

# Access Justification Report

## *Interstate 70*

*Access Modifications from  
TR Hughes to Woodlawn Overpass  
O'Fallon, Missouri*



May 2016

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## SUMMARY

### **Project Location**

Interstate access modifications are proposed along Interstate 70 (I-70) between TR Hughes Boulevard and the Woodlawn Avenue overpass in the City of O'Fallon, St. Charles County, Missouri.

### **Proposed Action**

It is proposed that a one-way outer road system be added to the section of I-70 between TR Hughes Boulevard and Route K. This modification would remove the existing weave segments from both eastbound and westbound I-70 at this location by reversing the on- and off-ramps. Specifically the on-ramps from Route K and TR Hughes located between the interchanges would be replaced with off-ramps to the proposed outer roadways; conversely, the existing off-ramps within the same area would be replaced with on-ramps from the proposed outer roadway. This reversal would remove congestion from I-70 by eliminating the weave movement and placing more traffic onto the outer roads. Additionally, this improvement would eliminate the closely spaced intersections of the I-70 westbound ramps and Terra Lane at Route K, merging them into one as Terra Lane would become the north outer roadway. Interstate operation will be further benefited by the addition of a longer acceleration lane at the westbound I-70 on ramp from Route K.

### **Purpose & Need for Action**

Over the past two decades, traffic along the Route K/Main Street corridor in O'Fallon has been increasing at a significant rate. If this is not addressed, growth will have a significant impact on O'Fallon's quality of life. The interchange at I-70 and Highway K/Main Street has become an even greater challenge, with the number of traffic signals causing significant backups during most of the day. This project will improve traffic operations, relieve congestion, and increase capacity at the interchange and to the south on Route K. Additionally, it will improve traffic flow on I-70 between TR Hughes Boulevard and Route K, and make travel safer and more efficient for all users.

### **Project Goals & Objectives**

**Congestion Mitigation** – The City of O'Fallon has recognized the importance of maintaining their transportation infrastructure and satisfying citizens' desire for smooth traffic flow and minimal delay. Currently, capacity is consistently exceeded within the Route K/Main Street interchange during peak commuter periods and on Saturdays. This results in excessive delays and congestion throughout the interchange and study corridor.

**Improve Local Access** – As St. Charles County experienced a population explosion, with major growth centers established in the Cities of O'Fallon, St. Charles, and St. Peters, I-70 became one of the heaviest traveled interstate routes in the St. Louis Metropolitan Region. To account for these conditions, I-70 has been studied and upgraded by MoDOT to provide auxiliary lanes to maximize capacity and maintain access. This project is an extension of that process. Specific local issues include:

- Route K (south of I-70) offers minimal access control, with multiple driveways having full access to Route K, particularly between I-70 and Route N. With limited north-south access and rapid growth in the region, this facility has been functioning at or near full capacity.
- Main Street (north of I-70) provides O'Fallon the only direct connection between I-70 and Route 79. The City of O'Fallon has jurisdiction of this roadway as a principal arterial that serves residential and

commercial land uses to and from the northern limits of O’Fallon. As Main Street extends north, the posted speed limit drops and it becomes a “downtown” district.

- West/East Terra Lane, generally a two and three-lane two-way facility, serves as the north outer road between Lake Saint Louis Boulevard and Route 79. The intersection of Terra Lane and Main Street is located less than 100 feet north of the I-70 westbound ramps. This inadequate intersection spacing exacerbates inefficiencies by minimizing the area for vehicular queuing.
- Veterans Memorial Drive is considered the de facto existing south outer road to I-70 and generally extends from Route 61 to Route 79. Improved access management near the Route K intersection and added capacity at the Route K intersection is warranted based on traffic operation constraints.

Improve I-70 Interface – I-70 is the primary route providing access between St. Charles County and St. Louis County. I-70 is a fully controlled access freeway constructed in the early 1960’s. This facility is one of the primary east/west routes used for the shipment of goods and freight by truck in the United States. As traffic increased to the major growth centers established in the Cities of O’Fallon, St. Charles, and St. Peters, I-70 became one of the heaviest traveled interstate routes in the St. Louis Metropolitan Region. Maintaining the regional connectivity is vital to I-70 improvements.

Meet Driver Expectation – Driver expectancy is typically defined as “a driver’s readiness to respond to situations, events, and information in predictable and successful ways”. A project that meets driver expectation will improve driver behavior, performance, and decision-making. The existing roadway configuration has many areas amenable to improvement:

- Reducing the number of missed exits;
- Increasing decision sight distances;
- Eliminating signs that systematically cause drivers to make incorrect decisions; and
- Improving network comprehension.

Improvements in accordance with long-range planning – The City of O’Fallon is actively evaluating the future of their community. It is vital that the improvement of I-70 is consistent with the goals, standards, and intentions of the community’s planning process.

### **Description of Preferred Alternative**

Modifications to the existing interstate access are proposed in order to provide one-way outer roads to the north and south of I-70 between Route K and TR Hughes Boulevard. No new I-70 access points are proposed to be added to or removed from the system; however, access between the two interchanges will be modified. This will allow for the existing weave segments on I-70 in both directions to be relocated to the outer roads, thus improving interstate operations. The Preferred Alternative for this project includes:

- The conversion of the existing two-way outer roadway north of I-70 from TR Hughes Boulevard to Route K to a westbound one-way outer roadway system;
- The addition of a new one-way eastbound outer road south of I-70 from Route K to TR Hughes Boulevard;
- A new connection from the modified one-way north outer roadway to the existing Terra Lane at School Road;

- A new westbound slip ramp west of Route K with its gore at the existing westbound on ramp gore point and an extended acceleration lane length to 1200 feet;
- Improvements along Route K including:
  - The removal of the existing intersection and traffic signal at Terra Lane and Route K;
  - The addition of a 3<sup>rd</sup> northbound lane on Route K beginning at Bramblett Road and terminating as an exclusive right turn lane at the new south outer roadway;
  - The conversion of the existing southbound right turn lane on Route K from I-70 eastbound to Veterans Memorial Parkway to a third southbound lane as a shared thru/right-turn lane at Veterans Memorial Parkway and terminating as a right turn at the strip mall driveway approximately 900 feet to the south;
  - The addition of a right turn lane from eastbound Veterans Memorial Parkway to southbound Route K;
  - A new concrete barrier median separating north- and south-bound traffic on Route K beginning approximately 300' south of Bramblett Road and continuing north to the south outer road;
  - A Texas U-turn on the east side of the Route K interchange allowing the traffic on the westbound one-way north outer road to avoid the signalized intersections at Route K when traveling from the one-way westbound north outer road to the one-way eastbound south outer road;
- The removal of the traffic signal at Terra Lane and Sonderen Loop Road; replace with channelization for right turn only movements to and from the one-way westbound north outer road;
- A new connection from the south outer road to the east side of the commercial area located in the southeast quadrant of the intersection of Route K and I-70 eastbound ramps;
- The removal of the on ramp to eastbound I-70 from Route K;
- The addition of a slip ramp from eastbound I-70 to the south outer road located just east of the Sonderen Street overpass;
- The removal of the off ramp from westbound I-70 to Route K;
- The addition of a slip ramp from the north outer road to westbound I-70 located to the east of Sonderen Street Loop;
- The addition of right turn lanes to Harmony Lane and Hilltop Way from the north outer road;
- The removal of the off ramp from eastbound I-70 to TR Hughes Boulevard;
- The addition of a slip ramp from the south outer road to eastbound I-70 located west of TR Hughes;
- The removal of the on ramp to westbound I-70 from TR Hughes Boulevard;
- The addition of a slip ramp from westbound I-70 to the north outer road located west of TR Hughes; and
- A connection from the new north outer road to a remaining segment of the existing East Terra Lane just west of TR Hughes Boulevard.

See **Exhibit 1** for a depiction of the Preferred Alternative.



**LEGEND**

- NEW/RECONSTRUCTED PAVEMENT
- EXISTING PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED RAISED MEDIAN
- PROPOSED PAVEMENT REMOVAL
- PROPOSED NEW RIGHT OF WAY
- PROPOSED CROSS ACCESS EASEMENT
- PROPOSED SOUND WALL
- TRAFFIC SIGNAL
- ADD ALTERNATE 1

EXHIBIT 1: PREFERRED ALTERNATIVE

## INTRODUCTION

The following Access Justification Report (AJR) was prepared to address I-70 access modifications proposed along Interstate 70 between TR Hughes Boulevard and the Woodlawn Avenue overpass in the City of O'Fallon, St. Charles County, Missouri. The study area is located entirely within the City of O'Fallon and St. Charles County, Missouri, which is situated in the St. Louis Regional Transportation Management Area.

