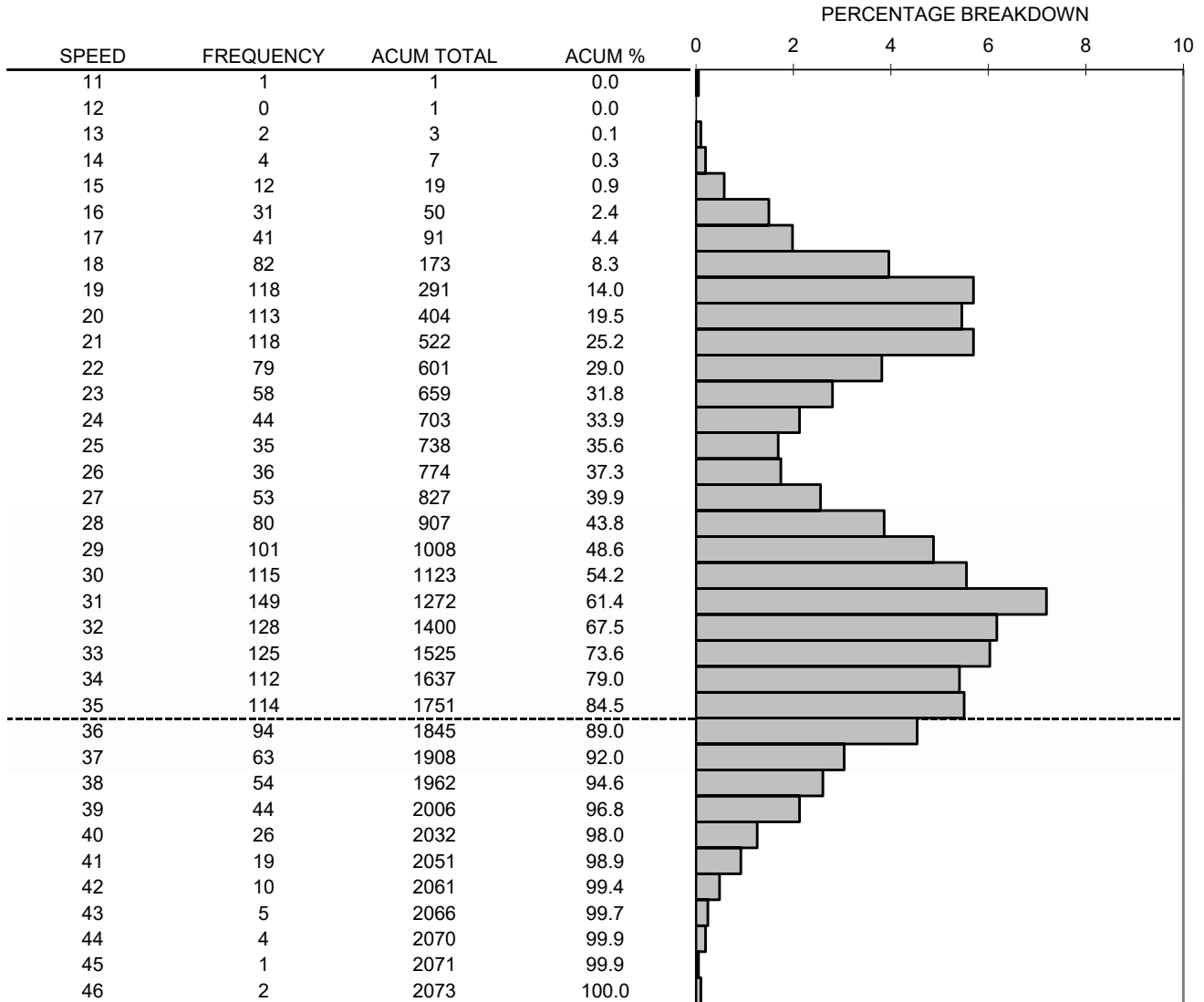
SAMPLE VARIANCE = 23.2939066
STANDARD DEVIATION = 4.8263761
RANGE 1*S = 69.09437
RANGE 2*S = 96.45345
RANGE 3*S = 99.74667