### PROJECT DESCRIPTION

As shown in **Exhibit 1**, modifications to the existing interstate access are proposed in order to provide one-way outer roads to the north and south of I-70 between Route K/Main Street and TR Hughes Boulevard. No new I-70 access points are proposed to be added to or removed from the system; however, access between the two interchanges will be modified. This will allow for the existing weave segments on I-70 in both directions to be relocated to the outer roads, thus improving interstate operations. Specific project improvements include:

- The conversion of the existing two-way outer roadway north of I-70 from TR Hughes Boulevard to Main Street to a westbound one-way outer roadway system;
- The addition of a new one-way eastbound outer road south of I-70 from Route K to TR Hughes Boulevard;
- A new connection from the modified one-way north outer roadway to the existing West Terra Lane at School Road;
- A new westbound slip ramp west of Route K with its gore at the existing westbound on ramp gore point and an extended acceleration lane length to 1200 feet;
- Improvements along Route K/Main Street including:
  - The removal of the existing intersection and traffic signal at Terra Lane and Main Street;
  - The addition of a 3<sup>rd</sup> northbound lane on Route K beginning at Bramblett Road and terminating as an exclusive right turn lane at the new south outer roadway;
  - The conversion of the existing southbound right turn lane on Route K from I-70 eastbound to Veterans Memorial Parkway to a third southbound lane as a shared thru/right-turn lane at Veterans Memorial Parkway and terminating as a right turn at the strip mall driveway approximately 900 feet to the south;
  - The addition of a right turn lane from eastbound Veterans Memorial Parkway to southbound Route K;
  - A new concrete barrier median separating north- and south-bound traffic on Route K beginning approximately 300' south of Bramblett Road and continuing north to the south outer road; and
  - A Texas U-turn on the east side of the Route K interchange allowing the traffic on the westbound one-way north outer road to avoid the signalized intersections at Route K/Main Street when traveling from the one-way westbound north outer road to the one-way eastbound south outer road;
- The removal of the traffic signal at East Terra Lane and Sonderen Street Loop; replace with channelization for right turn only movements to and from the one-way westbound north outer road;

- A new connection from the south outer road to the east side of the commercial area located in the southeast quadrant of the intersection of Route K and I-70 eastbound ramps;
- The removal of the on ramp to eastbound I-70 from Route K/Main Street;
- The addition of a slip ramp from eastbound I-70 to the south outer road located just west of the Sonderen Street overpass;
- The removal of the off ramp from westbound I-70 to Route K/Main Street;
- The addition of a slip ramp from the north outer road to westbound I-70 located to the east of Sonderen Street Loop;
- The addition of right turn lanes to Harmony Lane and Hilltop Way from the north outer road;
- The removal of the off ramp from eastbound I-70 to TR Hughes Boulevard;
- The addition of a slip ramp from the south outer road to eastbound I-70 located west of TR Hughes;
- The removal of the on ramp to westbound I-70 from TR Hughes Boulevard;
- The addition of a slip ramp from westbound I-70 to north outer road located west of TR Hughes; and
- A connection from the new north outer road to a remaining segment of the existing East Terra Lane just west of TR Hughes Boulevard.

This project will improve traffic operations, relieve congestion, and increase capacity at the interchange and to the south on Route K. Additionally, it will improve traffic flow on both the outer roadways and I-70 between TR Hughes Boulevard and Route K, and make travel safer and more efficient for all users.

Additionally, significant improvements will be made to pedestrian and bicycle facilities within the study area. Proposed facilities include:

- The installation of a 10' wide concrete shared use path along the west side of Route K extending from Veterans Memorial Parkway to north of the new North Outer Road and extending to the east along the north side of the North Outer Road to the eastern most entrance for Fort Zumwalt Middle School;
- The installation of an 10' wide concrete shared use path along the west side of Route K extending from the North Outer Road to Mariae Lane and connecting the shared use path to the existing sidewalk north of Mariae Lane;
- The installation of an 6' wide sidewalk on the east side of Route K extending from Veterans Memorial Parkway to the south side of the South Outer Road;
- Pedestrian upgrades at all three study area intersections along Route K including:
  - Crosswalks at all legs of the Veterans Memorial Parkway intersection;
  - Crosswalks at the west and south legs of the South Outer Road intersection; and
  - Crosswalks at the west and north legs of the North Outer Road intersection;
- High visibility crossings installed at all streets; and
- Share the road markings incorporated along new 6' shoulders of the outer roads.

**Exhibit 1** shows the majority of the pedestrian and bicycle improvements. Facilities are subject to some modification based on final design.

## STUDY AREA

The study focuses on the interchanges of I-70 with Route K/Main Street and TR Hughes Boulevard. It is centered upon the interstate corridor and its outer roads and also encompasses the immediately adjacent sections of the crossing arterials. The study area extends from west of Woodlawn Avenue on I-70 (to include an extended acceleration lane from the I-70 westbound on-ramp from Route K) to the TR Hughes interchange, a total distance of approximately 1.7 miles. The study area is depicted by the improvement shown on **Exhibit 1**.

## AREA OF INFLUENCE

The area of influence for the proposed modifications was based on the relevant characteristics of each segment of the corridor.

Along the interstate, the interchanges of Bryan Road to the west and Route 79 to the east were included to reflect the upstream and downstream impacts of the proposed modifications.

In the vicinity of Route K/Main Street, the first signalized intersection to the north of the new interstate connection, Pitman Street, was included, as was the first signalized intersection to the south of the interstate, Veterans Memorial Parkway. Additionally, the intersections of Woodlawn Avenue and West Terra Lane, as well as Sonderen Street Loop and East Terra Lane were included, thereby capturing all improvements to the local road network proposed in conjunction with the adjacent developments, while also reflecting the anticipated impacts of the proposed access modifications.

Additionally, Woodlawn Avenue and Sonderen Street were included from north of Terra Lane to south of Veteran's Memorial Parkway, including the intersections of Woodlawn Avenue and Veterans Memorial Parkway, Sonderen Street and Veteran's Memorial Parkway, and Sonderen Street and Sonderen Street Loop. While not improved, these intersections were impacted by the adjacent improvements.

At TR Hughes Boulevard, the first signalized intersection to the north of the new interstate connection is East Terra Lane. Due to the impacts at East Terra Lane and the close spacing of the next signalized intersection to the north, Public Works Drive and TR Hughes Boulevard was also included. To the south the first signalized intersection at Veterans Memorial Parkway was included. None of these intersections will be improved under the preferred alternative, but as with the other adjacent intersections, they will be impacted by the adjacent improvements.

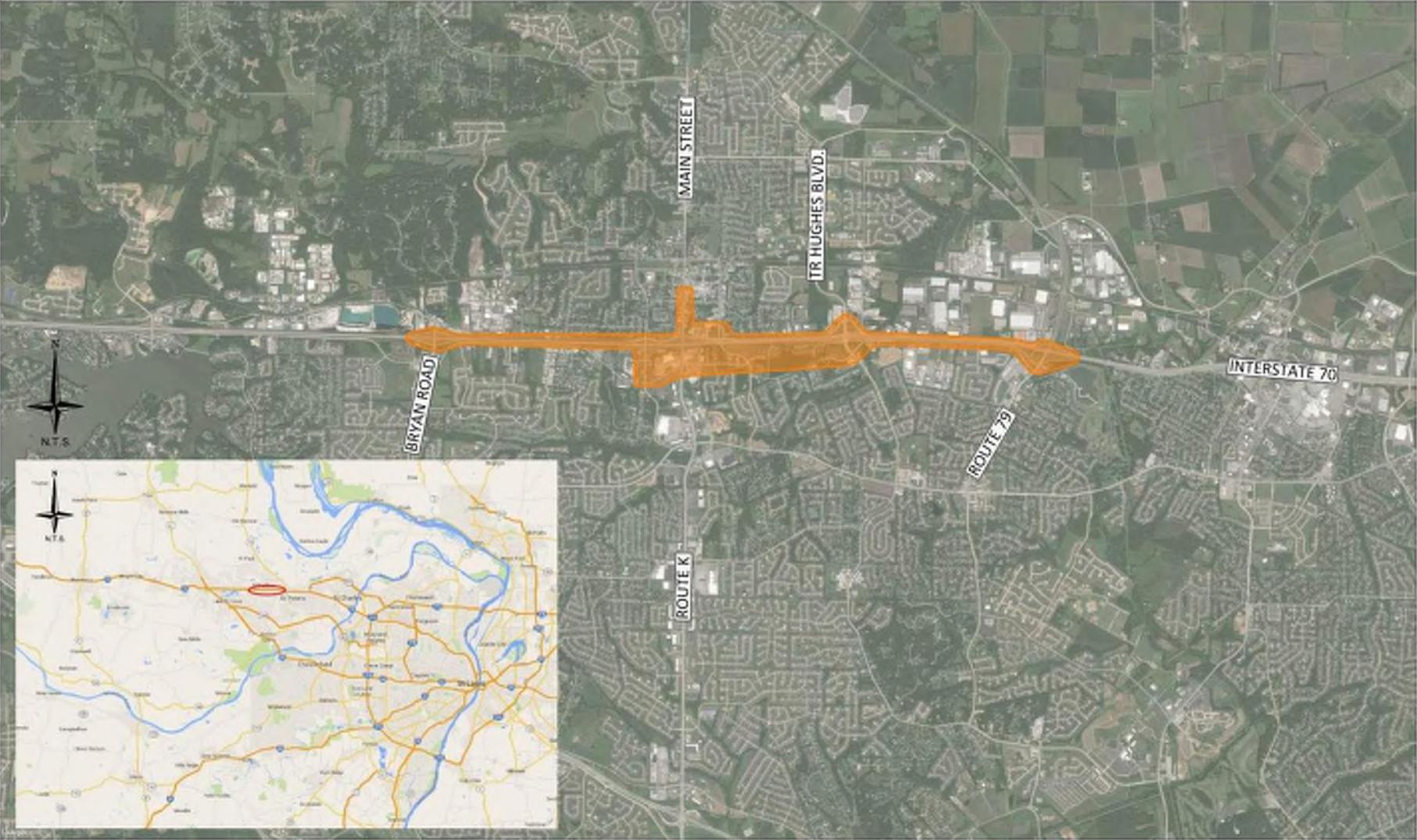
The resulting area of influence for the study is illustrated in **Figure 1**. It should be noted that the study parameters, including the area of influence, were agreed by MoDOT and FHWA in August of 2015.