SPOT SPEED STUDY RESULTS RELATIVE FREQUENCY DISTRIBUTION

CITY: Parkville
OBSERVER: ARM
DATE: 2/25/19 to 2/27/19

COUNTY: Platte
SPEED LIMIT: 25
DIRECTION: SB

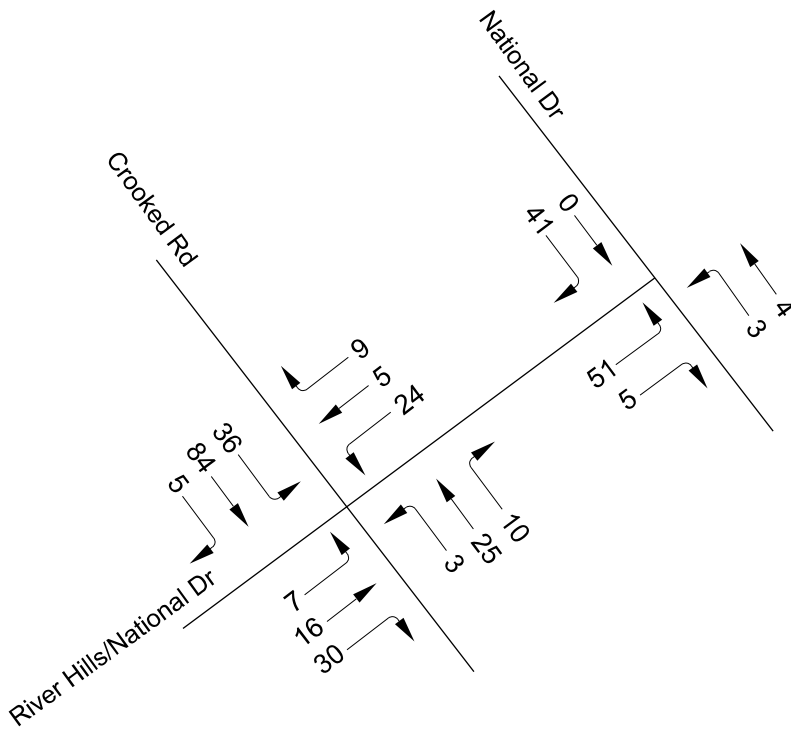
LOCATION: Crooked Rd north of River Hills/National Drive
TIME START: 11:00 AM 2/25/19
TIME END: 3:15 PM 2/27/19



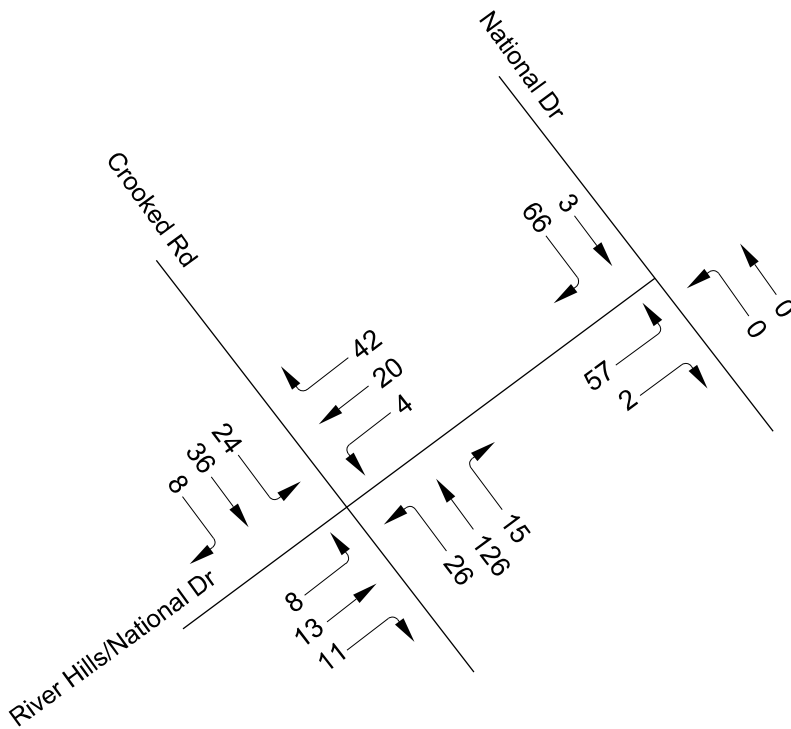
AVERAGE SPEED = 28.4
50th PERCENTILE = 29.2
85th PERCENTILE = 35.1
90th PERCENTILE = 36.3
95th PERCENTILE = 38.2

PACE = 28 - 37
VEHICLES IN PACE = 1081
% IN PACE = 52.1
% BELOW PACE = 39.9
% ABOVE PACE = 8.

SAMPLE VARIANCE = 48.0308997
STANDARD DEVIATION = 6.9304329
RANGE 1*S = 64.97829
RANGE 2*S = 99.08345
RANGE 3*S = 100.



A.M. PEAK HOUR VOLUMES



P.M. PEAK HOUR VOLUMES

April 2019

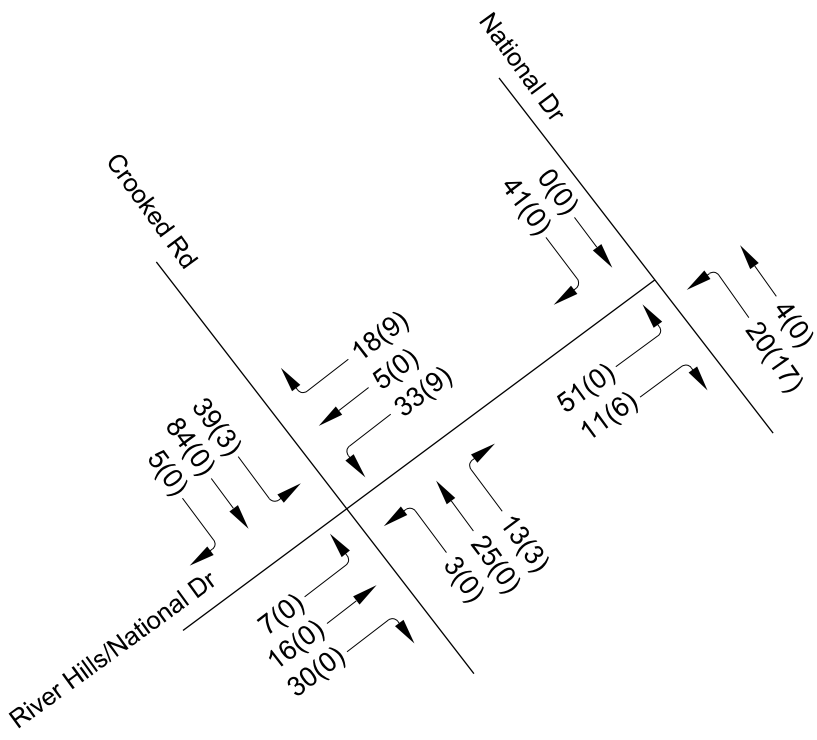
No Scale

Intersection Analyses
Parkville, Missouri

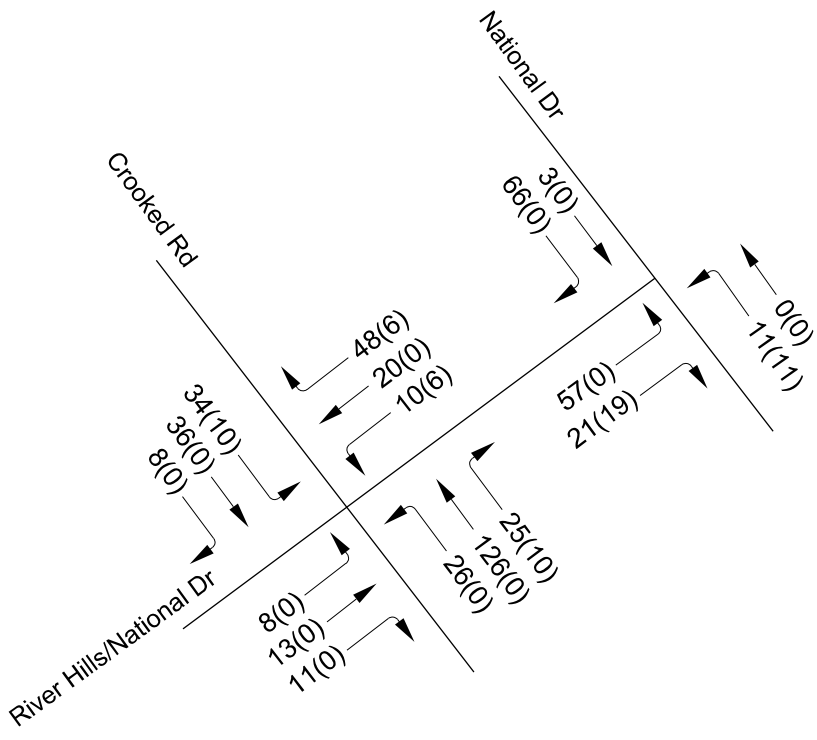
EXISTING CONDITIONS
PEAK HOUR TURNING MOVEMENT VOLUMES

Figure A-10





A.M. PEAK HOUR VOLUMES



P.M. PEAK HOUR VOLUMES

Legend

- Total Hourly Volume
- Residential Development Traffic

April 2019
No Scale

Intersection Analyses
Parkville, Missouri

EXISTING PLUS DEVELOPMENT CONDITIONS
PEAK HOUR TURNING MOVEMENT VOLUMES



HCM 6th TWSC
 1: Crooked Rd & River Hills Dr/River Hills/National Dr

A.M. Peak Hour
 Existing Conditions

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	16	30	24	5	9	3	25	10	36	84	5
Future Vol, veh/h	7	16	30	24	5	9	3	25	10	36	84	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	17	33	26	5	10	3	27	11	39	91	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	218	216	94	236	213	33	96	0	0	38	0	0
Stage 1	172	172	-	39	39	-	-	-	-	-	-	-
Stage 2	46	44	-	197	174	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	738	682	963	718	684	1041	1498	-	-	1572	-	-
Stage 1	830	756	-	976	862	-	-	-	-	-	-	-
Stage 2	968	858	-	805	755	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	711	663	963	666	665	1041	1498	-	-	1572	-	-
Mov Cap-2 Maneuver	711	663	-	666	665	-	-	-	-	-	-	-
Stage 1	828	736	-	974	860	-	-	-	-	-	-	-
Stage 2	951	856	-	740	735	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.8		10.2		0.6		2.1	
HCM LOS	A		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1498	-	-	814	728	1572	-