## RELATIONSHIP TO OTHER PROJECTS

At this time there are no other projects planned along the I-70 corridor in this vicinity.

Future plans for the corridor include widening to 4 through lanes throughout the project area. While this is not planned at this time, it is accommodated in the preferred alternative. Additionally, there is potential that the outer roadway system may be expanded in the future to continue to both the east and west.

FIGURE 1: AREA OF INFLUENCE



## **PROJECT HISTORY**

Congestion, poor traffic flow, and a lack of pedestrian facilities, have been ongoing issues for this portion of I-70 and the adjacent roadway network through the City of O’Fallon, Missouri.

In 1996, Bucher, Willis & Ratliff performed a study that examined improvements to alleviate traffic at the Route K Interchange. The study also investigated outer roads.

In 2011, George Butler Associated performed an updated study. It examined numerous interchange types at the Route K/Main Street interchange. In all, 20 interchange concepts were developed and evaluated. This work formed the basis for both the cost share application and STIP/CMAQ applications.

At the end of 2012, St. Charles County and the City of O’Fallon collaborated on the potential conversion from a spot interchange project to a corridor project in order to more comprehensively address system-wide issues. St. Charles County hired Horner & Shifrin to further evaluate the outer roadway system.

In 2013, a study focusing on the area between the TR Hughes Boulevard interchange and the Woodlawn Avenue overpass was conducted. In addition to interchange configurations at TR Hughes Boulevard and Route K/Main Street, outer roads were considered. The study concluded that a one-way outer road system, one which would provide slip ramps instead of traditional diamond interchange ramps, would best address the traffic operational issues affecting the area. The one-way outer road system was found to benefit the stretch of I-70 between the TR Hughes Boulevard interchange and the Woodlawn Avenue overpass. This was found to spread out the congestion and put more traffic on the under-utilized outer road. Additionally, it was found that the one-way outer road system would provide improved access to the other side streets.

In 2015, the Categorical Exclusion study and preliminary design efforts were conducted to detail the interchange configurations, outer roadway systems, access management improvements and pedestrian facilities. This process resulted in the selection of the preferred alternative.

## **CONSISTENCY WITH LOCAL PLANNING PROCESSES**

As noted above, the City of O’Fallon, St. Charles County, and MoDOT have been collaborating on this project for several years. As part of the cost share program, it is being designed and constructed using funds from the City and County as well as MoDOT. Additionally, Federal CMAQ and TAP funds will be utilized. The proposed modifications are consistent with long-standing planning processes by all three agencies.

## **PURPOSE AND NEED**

Over the past 10 years, traffic along the I-70 and Route K/Main Street corridors in O’Fallon has been increasing. If this is not addressed, growth will have a significant impact on O’Fallon’s quality of life. The interchange at I-70 and Highway K/Main Street has become an even greater challenge, with the number of traffic signals causing significant backups during most of the day. This project will improve traffic operations, relieve congestion, and increase capacity at the interchange and to the south on Route K. Additionally, it will improve traffic flow on I-70 between TR Hughes Boulevard and Route K, and make travel safer and more efficient for all users.

## **CONSISTENCY WITH FHWA POLICY**

The FHWA Policy identifies eight “Considerations and Requirements” that an Interstate access request must satisfy for approval. A latter section of this report (following the description of study alternatives and the identification of preferred alternatives) contains a Consistency Review for each of the eight Policy Points.

## EXISTING CONDITIONS

### EXISTING TRANSPORTATION SYSTEM

#### Interstate 70

Nationally, I-70 extends from near Baltimore, Maryland to Cove Fort, Utah and is one of the primary east/west routes used for the shipment of goods and freight by truck in the United States. At the regional level, I-70 serves as the primary route providing access between St. Charles County and St. Louis County. As mentioned previously, I-70 has become one of the heaviest traveled interstate routes in the St. Louis Metropolitan Region as traffic has increased to the major growth centers established in the Cities of O'Fallon, St. Charles, and St. Peters.

Based on MoDOT's 2013 Traffic Volume Maps, I-70 carries an Annual Average Daily Traffic (AADT) volume of approximately 117,000 vehicles per day (vpd) to the east of TR Hughes Boulevard and 75,000 vehicles per day (vpd) to the west of the study area, just east of the connection with I-64. Three lanes of travel are provided in each direction, with a posted speed limit of 60 miles per hour. An auxiliary lane of approximately 4,000 feet is provided to serve as an acceleration lane from the eastbound on ramp at Route K and a deceleration lane for the eastbound off ramp at TR Hughes Boulevard (the next downstream interchange). Similarly, an auxiliary lane of approximately 5,240 feet is provided between TR Hughes Boulevard and Route 79. In the westbound direction a fourth lane is extended from the east before dropping at the Route K off ramp.

#### Route K

Route K is a principal arterial that serves residential and commuter traffic through O'Fallon, between I-70 to the north and I-64 to the south. Near the I-70 interchange, Route K carries about 38,000 vehicles per day. Moving south, the AADT is about 35,000 per day near Route N and about 34,000 per day just north of I-64. Route K is primarily a five-lane facility with a posted speed limit of 30 miles per hour through most of the study area, increasing to 45 mph just south of Veterans Memorial Parkway, and is one of only two corridors in St. Charles County that provides a direct connection between I-70 and I-64. Route K offers minimal access control, with multiple driveway having full access to Route K, particularly between I-70 and Route N. With limited north/south access and rapid growth in the region, this facility has been functioning at or near full capacity.

A signalized diamond interchange is provided at I-70. Separate left turn lanes are provided both northbound and southbound under the bridge. Additionally a separate right turn lane is provided northbound to the I-70 eastbound on ramp and a third lane is provided southbound beginning at the I-70 eastbound off ramp. At the signalized intersection with Veterans Memorial Parkway, the third southbound lane terminates as a right turn and separate right and left turn lanes are provided in both the southbound and northbound directions.

#### Main Street

Main Street (north of I-70) is a principal arterial that serves residential and commercial land uses to and from the northern limits of O'Fallon. This four and five-lane facility provides the only direct connection between I-70 and Route 79. The City of O'Fallon has jurisdiction of this roadway between East/West Terra Lane and Route P to the north. As Main Street extends north from I-70, the posted speed limit drops to 35 miles per hour and it becomes a "downtown" district.

At its signalized intersection with East/West Terra Lane separate left turn lanes are provided in both directions and a separate right turn lane is provided for the southbound movement. However, this intersection is located less than 100 feet north of the I-70 westbound ramps allowing for minimal vehicular queuing and exacerbating any operational deficiencies. The signalized intersection with Pitman Street is located around ¼ of a mile north of Terra Lane. Separate left turn lanes are provided on all legs of the intersection.

### **TR Hughes Boulevard**

TR Hughes Boulevard is a north-south minor arterial extending from Route 79 to Veterans Memorial Parkway. To the south of Veterans Memorial Parkway it become Belleau Creek Road. It is primarily a four-lane roadway with a posted speed limit of 40 miles per hour to the north of I-70 and 35 miles per hour to the south of I-70.

A Single Point Urban Interchange (SPUI) is provided at I-70 with dual lefts provided for all turning movements and free right turn movement from both off ramps onto TR Hughes Boulevard. At its signalized intersection with Veterans Memorial Parkway, approximately 475 feet south of the I-70 eastbound ramps, exclusive left turn lanes are provided in both directions and an exclusive right turn is provided for the southbound movement. At the signalized intersection with East Terra Lane, approximately 500 feet to the north of the I-70 westbound ramps, exclusive left turn lanes are provided in both directions and an exclusive right turn is provided for the northbound movement. Approximately 400 feet to the north is the next signalized intersection at Widell Lane, a local two-lane road. Exclusive left turn lanes are provide from TR Hughes Boulevard to Widell Lane.

### **West/East Terra Lane**

West/East Terra Lane is classified as an east-west major collector and serves as the north outer road between Lake Saint Louis Boulevard and Route 79. It is generally a two and three-lane two-way facility with a posted speed limit of 40 to 45 miles per hour throughout the study area.

The signalized intersection with Woodlawn Avenue provides exclusive left turn lanes in both directions. The signalized intersection of Terra Lane and Main Street includes dedicated left and right turn lanes in the eastbound direction and a dedicated right turn lane in the westbound directions. This intersection is located less than 100 feet north of the I-70 westbound ramps. The signalized intersection with Sonderen Street Loop provides a dedicated left turn lane for the eastbound movement. Finally, at the signalized intersection with TR Hughes Boulevard, West Terra lane includes dedicated left turn lanes in both directions and a dedicated right turn lane in the eastbound direction.

### **Veterans Memorial Parkway**

Veterans Memorial Parkway is an east-west major collector extending from Route 61 to State Route 79. It is considered the de facto existing south outer road to I-70. From Woodlawn Avenue to Sonderen Street it is a three-lane facility providing a two-way-left-turn-lane with a speed limit of 35 mph to the west, decreasing to 30 mph between Woodlawn Avenue and Veterans Memorial Parkway. At Sonderen Street it jogs to the south and becomes mainly a two-lane facility to its terminus at Route 79.

The signalized intersection with Woodlawn Avenue provides exclusive right and left turn lanes in both directions. At its signalized intersection with Route K, located approximately 600 feet south of the I-70 eastbound ramps, dedicated left and right turn lanes are provided. The signalized intersection at Sonderen Street provides exclusive left turn lanes in both directions. Finally, the signalized intersection with TR Hughes Boulevard, located approximately 500 feet south of the I-70 eastbound ramps, also includes dedicated left and right turn lanes in both directions.

## **Woodlawn Avenue**

Woodlawn Avenue is a north-south major collector extending from Emge Road to the north to Mexico Road to the south. To the north of West Terra Lane it is a two and three-lane facility with a posted speed limit of 25 miles per hour. To the south of West Terra Lane is a four-lane facility with a posted speed limit of 30 miles per hour. At its signalized intersection with West Terra Lane exclusive left turn lanes are provided in both directions. At its signalized intersection with Veterans Memorial Parkway exclusive left and right turn lanes are provided in both directions.

## **Sonderen Street**

Sonderen Street is a north-south major collector extending from Eggering Drive to the north to Mexico Road to the south. It is primarily a two and three-lane facility with a posted speed limit of 30 miles per hour. At its signalized intersection with Sonderen Street Loop and Fort Zumwalt School exclusive left turn lanes are provided in both directions. At its signalized intersection with Veterans Memorial Parkway exclusive left turn lanes are provided in both directions.

## **EXISTING TRAVEL DEMANDS**

The existing traffic volumes used in this evaluation were originally obtained for the 2013 study previously mentioned. This information was supplemented with mainline data provided by MoDOT through Traffic.com (mainline volumes were averaged to reflect a typical day). The existing traffic volumes are summarized on **Exhibits A-1 and A-4 in Appendix A.**

## **EXISTING PERFORMANCE**

A number of locations in the study area currently experience congestion due to operational deficiencies, capacity constraints or inefficiencies. To quantify those existing operating conditions, capacity analyses were performed on each of the intersections, ramp terminals and merge zones in the study area.

## **Performance Measures & Criteria**

Capacity is generally quantified by Levels of Service (LOS), which are measures that reflect motorists' delay, density, speed and maneuverability. The "Highway Capacity Manual" (HCM), published in 2010 by the Transportation Research Board, establishes six levels of service, ranging from LOS A ("free flow" conditions) to LOS F ("oversaturated" conditions). LOS C, which is commonly used for design purposes, represents a roadway with volumes utilizing approximately 70 to 80 percent of its capacity; whereas LOS D is widely considered an acceptable standard for peak period conditions in urban and suburban areas.

Level of service criteria for intersections vary depending upon the type of control. Signalized intersections have higher delay tolerances than unsignalized locations because motorists are accustomed to and accept longer delays at signals. The corresponding thresholds for signalized and unsignalized intersections are summarized in **Table 1.**

**Table 1: Intersection Level of Service (LOS) Thresholds**

Level of Service	Control Delay per Vehicle (sec/veh)	
	Signalized	Unsignalized
A	< 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Likewise, analyses of I-70 operations are quantified by LOS based on density. Although speed is a major indicator of service quality, freedom to maneuver within the traffic stream and proximity to other vehicles, as measured by the density of the traffic stream, are equally noticeable concerns. Density increases as flow increases, resulting in a measure of effectiveness that is sensitive to a broad range of flows. For these reasons, density is the parameter used to define LOS for I-70 and ramp sections, as described in **Table 2**.

**Table 2: Freeway Level of Service Thresholds**

Level of Service	Merging / Diverging Segments (pc/mile/lane)	Freeway Weaving Segment (pc/mile/lane)	Basic Freeway Segment (pc/mile/lane)
A	0-10	0-10	0-11
B	> 10-20	> 10-20	> 11-18
C	> 20-28	> 20-28	> 18-26
D	> 28-35	> 28-35	> 26-35
E	> 35	> 35	> 35 -45
F	Demand Exceeds Capacity	Demand Exceeds Capacity	> 45

Three different evaluation tools were utilized to perform the capacity analyses: Highway Capacity Software, Synchro 9 and VISSIM 7.0. The specific methodology related to these analyses is detailed in a latter section of this report.

### Existing Operating Conditions

The results of the capacity analyses of the existing conditions are summarized in **Table 3** for the I-70 segments and **Table 4** for the adjacent intersections. As discussed previously deficiencies currently exist along I-70 and Route K/Main Street within the study area. It should be noted that while posted speed limits are 60 mph, a free flow speed of approximately 65 mph exists within the study area and was therefore utilized in the analysis.

Specifically, mainline deficiencies on I-70 coincide with peak commuter patterns. Eastbound I-70 is congested during the a.m. peak period and westbound I-70 is congested during the p.m. peak period. Slowing or congestion are most prevalent within the weave segments between the on ramp at one interchange and off ramp at the next interchange. **Table 3** illustrates the lower speeds within these segments as highlighted in yellow.

**Table 3: Existing I-70 Capacity Analysis**

Segment	Type	Type	Lanes	Existing HCS						Existing VISSIM					
				AM			PM			AM			PM		
				LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)
West of Bryan Road	EB	Freeway	3	C	22.3	65.0	B	15.6	65.0	C	20.5	63.3	B	14.2	64.0
Bryan Road Off Ramp	EB	Diverge	4	C	22.8	57.9	B	17.1	58.1	B	15.6	62.3	B	10.7	63.4
Between Bryan Road Ramp	EB	Freeway	3	C	18.7	65.0	B	13.5	65.0	B	17.1	63.5	B	12.3	64.0
Bryan Road On Ramp	EB	Merge	4	C	27.3	57.7	C	22.6	58.7	B	16.9	61.6	B	13.0	62.4
Between Bryan Road and Route K	EB	Freeway	3	C	24.0	64.7	C	18.7	65.0	C	22.3	62.4	B	17.2	63.1
Route K Off Ramp	EB	Diverge	4	C	24.5	58.7	B	19.0	58.2	B	16.7	62.5	B	13.0	63.0
Between Route K Ramps	EB	Freeway	3	C	22.2	65.0	B	16.2	65.0	C	20.5	62.9	B	14.8	63.6
Between Route K and TR Hughes	EB	Weave	4	C	27.1	48.9	B	18.9	52.4	B	19.4	61.3	B	14.1	63.2
Between TR Hughes Ramps	EB	Freeway	3	C	23.8	64.7	B	17.9	65.0	C	21.9	62.2	B	16.3	63.3
TR Hughes On Ramp	EB	Merge	5	B	17.0	58.7	A	7.8	61.1	B	16.6	62.1	B	11.5	63.3
Between TR Hughes and Route 79	EB	Weave	4	D	28.9	49.9	B	18.6	54.6	C	21.0	61.4	B	14.4	63.2
Between Route 79 Ramps	EB	Freeway	3	D	30.1	61.9	C	19.6	65.0	D	26.9	61.5	C	18.0	63.1
Route 79 SB On Ramp	EB	Add Lane	4	C	25.5	64.2	B	16.6	65.0	C	23.9	60.8	B	15.4	62.5
Route 79 NB On Ramp	EB	Add Lane	5	C	23.7	64.8	B	15.0	65.0	C	21.6	63.0	B	13.6	63.8
East of Route 79	WB	Freeway	5	B	11.8	65.0	C	25.9	64.0	A	10.7	64.0	C	23.9	62.1
Route 79 Off Ramp	WB	Diverge	5	A	2.9	62.4	B	14.6	60.0	A	10.7	63.8	C	26.0	57.0
Between Route 79 Ramps	WB	Freeway	4	B	11.4	65.0	C	25.1	64.4	A	10.3	64.2	C	23.7	60.4
Route 79 On Ramp	WB	Merge	5	A	7.6	61.7	C	19.5	59.1	A	9.0	64.0	B	19.5	62.4
Between Route 79 and TR Hughes	WB	Freeway	4	B	12.3	65.0	D	26.8	63.7	B	11.3	64.0	C	24.5	62.1
TR Hughes Off Ramp	WB	Diverge	4	B	16.6	62.4	D	31.3	59.7	B	11.3	63.8	C	25.1	60.5
Between TR Hughes Ramps	WB	Freeway	4	A	10.8	65.0	C	20.8	65.0	A	9.8	64.1	C	19.3	62.7
TR Hughes On Ramp	WB	Merge	5	B	12.2	61.2	C	20.9	59.4	A	8.7	63.0	B	16.9	61.0
Between TR Hughes and Route K	WB	Weave	4	B	13.1	58.8	C	25.9	55.6	B	11.0	63.0	C	21.5	59.9
Between Route K Ramps	WB	Freeway	3	B	12.5	65.0	C	24.6	64.5	B	11.4	64.0	C	22.6	62.3
Route K On Ramp	WB	Merge	4	B	15.9	59.7	C	27.2	57.5	A	9.9	62.7	C	20.4	56.3
Between Route K and Bryan Road	WB	Freeway	3	B	14.2	65.0	D	27.1	63.5	B	13.1	63.5	C	25.0	61.6
Bryan Road Off Ramp	WB	Diverge	4	B	15.1	56.3	C	26.4	57.1	B	10.1	61.9	B	19.2	60.1
Between Bryan Road Ramps	WB	Freeway	3	A	10.2	65.0	C	21.1	65.0	A	9.2	64.3	C	19.3	63.1
Bryan Road On Ramp	WB	Merge	4	B	15.0	59.7	C	26.0	56.0	A	8.3	62.7	B	18.0	57.1
West of Bryan Road	WB	Freeway	3	B	11.9	65.0	C	23.8	64.7	A	10.8	64.0	C	22.0	62.0