HCM Lane V/C Ratio	0.002	-	-	0.071	0.057	0.025	-
HCM Control Delay (s)	7.4	0	-	9.8	10.2	7.3	0
HCM Lane LOS	A	A	-	A	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0.1	-

HCM Unsignalized Intersection Capacity Analysis
2: National Dr & River Hills/National Dr

A.M. Peak Hour
Existing Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	51	5	3	4	0	41
Future Volume (Veh/h)	51	5	3	4	0	41
Sign Control	Free			Yield	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	5	3	4	0	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		158	112	115	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		158	112	115	0
tC, single (s)	4.1		7.1	6.5	6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2		3.5	4.0	4.0	3.3
p0 queue free %	97		100	99	100	96
cM capacity (veh/h)	1623		755	751	749	1085
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	60	7	45			
Volume Left	55	3	0			
Volume Right	5	0	45			
cSH	1623	753	1085			
Volume to Capacity	0.03	0.01	0.04			
Queue Length 95th (ft)	3	1	3			
Control Delay (s)	6.7	9.8	8.5			
Lane LOS	A	A	A			
Approach Delay (s)	6.7	9.8	8.5			
Approach LOS		A	A			
Intersection Summary						
Average Delay			7.6			
Intersection Capacity Utilization			13.3%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM 6th TWSC
 1: Crooked Rd & River Hills Dr/River Hills/National Dr

P.M. Peak Hour
 Existing Conditions

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	13	11	4	20	42	26	126	15	24	36	8
Future Vol, veh/h	8	13	11	4	20	42	26	126	15	24	36	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	14	12	4	22	46	28	137	16	26	39	9

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	331	305	44	310	301	145	48	0	0	153	0	0
Stage 1	96	96	-	201	201	-	-	-	-	-	-	-
Stage 2	235	209	-	109	100	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	622	608	1026	642	612	902	1559	-	-	1428	-	-
Stage 1	911	815	-	801	735	-	-	-	-	-	-	-
Stage 2	768	729	-	896	812	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	557	584	1026	605	588	902	1559	-	-	1428	-	-
Mov Cap-2 Maneuver	557	584	-	605	588	-	-	-	-	-	-	-
Stage 1	893	800	-	785	720	-	-	-	-	-	-	-
Stage 2	693	714	-	853	797	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.6		10.3		1.1		2.7	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1559	-	-	676	757	1428	-
HCM Lane V/C Ratio	0.018	-	-	0.051	0.095	0.018	-
HCM Control Delay (s)	7.4	0	-	10.6	10.3	7.6	0
HCM Lane LOS	A	A	-	B	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.3	0.1	-

HCM Unsignalized Intersection Capacity Analysis
2: National Dr & River Hills/National Dr

P.M. Peak Hour
Existing Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	2	0	0	3	66
Future Volume (Veh/h)	57	2	0	0	3	66
Sign Control	Free			Yield	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	2	0	0	3	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		198	125	126	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		198	125	126	0
tC, single (s)	4.1		7.1	6.5	6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2		3.5	4.0	4.0	3.3
p0 queue free %	96		100	100	100	93
cM capacity (veh/h)	1623		687	736	735	1085
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	64	0	75			
Volume Left	62	0	0			
Volume Right	2	0	72			
cSH	1623	1700	1065			
Volume to Capacity	0.04	0.00	0.07			
Queue Length 95th (ft)	3	0	6			
Control Delay (s)	7.1	0.0	8.6			
Lane LOS	A	A	A			
Approach Delay (s)	7.1	0.0	8.6			
Approach LOS		A	A			
Intersection Summary						
Average Delay			7.9			
Intersection Capacity Utilization			14.2%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM 6th TWSC
1: Crooked Rd & River Hills Dr/River Hills/National Dr

A.M. Peak Hour
Existing + Development Conditions

Intersection												
Int Delay, s/veh	5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	16	30	33	5	18	3	25	13	39	84	5
Future Vol, veh/h	7	16	30	33	5	18	3	25	13	39	84	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	17	33	36	5	20	3	27	14	42	91	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	231	225	94	243	220	34	96	0	0	41	0	0
Stage 1	178	178	-	40	40	-	-	-	-	-	-	-
Stage 2	53	47	-	203	180	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	724	674	963	711	678	1039	1498	-	-	1568	-	-
Stage 1	824	752	-	975	862	-	-	-	-	-	-	-
Stage 2	960	856	-	799	750	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	690	654	963	658	658	1039	1498	-	-	1568	-	-
Mov Cap-2 Maneuver	690	654	-	658	658	-	-	-	-	-	-	-
Stage 1	822	731	-	973	860	-	-	-	-	-	-	-
Stage 2	934	854	-	732	729	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.8		10.3		0.5		2.2	
HCM LOS	A		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1498	-	-	806	746	1568	-
HCM Lane V/C Ratio	0.002	-	-	0.071	0.082	0.027	-
HCM Control Delay (s)	7.4	0	-	9.8	10.3	7.4	0
HCM Lane LOS	A	A	-	A	B	A	A
HCM 95th %tile Q(veh)	0	-	-	0.2	0.3	0.1	-

HCM Unsignalized Intersection Capacity Analysis

2: National Dr & River Hills/National Dr

A.M. Peak Hour
Existing + Development Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	51	11	20	4	0	41
Future Volume (Veh/h)	51	11	20	4	0	41
Sign Control	Free			Yield	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	12	22	4	0	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		161	116	122	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		161	116	122	0
tC, single (s)	4.1		7.1	6.5	6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2		3.5	4.0	4.0	3.3
p0 queue free %	97		97	99	100	96
cM capacity (veh/h)	1623		751	748	742	1085
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	67	26	45			
Volume Left	55	22	0			
Volume Right	12	0	45			
cSH	1623	751	1085			
Volume to Capacity	0.03	0.03	0.04			
Queue Length 95th (ft)	3	3	3			
Control Delay (s)	6.0	10.0	8.5			
Lane LOS	A	A	A			
Approach Delay (s)	6.0	10.0	8.5			
Approach LOS		A	A			
Intersection Summary						
Average Delay			7.6			
Intersection Capacity Utilization		18.1%		ICU Level of Service		A
Analysis Period (min)			15			