**Table 4: Existing Intersection Capacity Analysis**

Intersection/Approach	Existing Synchro				Existing VISSIM			
	AM		PM		AM		PM	
	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)
<b>Woodlawn Avenue &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	C (26.2)	131, 285	B (20.0)	61, 149	C (23.1)	37, 239	D (49.1)	70, 323
Westbound Approach	C (34.4)	139, 152	C (25.7)	70, 165	C (24.4)	22, 205	C (27.2)	34, 224
Northbound Approach	C (23.2)	122, 142	B (18.7)	96, 192	D (35.0)	43, 271	D (40.7)	69, 276
Southbound Approach	C (29.7)	159, 205	C (24.1)	106, 225	B (20.0)	25, 197	C (26.4)	44, 284
<b>Overall</b>	<b>C (27.8)</b>		<b>C (21.8)</b>		<b>C (25.2)</b>		<b>D (36.2)</b>	
<b>Woodlawn Avenue &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	B (15.1)	88, 177	B (18.2)	120, 215	C (29.1)	43, 342	B (18.9)	41, 311
Westbound Approach	B (11.5)	28,63	C (24.0)	216, 369	B (10.6)	7, 162	B (17.8)	57, 476
Northbound Approach	B (15.3)	55, 113	C (20.6)	88, 183	D (42.5)	90, 365	C (20.4)	48, 309
Southbound Approach	B (16.3)	37,82	C (27.9)	119, 239	C (24.0)	14, 172	C (24.0)	41, 270
<b>Overall</b>	<b>B (14.9)</b>		<b>C (22.6)</b>		<b>C (30.1)</b>		<b>B (19.9)</b>	
<b>Route K &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	D (41.6)	142, 223	C (25.1)	42, 65	C (34.9)	62, 258	C (24.4)	17, 139
Westbound Approach	D (53.1)	101, 150	<b>E (70.2)</b>	124, 167	D (41.6)	47, 207	D (41.0)	50, 181
Northbound Approach	B (14.2)	93, 117	A (6.8)	36, 407	A (3.8)	13, 156	A (3.0)	27, 194
Southbound Approach	<b>F (83.3)</b>	276, 354	<b>F (81.0)</b>	287, 365	C (22.8)	51, 300	C (27.9)	70, 372
<b>Overall</b>	<b>D (49.3)</b>		<b>D (39.0)</b>		<b>C (20.1)</b>		<b>B (16.4)</b>	
<b>Route K &amp; Interstate 70 WB Ramps (Signalized)</b>								
Westbound Approach	D (36.3)	157, 212	C (33.5)	263, 301	C (34.5)	64, 257	D (35.7)	97, 379
Northbound Approach	A (2.3)	23, 28	A (6.7)	39, 84	A (5.0)	9, 115	A (9.8)	49, 304
Southbound Approach	<b>F (81.0)</b>	244, 310	<b>E (76.5)</b>	451, 531	A (7.0)	18, 235	A (5.3)	20, 395
<b>Overall</b>	<b>D (43.7)</b>		<b>D (36.8)</b>		<b>B (13.9)</b>		<b>B (15.7)</b>	
<b>Route K &amp; Interstate 70 EB Ramps (Signalized)</b>								
Eastbound Approach	C (29.3)	100, 167	D (49.3)	173, 224	C (23.9)	34, 194	C (29.1)	57, 264
Northbound Approach	B (19.1)	206, 268	A (4.9)	77, 118	A (6.8)	23, 303	A (5.9)	13, 274
Southbound Approach	A (7.2)	184, 280	B (12.7)	92, 540	A (5.7)	17, 225	A (9.2)	72, 329
<b>Overall</b>	<b>B (15.2)</b>		<b>B (14.0)</b>		<b>A (8.3)</b>		<b>B (10.1)</b>	
<b>Route K &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	D (49.4)	241, 298	<b>F (118.4)</b>	305, 445	<b>F (89.3)</b>	260, 818	<b>E (60.2)</b>	137, 629
Westbound Approach	C (25.5)	29, 55	D (41.7)	168, 233	D (41.3)	19, 102	D (44.7)	79, 342
Northbound Approach	C (23.7)	363, 460	C (33.3)	460, 572	B (14.0)	46, 322	C (26.9)	131, 630
Southbound Approach	B (15.5)	233, 229	C (31.2)	432, 564	B (18.1)	102, 447	B (14.6)	111, 494
<b>Overall</b>	<b>C (25.4)</b>		<b>D (44.4)</b>		<b>C (28.6)</b>		<b>C (28.3)</b>	

Note: Cells are highlighted to indicate unacceptable LOS

**Table 4 (cont'd)**

Intersection/Approach	Existing Synchro				Existing VISSIM			
	AM		PM		AM		PM	
	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)
<b>Sonderen Loop &amp; Terra Lane (Signalized)</b>								
Eastbound Approach	A (4.5)	24, 28	A (3.2)	1,20	A (4.2)	2, 91	A (3.6)	1, 76
Westbound Approach	B (10.1)	15, 31	A (5.7)	0, 77	A (4.8)	1, 54	A (3.5)	2, 69
Southbound Approach	A (8.4)	9, 26	A (8.8)	0, 27	A (7.6)	3, 62	A (7.1)	2, 55
<b>Overall</b>	<b>A (6.3)</b>		<b>A (5.5)</b>		<b>A (5.1)</b>		<b>A (4.1)</b>	
<b>Sonderen &amp; Sonderen Loop (Signalized)</b>								
Westbound Approach	A (6.6)	4,9	A (9.8)	10,42	A (8.4)	3, 107	B (14.8)	7, 94
Northbound Approach	B (10.1)	23, 49	A (6.6)	20, 75	A (6.0)	2, 89	A (3.7)	2, 75
Southbound Approach	A (3.6)	18, 20	A (4.7)	40, 61	A (1.7)	1, 74	A (2.8)	3, 98
<b>Overall</b>	<b>A (5.9)</b>		<b>A (6.1)</b>		<b>A (4.5)</b>		<b>A (4.9)</b>	
<b>Sonderen &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	B (12.3)	33, 69	B (15.7)	35, 85	A (6.9)	6, 90	A (7.9)	8, 95
Westbound Approach	NA	NA	A (6.9)	2, 10	NA	NA	A (6.5)	0, 23
Northbound Approach	A (3.3)	10, 18	A (5.9)	11,57	A (4.2)	1, 54	A (4.4)	2, 90
Southbound Approach	A (6.0)	14, 33	B (15.2)	100, 216	A (5.7)	2, 81	A (6.0)	7, 171
<b>Overall</b>	<b>A (8.5)</b>		<b>B (13.1)</b>		<b>A (5.9)</b>		<b>A (6.2)</b>	
<b>TR Hughes &amp; Public Works (Signalized)</b>								
Eastbound Approach	A (8.3)	0, 76	A (4.3)	1, 68	A (8.3)	0, 76	A (4.3)	1, 68
Westbound Approach	B (18.5)	3, 96	C (22.1)	14, 190	B (18.5)	3, 96	C (22.1)	14, 190
Northbound Approach	A (2.7)	3, 140	A (4.1)	11, 278	A (2.7)	3, 140	A (4.1)	11, 278
Southbound Approach	A (3.4)	8, 145	A (5.9)	12, 136	A (3.4)	8, 145	A (5.9)	12, 136
<b>Overall</b>	<b>A (3.7)</b>		<b>A (6.3)</b>		<b>A (3.7)</b>		<b>A (6.3)</b>	
<b>TR Hughes &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	C (26.1)	97, 134	B (14.5)	23, 35	C (28.6)	42, 220	D (37.1)	19, 76
Westbound Approach	C (30.5)	30, 42	D (35.1)	153, 121	D (40.5)	13, 99	D (39.0)	41, 188
Northbound Approach	B (13.7)	78, 133	B (20.8)	171, 260	C (26.2)	142, 388	C (21.9)	89, 408
Southbound Approach	B (17.2)	131, 182	C (26.0)	115, 176	B (13.5)	46, 263	B (12.8)	30, 198
<b>Overall</b>	<b>B (17.7)</b>		<b>C (24.4)</b>		<b>C (21.5)</b>		<b>C (22.6)</b>	
<b>TR Hughes &amp; Interstate 70 Ramps (Signalized)</b>								
Eastbound Approach	B (14.4)	92, 119	B (12.1)	65, 87	C (34.1)	81, 389	B (15.6)	24, 148
Westbound Approach	B (10.7)	43, 57	B (18.0)	244, 302	C (31.7)	27, 207	B (19.6)	74, 323
Northbound Approach	B (13.4)	118, 65	C (28.3)	151, 196	C (24.3)	48, 295	C (26.5)	64, 183
Southbound Approach	B (18.0)	164, 208	C (26.0)	123, 155	B (19.4)	61, 262	C (24.2)	64, 200
<b>Overall</b>	<b>B (14.6)</b>		<b>C (21.5)</b>		<b>C (25.8)</b>		<b>C (21.7)</b>	
<b>TR Hughes &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	D (47.8)	244, 249	C (32.3)	89, 135	D (37.0)	65, 319	C (30.5)	32, 162
Westbound Approach	B (18.2)	15, 35	C (25.8)	66, 104	C (22.7)	7, 61	C (27.2)	24, 143
Northbound Approach	B (17.1)	104, 215	B (12.4)	106, 154	B (15.4)	36, 306	B (11.5)	22, 269
Southbound Approach	A (8.9)	61, 120	A (5.3)	80, 102	A (8.7)	20, 155	A (5.6)	17, 172
<b>Overall</b>	<b>C (23.0)</b>		<b>B (12.5)</b>		<b>B (18.7)</b>		<b>B (11.9)</b>	