HCM 6th TWSC
 1: Crooked Rd & River Hills Dr/River Hills/National Drive

P.M. Peak Hour
 Existing + Development Conditions

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	13	11	10	20	48	26	126	25	34	36	8
Future Vol, veh/h	8	13	11	10	20	48	26	126	25	34	36	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	14	12	11	22	52	28	137	27	37	39	9

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	362	338	44	338	329	151	48	0	0	164	0	0
Stage 1	118	118	-	207	207	-	-	-	-	-	-	-
Stage 2	244	220	-	131	122	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	594	583	1026	616	590	895	1559	-	-	1414	-	-
Stage 1	887	798	-	795	731	-	-	-	-	-	-	-
Stage 2	760	721	-	873	795	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	524	556	1026	576	563	895	1559	-	-	1414	-	-
Mov Cap-2 Maneuver	524	556	-	576	563	-	-	-	-	-	-	-
Stage 1	869	776	-	779	716	-	-	-	-	-	-	-
Stage 2	680	707	-	824	774	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.9		10.6		1.1		3.3	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1559	-	-	648	732	1414	-
HCM Lane V/C Ratio	0.018	-	-	0.054	0.116	0.026	-
HCM Control Delay (s)	7.4	0	-	10.9	10.6	7.6	0
HCM Lane LOS	A	A	-	B	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.4	0.1	-

HCM Unsignalized Intersection Capacity Analysis

2: National Dr & River Hills/National Drive

P.M. Peak Hour
Existing + Development Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	21	11	0	3	66
Future Volume (Veh/h)	57	21	11	0	3	66
Sign Control	Free			Yield	Yield	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	23	12	0	3	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0		209	136	147	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0		209	136	147	0
tC, single (s)	4.1		7.1	6.5	6.5	6.2
tC, 2 stage (s)						
tF (s)	2.2		3.5	4.0	4.0	3.3
p0 queue free %	96		98	100	100	93
cM capacity (veh/h)	1623		676	726	716	1085
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	85	12	75			
Volume Left	62	12	0			
Volume Right	23	0	72			
cSH	1623	676	1063			
Volume to Capacity	0.04	0.02	0.07			
Queue Length 95th (ft)	3	1	6			
Control Delay (s)	5.4	10.4	8.6			
Lane LOS	A	B	A			
Approach Delay (s)	5.4	10.4	8.6			
Approach LOS		B	A			
Intersection Summary						
Average Delay			7.2			
Intersection Capacity Utilization			18.4%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: National Dr & River Hills/National Dr

A.M. Peak Hour
Proposed Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	51	11	20	4	0	41
Future Volume (Veh/h)	51	11	20	4	0	41
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	12	22	4	0	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	70	22	45			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	70	22	45			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	99	99			
cM capacity (veh/h)	921	1054	1563			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	67	26	45			
Volume Left	55	22	0			
Volume Right	12	0	45			
cSH	942	1563	1700			
Volume to Capacity	0.07	0.01	0.03			
Queue Length 95th (ft)	6	1	0			
Control Delay (s)	9.1	6.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	6.2	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			5.6			
Intersection Capacity Utilization			18.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
2: National Dr & River Hills/National Dr

P.M. Peak Hour
Proposed Conditions



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	21	11	0	3	66
Future Volume (Veh/h)	57	21	11	0	3	66
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	23	12	0	3	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	63	39	75			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	63	39	75			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	98	99			
cM capacity (veh/h)	936	1033	1524			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	85	12	75			
Volume Left	62	12	0			
Volume Right	23	0	72			
cSH	960	1524	1700			
Volume to Capacity	0.09	0.01	0.04			
Queue Length 95th (ft)	7	1	0			
Control Delay (s)	9.1	7.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	7.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			5.0			
Intersection Capacity Utilization			18.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Appendix B

Trip Generation and Distribution..... See Attached Worksheets

Parkville MOTEAP
Parkville, Missouri
Trip Generation

Proposed Land Use	Intensity		ITE Code	Daily	A.M. Peak Hour				P.M. Peak Hour					
					Total	% In	% Out	In	Out	Total	% In	% Out	In	Out
Single-Family Detached Housing	58	du	210	630	46	25%	75%	11	35	60	63%	37%	38	22
Total Development Trips				630	46			11	35	60			38	22