As previously discussed, Route K and Main Street regularly experience peak period congestion at the I-70 interchange and at several of the nearby intersections. As illustrated in Table 4, Synchro analysis shows that the southbound approach at Terra and the I-70 westbound ramps operates poorly in both peak hours. While VISSIM doesn't mirror these results, significant queues for the southbound movement at Terra Lane do indicate delays and congestion. The lack of delay at the westbound ramp intersection is due to the coordination of signals being more accurately depicted in VISSIM modeling. During the afternoon peak period, additional movements at these intersections show significant delay and/or queues according to both Synchro and VISSIM. Additionally, the eastbound left turn movement at Veterans Memorial Parkway experiences long queues and significant delays.

### Existing Safety Performance

The safety performance of the existing system was reviewed to provide a baseline and identify prominent safety issues. MoDOT traffic engineering staff provided crash summaries for I-70 mainline from 2010-2014 and intersection crash summaries for intersections along Route K / Main Street from 2011-2014 for this purpose. These summaries are provided in **Appendix B**.

#### Mainline I-70

The 4.4 mile segment of mainline I-70 from Bryan Road to Route 79 had a total 982 crashes from 2010 to 2014. These included zero fatalities and 14 disabling injuries. The crash rates in both the eastbound and westbound directions were generally elevated when compared to Missouri statewide averages for most of the period considered. The elevated accident rate in comparison to the statewide average is not uncommon given that the corridor is an urban interstate with more frequent access than rural freeway and interstates also included in the statewide averages. Classification of crashes for mainline I-70 are typical urban interstate and freeway with periods of congestion with the highest number of crashes attributed to rear end, passing, out of control, and lane change classifications.

It is notable that the crash rate on westbound I-70 experienced significant reductions and more closely reflected the statewide average in crash years 2012-2014. Improvements to westbound auxiliary lanes during that timeframe might account for the reduction in crash rates.

Crash severity and crash rate summaries for I-70 are shown in **Tables 5** and **6**. Crash rates are shown in crashes per hundred million vehicle miles traveled.

**Table 5: Crash Summary – I-70 EB from Bryan to MO 79 (4.404 miles)**

Severity	2010	2011	2012	2013	2014	Total
<b>Fatal</b>	0	0	0	0	0	0
<b>Disabling Injury</b>	3	2	1	0	0	6
<b>Minor Injury</b>	24	17	17	17	22	97
<b>PDO</b>	91	96	78	99	81	445
<b>Total</b>	118	115	96	116	103	548
<b>AADT</b>	59,713	58,964	55,408	56,904	58,229	
<b>Crash Rate</b>	122.93	121.32	107.78	126.81	110.04	
<i>STATEWIDE RATE-IS</i>	103.84	98.33	80.56	88.14	87.86	
<i>STATEWIDE RATE-FREEWAY</i>	104.51	99.05	81.96	89.4	87.47	

**Table 6: Crash Summary – I-70 WB from MO 79 to Bryan (4.404 miles)**

Severity	2010	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0	0
Disabling Injury	2	5	0	1	0	8
Minor Injury	18	15	14	8	9	64
PDO	93	79	60	59	71	362
<b>Total</b>	<b>113</b>	<b>99</b>	<b>74</b>	<b>68</b>	<b>80</b>	<b>434</b>
<b>AADT</b>	<b>51,525</b>	<b>50,769</b>	<b>55,419</b>	<b>56,915</b>	<b>57,480</b>	
<b>Crash Rate</b>	<b>136.27</b>	<b>121.17</b>	<b>82.97</b>	<b>74.24</b>	<b>86.48</b>	
<i>STATEWIDE RATE-IS</i>	103.84	98.33	80.56	88.14	87.86	
<i>STATEWIDE RATE-FREEWAY</i>	104.51	99.05	81.96	89.4	87.47	

In addition to the classifications noted as being typical for an urban interstate, the crash summaries in in **Appendix B** show a significant number of “Other” crashes on I-70. These Other crashes include a combination of Other Object, Other Non-Collision, and Motor Vehicle in Traffic crashes. Most entail debris in the roadway, mechanical failures resulting in a crash, or cargo or vehicle parts coming off other vehicles and another vehicle colliding with the debris. A smaller subset of Other crashes include vehicle fires without a prior collision as well as running off the roadway due to loss of control without striking another vehicle or fixed object.

Main Street

The intersection of Main Street and Terra Lane had a total of 59 crashes attributed to the intersection from 2011 to 2014. These include no fatalities and no disabling injuries. The intersection crash rate over the four year period was 1.20 crashes per million entering vehicles. The highest number of crashes are attributed to rear-end and left turning related classifications.

Crash severity and crash rate summaries for the Main Street and Terra Lane intersection are shown in **Table 7**. Crash rates are shown in crashes per million vehicle entering the intersection.

**Table 7: Intersection Crash Summary – Main Street and Terra Lane**

Severity	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	0	0	0	0
Minor Injury	2	3	3	5	13
PDO	14	13	7	12	46
<b>Total</b>	<b>16</b>	<b>16</b>	<b>10</b>	<b>17</b>	<b>59</b>
<b>AADT</b>	<b>31,435</b>	<b>34,865</b>	<b>34,408</b>	<b>34,040</b>	
<b>Crash Rate</b>	<b>1.39</b>	<b>1.26</b>	<b>0.80</b>	<b>1.37</b>	

***Route K***

The intersection of Route K and the I-70 westbound ramp terminals had a total of 15 crashes attributed to the intersection from 2011 to 2014. These include no fatalities and no disabling injuries. The intersection crash rate over the four year period was 0.23 crashes per million entering vehicles. The highest number of crashes are attributed to rear-end and left turning related classifications.

The intersection of Route K and the I-70 eastbound ramp terminals had a total of 36 crashes attributed to the intersection from 2011 to 2014. These include no fatalities and one disabling injuries. The intersection crash rate over the four year period was 0.60 crashes per million entering vehicles. The highest number of crashes are attributed to rear-end and left turning related classifications.

The intersection of Route K and the Veterans Memorial Parkway had a total of 108 crashes attributed to the intersection from 2011 to 2014. These include no fatalities and no disabling injuries. The intersection crash rate over the four year period was 1.76 crashes per million entering vehicles. The highest number of crashes are attributed to rear-end and left turning related classifications.

Crash severity and crash rate summaries for the Route K intersections with the I-70 ramp terminals and Veterans Memorial Parkway are shown in **Tables 8, 9, and 10**. Crash rates are shown in crashes per million vehicle entering the intersection.

**Table 8: Intersection Crash Summary – Route K and I-70 Westbound Ramp Terminals**

Severity	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	0	0	0	0
Minor Injury	1	1	1	2	5
PDO	0	3	2	5	10
<b>Total</b>	1	4	3	7	15
<b>AADT</b>	35,994	48,027	47,735	47,556	
<b>Crash Rate</b>	0.08	0.23	0.17	0.40	

**Table 9: Intersection Crash Summary – Route K and I-70 Eastbound Ramp Terminals**

Severity	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	1	0	0	1
Minor Injury	0	1	1	1	3
PDO	1	9	10	12	32
<b>Total</b>	1	11	11	13	36
<b>AADT</b>	35,994	42,776	42,458	42,136	
<b>Crash Rate</b>	0.08	0.70	0.71	0.85	

**Table 10: Intersection Crash Summary – Route K and Veterans Memorial Parkway**

Severity	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	0	0	0	0
Minor Injury	1	6	3	6	16
PDO	20	24	22	26	92
<b>Total</b>	21	30	25	32	108
<b>AADT</b>	40,632	43,176	42,600	42,148	
<b>Crash Rate</b>	1.42	1.90	1.61	2.08	

**EXISTING TRANSIT & NON-MOTORIZED ACCOMMODATIONS**

The city of O’Fallon partners with Mid-East Area on Aging to provide the Senior Transportation and Rides (STAR) Program which offers transportation to eligible O’Fallon residents for necessary medical services. Additionally, five companies within St. Charles County provide taxicab service and five transportation companies provide bus charter and rental services.

Sidewalks are present on both sides of Main Street to the north of Cordes Street (which is located between Terra Lane and Pitman Street), on the west side of Route K south of Veterans Memorial Parkway, along the west side of Woodlawn Avenue through the study area, along the west side of Sonderen Street beginning just south of the overpass for I-70 and extending north, on the south side of Veterans Memorial Parkway from Woodlawn Avenue to Route K, and on both sides of Veterans Memorial Parkway from Route K to Sonderen Street. Crosswalks are provided at both of the signalized intersections on Woodlawn Avenue, at the intersection of Main Street and Pitman Street, and at the intersections of TR Hughes Boulevard with West Terra Lane and Veterans Memorial Parkway.

The Gateway Bike Plan, completed in 2011 by Great Rivers Greenway with participation from MoDOT, East-West Gateway, and local municipal agencies, recommends on street bike facilities for several roadways within the study area including Woodlawn Avenue, Sonderen Street, TR Hughes Boulevard, Terra Lane, and Veterans Memorial Parkway.

**EXISTING LAND USE & ENVIRONMENTAL CONDITIONS**

Existing land uses within the study area include commercial, residential, church, school, and several others.

This project is in accordance with the local transportation planning goals. The City of O’Fallon (in conjunction with St. Charles County, MoDOT and the East-West Gateway Council of Governments) studied traffic flow improvement for the portion of I-70 between Mid Rivers Mall Drive on the east, and Bryan Road on the west. Based on the study results and the project’s public involvement plan the proposal to improve the area between TR Hughes Boulevard and Woodlawn Avenue emerged.

The only environmental concerns identified within the study area are noise impacts to residential areas located along the study corridor. Based on the preliminary design of the roadway, impacted areas will be identified and mitigation will be analyzed for feasibility and reasonableness.

The environmental evaluation is being completed concurrently with this document. The project is currently being processed as a Categorical Exclusion (CE) and is currently in the review stage.

## METHODOLOGY

As previously discussed, the study area is based on the conceptual design included in the design RFP by the City of O’Fallon, Missouri. It includes the project limits as well as one signalized intersection to the north and south on Route K and TR Hughes Boulevard, thereby capturing the impacts of the conversion from two-way to one-way outer roads on the adjacent signals. Along the interstate, the interchanges of Bryan Road and MO 79 were included as they represent the next interchanges to the east and west of the proposed access modifications.

### TRAFFIC FORECASTS

A key step in this process was the development of 20-year forecasts for the transportation system. Both build and no-build forecasts including ramp and intersection volumes for the year 2040 were provided from a previous study for the conceptual design. While the no-build volumes were utilized with minimal changes, the build forecasts were modified somewhat to more accurately account for the proposed network modifications.

I-70 forecasts were determined based on the provided ramp volumes for all scenarios and historical growth rates near the study area. Existing I-70 volumes for the AM and PM peak hour were based on an average day in 2015 correlated with the provided existing volumes for the ramp termini. All volume exhibits are provided in **Appendix A. Exhibit A-1** provides the existing interstate and ramp volumes within the study area.

Both No-Build and Build I-70 volumes were determined by adding a growth factor to the existing volumes west of Bryan Road. **Table 11** provides historical AADT (Annual Average Daily Traffic) volumes within the study area.

It is evident from the table that volumes have not grown steadily over the past 10 years. In fact, from 2007 to 2011 volumes declined and in 2013 had still not recovered to the 2007 peak. Based on this data and an assumption of future development in this area, background growth on the mainline of I-70 was assumed to be 0.5% annually. Because of the additional development growth determined within the study area, the 0.5% was applied only to the I-70 volumes west of Bryan Road; from there the provided ramp volumes were utilized and interstate volumes were determined accordingly.

**Table 11: Historical Traffic Volumes on I-70 East of Route K**

<i>Year</i>	<i>AADT</i>	<i>Annual Growth</i>
2004	115,627	
2005	115,789	0%
2006	116,521	0.5%
2007	117,686	1.0%
2008	116,956	-0.5%
2009	117,139	0%
2010	115,967	-1%
2011	114,806	-1%
2012	116,496	1.5%
2013	117,079	0.5%

The resulting traffic forecasts for the interstate and ramps within the study area are provided in **Exhibits A-2** and **A-3** for the No-Build and Build scenarios, respectively. It should be noted that to the west of Route K and east of TR Hughes, I-70 volumes remain constant in these two scenarios.

Existing intersection volumes for the year 2015 were provided from the conceptual study and used as such. The existing intersection volumes are provided in **Exhibit A-4**. No-Build intersection volumes were modified slightly to account for intersection balancing. The No-Build intersection volumes are provided in **Exhibit A-5**.

As mentioned previously, the build forecasts were modified to more accurately account for the changes to traffic patterns, as well as to account for changes made to the preferred alternative. In order to provide an accurate model of traffic shifts, the No-Build VISSIM model contained volumes for numerous origin-destination (O-D) routes within the study area. Once intersection volumes were verified for these routes, the proposed network modifications were added to the model and traffic was re-routed accordingly based on relative travel time. The Build intersection volumes are provided in **Exhibit A-6**.

All traffic forecasts were previously submitted and accepted by MoDOT District Traffic Personnel.

### **OPERATIONAL ANALYSIS PROCEDURES**

Due to the complex nature of the study area and analysis of various types of facilities, three different analysis tools were used to evaluate operations. Where possible, conditions were evaluated using more than one tool to capitalize on the strengths of each tool and compare results across platforms.

HCS 2010 software was used to evaluate individual interstate segments including ramp and weave segments. Synchro 9, which is based on analytical procedures outlined in the HCM, was used to analyze signalized intersections. It is recognized as one of the most widely-used evaluation tools in traffic engineering for evaluating signalized intersections and corridors and traffic signal operations. VISSIM is a traffic micro-simulation model that replicates complex traffic operations including interactions of closely-spaced signalized intersections, complex roadway systems, and freeway operations. VISSIM models each individual vehicle and their interactions with other vehicles as well as roadway and traffic control features and allows the user to visually observe the traffic conditions as they are simulated.

VISSIM was used to develop an entire study area network analysis, integrating arterial and freeway operations with great flexibility of design input and calibration parameters that emulate traffic operations and field conditions. The study area roadways were coded into VISSIM with their existing roadway geometry along with the existing traffic count data and current traffic signal timing plans. The existing conditions models for the AM and PM peak hour were calibrated/validated using average vehicle speed data along I-70 provided by MoDOT, as well as observational queues of the study area. VISSIM is generally considered the most appropriate tool for analyzing such conditions due to its sophisticated modeling of driver behavior reflecting lane-changing and car-following maneuvers. Because of the randomness of driver behavior that can occur between various model “runs”, it is critical to collect a sufficient sample size so that we may have confidence in the reported results. All VISSIM results were compiled as an average of ten model “runs”.

To evaluate the mainline and ramp segments of I-70 both HCS and VISSIM were utilized. Density and Level of Service (LOS) are key Measures of Effectiveness (MOEs) in the analysis. In accordance with HCM methodology, density is used to determine level of service (LOS) thresholds for freeways.

Intersection capacity analyses were completed using both VISSIM and Synchro. Synchro was used to optimize traffic signal timings for both the build and no-build alternatives along the Route K, Terra Lane (North Outer Road) and Veterans Memorial Parkway corridors which were imported into VISSIM. Delay, LOS, and queue length are key Measures of Effectiveness (MOEs) in the analysis. In accordance with HCM methodology, delay is used to determine level of service (LOS) thresholds for intersections.

Results between the various analysis tools may differ. Specifically, VISSIM results include the influence of capacity constraints, delays, and queueing throughout the system, while Synchro and HCS analyze only individual segments. Furthermore, VISSIM results report average and maximum results from the entire peak hour while HCS and Synchro report results only for the worst 15 minute period of the peak hour.

**SAFETY ANALYSIS PROCEDURES**

An important step in this process was the performance of safety analyses that are intended to determine whether the proposed access modifications would have a significant adverse impact on highway safety (particularly freeway operations). These analyses were performed in accordance with the procedures outlined in the Highway Safety Manual (HSM) utilizing the Interchange Safety Analysis Tool Enhanced (ISATe).

Based on the procedures used in similar studies and the requirements of the ISATe method, the analyses considered the corridor as a whole (both directions of travel) with limits extending beyond the ends of the project study area to incorporate the next interchange (upstream and downstream) in both directions. The analysis methods that were incorporated reflect the “new chapters” of the HSM, including the Crash Prediction Models, and they incorporated the calibration factors generated by MoDOT’s Central Office to the extent permitted in the ISATe tool.

Safety conditions were evaluated for the No-Build and proposed conditions in a substantive (i.e. quantitative) analysis in which predicted crash statistics were calculated (based on roadway characteristics and traffic volumes) using the Highway Safety Manual’s *Interchange Safety Analysis Tool (ISATe\_V06j)*. This approach allowed for a direct comparison between the No-Build and proposed conditions over a representative study period from 2021 to 2040. Additional details on the analysis methodology may be found in **Appendix B**. A complete discussion of the quantitative safety analysis and results are included under Policy Point #3.