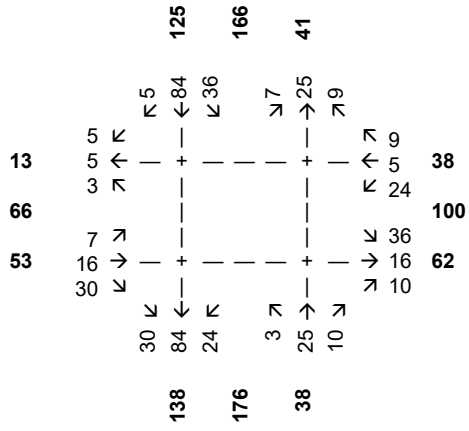
Notes:

Trip generation estimates based on 10th Edition
 General Urban/Suburban location

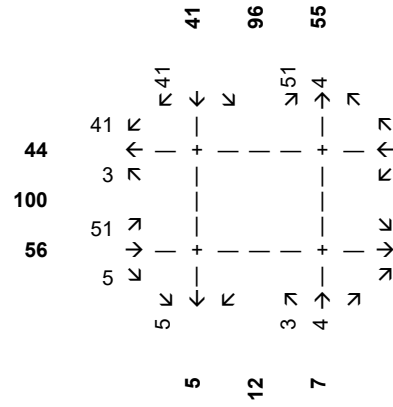
Parkville MOTEAP Parkville, Missouri

Existing Traffic Volumes A.M. Peak Hour

Crooked Road and National Entrance



National Drive and National Entrance

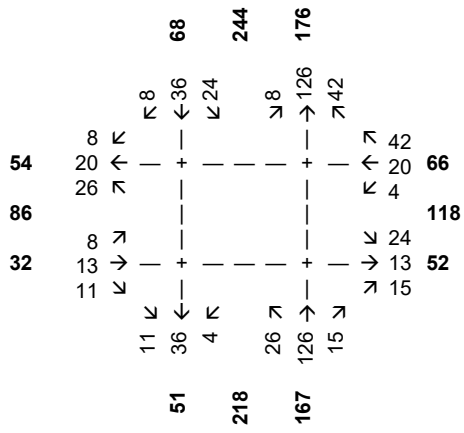


Parkville MOTEAP

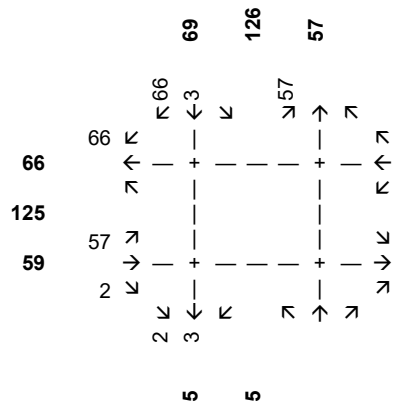
Parkville, Missouri

Existing Traffic Volumes P.M. Peak Hour

Crooked Road and National Entrance



National Drive and National Entrance

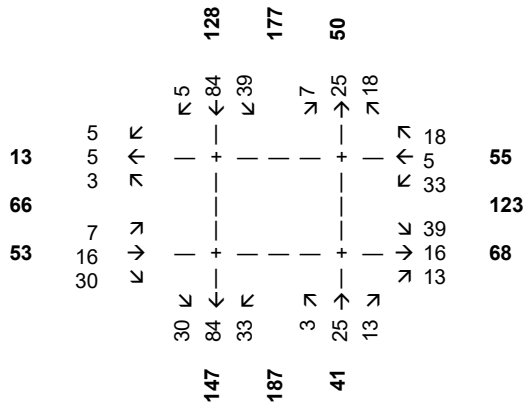


Parkville MOTEAP

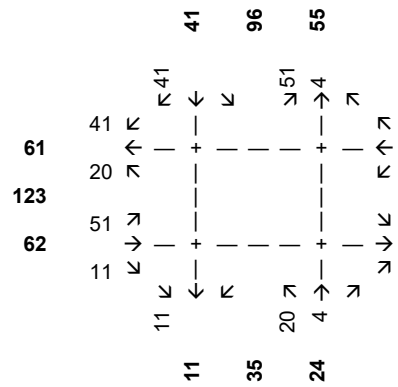
Parkville, Missouri

Existing plus Development Traffic Volumes A.M. Peak Hour

Crooked Road and National Entrance



National Drive and National Entrance

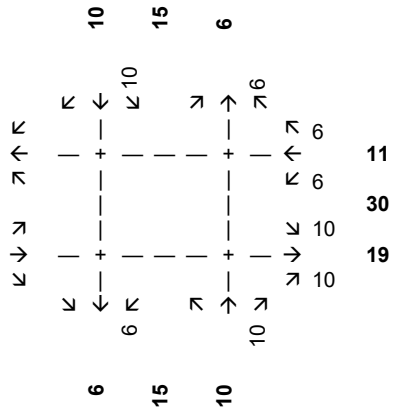


Parkville MOTEAP

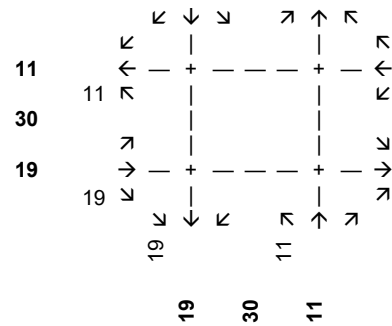
Parkville, Missouri

Proposed Development Trips P.M. Peak Hour

Crooked Road and National Entrance



National Drive and National Entrance

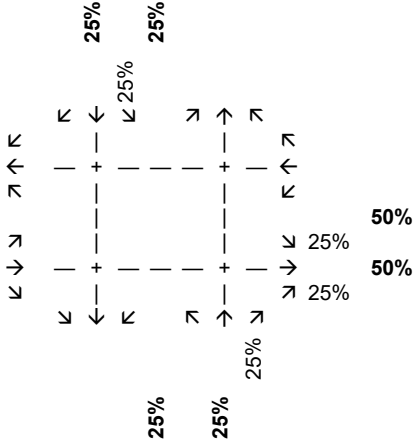


Parkville MOTEAP

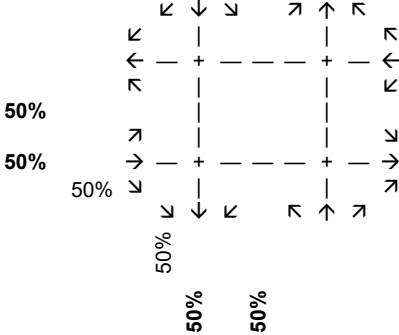
Parkville, Missouri

Trip Distribution INBOUND

Crooked Road and National Entrance



National Drive and National Entrance



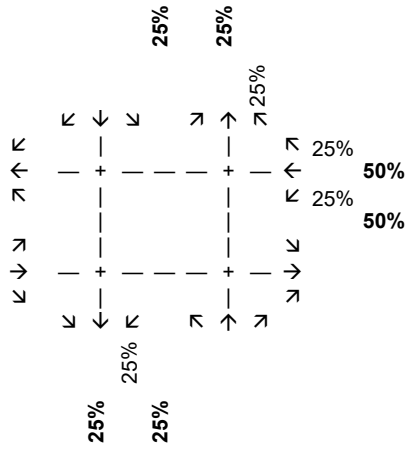
50% of projected incoming development traffic to come from east of the development site and will not travel through study intersections.

Parkville MOTEAP

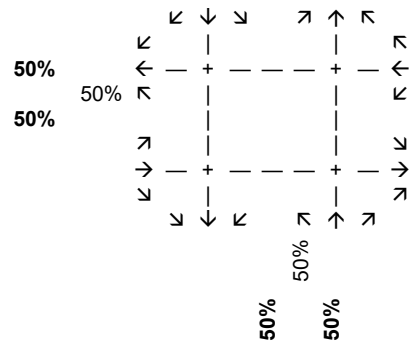
Parkville, Missouri

Trip Distribution OUTBOUND

Crooked Road and National Entrance



National Drive and National Entrance



50% of projected outgoing development traffic to travel east from the development site and will not travel through study intersections.