The HSM ISATe predictive safety analysis and corresponding results are presented using the five-level KABCO crash severity scale in which K = fatal injury; A = incapacitating injury; B = non-incapacitating evident injury; C = possible injury; O = property damage only. The KABCO crash severity scale generally correlates to the four-level MoDOT crash severity scale that was used to present the historical crash data in the existing safety analysis as follows:

**Comparison of Crash Severity Scales – KABCO vs. MoDOT**

<i>KABCO Crash Severities</i>	<i>MoDOT Crash Severities</i>
K = Fatal Injury	<b>Fatal</b>
A = Incapacitating Injury	<b>Disabling Injury</b>
B = Non-Incapacitating Evident Injury	<b>Minor Injury</b>
C = Possible Injury	
O = Property Damage Only	<b>PDO (Property Damage Only)</b>

In addition to the quantitative analysis, a qualitative analysis of the proposed changes was made throughout the alternatives development phase. With known safety concerns identified in the existing safety analysis, the alternatives development considered solutions that would mitigate these safety concerns within the scope the proposed improvements.

## ALTERNATIVES

As described previously, modifications to the existing interstate access are proposed along with the addition of a one way outer road system and a number of other improvements to the local roadway network. The interstate modifications are relatively minor, and do not change the number of existing access points. Instead access between the interchanges of Route K/Main Street and TR Hughes Boulevard is reversed and the existing weaving segments are eliminated.

The proposed improvements were compared to the No-Build Network with consideration of the committed improvements to the local road system and interchange.

### ALTERNATIVES

Based on previous studies, many alternative concepts were eliminated from consideration and one alternative was selected to move forward. As such, only one alternative was analyzed for this study. Additional information regarding previous alternatives can be found in the 2011 Traffic Engineering Study for the I-70 & Main Street Interchange and in a number of memos submitted to MoDOT in 2013 and 2014.

While exact ramp locations and other details of the preferred alternative were considered and evaluated as this document was being prepared, none of these details would change the I-70 access or operation. Therefore, only the preferred alternative and No-Build condition were considered in this analysis.

### SUMMARY OF PREFERRED ALTERNATIVE

After considering physical constraints, operational and safety performance metrics, and the goals and objectives of the stakeholders, a preferred alternative was identified and agreed upon by MoDOT, St. Charles County and the City of O'Fallon.

The supporting safety and operational analyses presented here are for the preferred alternative as described previously in this document and illustrated in **Exhibit 1**. Its relative performance in comparison to the No Build condition, are summarized and discussed under Policy Point #3 in the following section of this report.

## **CONSISTENCY WITH FHWA POLICY FOR NEW OR REVISED INTERSTATE ACCESS**

The proposed access modifications require approval by both the Missouri Department of Transportation (MoDOT) and the Federal Highway Administration (FHWA). The FHWA policy on access to the interstate system was developed to ensure that proposed modifications are properly reviewed and that the highest level of service in terms of safety and mobility can be maintained. FHWA's interest is to ensure that all new or revised access points:

- Are considered using a decision-making process that is based on information and analysis of the system as a whole; the planning of the proposed change; the environment; and potential economic development.
- Support the intended purpose of the interstate system.
- Do not have an adverse impact on the safety or operations of the interstate system and connecting local roadway network or other elements of the transportation system.
- Are designed to acceptable standards.

The request must address the eight requirements outlined in the policy and provide supporting analysis to demonstrate how each requirement is met. The following sections present each applicable policy requirement followed by the corresponding documentation of how the proposed action is consistent with each policy point.

## POLICY POINT #1

*Access needs cannot be adequately satisfied by existing interchanges and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved to satisfactorily accommodate the design-year traffic demands.*

The purpose of the proposed modifications would be to provide one way outer roads at a congested section of I-70 between the interchanges at Route K/Main Street and TR Hughes Boulevard, thus removing undesirable weave movements from the interstate and placing them onto the outer road system. Additional access points are not proposed, instead a shift in the locations of four existing gores between the two interchanges is requested.

The existing interchange configuration cannot adequately satisfy access needs due to increasing congestion and delay as a result of closely spaced intersections and capacity constraints along Route K/Main Street. In order to improve Route K/Main Street, it was determined that the most desirable solution would be to combine the closely spaced intersections of the I-70 westbound ramps and Terra Lane as a one-way outer road, which would have the added benefit of eliminating the weave segments along the I-70 mainline.

In the existing condition, the Route K/Main Street interchange is a diamond configuration and The TR Hughes Boulevard interchange is a single-point diamond configuration. Terra Lane, a two-way roadway is adjacent to the I-70 with intersection spacing of 150' at Route K/Main Street and 650' at TR Hughes. Given the diamond ramps configurations at these interchanges, ramp sequencing along I-70 for these interchanges is off-ramp, on-ramp, off-ramp, on-ramp. With approximately 0.8 miles between ramp gores of these two interchanges, freeway weaving movements present operational and safety challenges especially during peak periods where high volumes result in congestion, slowdowns, and related crash patterns on the freeway system.

The proposed modifications of one way outer roads adjacent the freeway between the interchanges at Route K/Main Street and TR Hughes Boulevard will provide the opportunity to shift weave movements and some freeway volume onto the outer road system by resequencing the ramps in both directions of travel to off-ramp, off-ramp, on-ramp, on-ramp. Additionally, the proposed modifications include improvements to the Route K/Main Street corridor near the I-70 interchange where congestion and delay are a common occurrence. Most significant of these improvements is the merger of the two very closely spaced intersections (Terra Lane and the I-70 westbound ramps) into one intersection at the north outer road. As demonstrated in subsequent Policy Points, these proposed modifications will help to relieve the congestion leading to a safer and more efficient system.

## POLICY POINT #2

*The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management, geometric design, and alternative improvements to the Interstate without the proposed change(s) in access.*

Numerous modification options (twenty total concepts) including a number of interchange options at Route K/Main Street, a grade separated overpass of Terra Lane over Main Street, modified intersections along the Route K/Main Street corridor, as well as one-way outer road alternatives were evaluated in the 2011 Traffic Engineering study mentioned previously which focused only on the Route K/Main Street interchange. As the City of O'Fallon and St. Charles County began to collaborate, the project moved from a spot interchange project to a corridor project in order to more comprehensively address system-wide issues. The outer roadway system was considered with a number of interchange configurations at TR Hughes Boulevard and Route K/Main Street. The preferred alternative was found to spread out the congestion and put more traffic on the under-utilized outer road. Additionally, it was found that the one-way outer road system would provide improved access to the other side streets.

Active participation by the City, County, MoDOT and FHWA has influenced many aspects of the preferred alternative including ramp locations, side street connections, and interchange/intersection configurations. A number of new options were considered for local road connection within the northwest quadrant of the Route K/Main Street interchange and at the TR Hughes interchange.

Transportation system management (TSM) measures were also considered. It should be acknowledged that the proposed modifications are, in themselves, a form of transportation system management in that they provide for greater efficiencies and the dispersal of traffic within the existing system. Specifically, the addition of the one-way outer road system will effectively divert traffic away from the existing interchanges and crossing arterials.

In addition to the previously mentioned roadway improvements, it is proposed that new pedestrian accommodations be added along the Route K corridor including sidewalks from the existing sidewalk at Mariae Lane extending south to Veterans Memorial Parkway at the west edge of the roadway and extending south to the new north outer road at the east edge of the roadway. Additionally, crosswalks will be added at all signalized intersections along Route K within the study area.

Ramp metering or improvement to MoDOT's ITS installations within the study area may provide a benefit to the I-70 movements, but would likely not provide the additional improvements to Route K. Currently, very limited public transportation options are provided in this area making transit options unreasonable at this time.

Other TSM measures were also considered as part of the preferred alternative, including extended turn bays, traffic signal system improvements and optimized signal timing. Many of these improvements will help also accommodate more non-motorized transportation through the integration of enhanced pedestrian facilities.

## POLICY POINT #3

*An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility or on the local street network based on both the current and the planned future traffic projections.*

### OPERATIONAL ANALYSES

Operational parameters were evaluated using multiple tools. For system improvements VISSIM micro-simulation modeling software will generally give the most realistic results as it accurately replicates individual vehicles and their interactions within complex traffic streams and is capable of incorporating all of the system-types collectively. The VISSIM model reflects each of the interchanges and the intersections with the outer road system between TR Hughes Boulevard and Route K/Main Street. Additionally, HCS and Synchro 9 were used to analyze each I-70 segment and signalized intersection, respectively, within the study area. HCS and Synchro are based on analytical procedures outlined in the HCM.

Results may differ between the analysis tools due to a number of factors. One difference between VISSIM and HCS or Synchro is that results reported from VISSIM are average and maximums from the entire peak hour while HCS and Synchro report results only for the worst 15 minute period of the peak hour. The ability of VISSIM to model the entire system as a whole and take into account the effect of adjacent signals/weave segments/etc. versus only analyzing individual segments in HCS and Synchro can also affect results. Analyses were performed for the following scenarios:

- Existing Conditions
- 2040 No-Build
- 2040 Build (includes proposed ramp and outer road modification as well as Route K improvements)

### I-70 Operations

The existing interstate system within the study area is comprised of three through lanes eastbound with a deceleration lane provided at the Route K/Main Street off ramp and auxiliary lanes provided between Route K/Main Street and TR Hughes Boulevard as well as TR Hughes Boulevard and Route 79 to the east. In the westbound direction four through lanes are provided from the east with an acceleration lane but no deceleration lane provided at TR Hughes. At Route K/Main Street the fourth lane becomes an exit only at the off ramp and an acceleration lane is provided from the on ramp.

The interstate system generally operates favorably through the study area, with peak period operating conditions (as calculated by the models) of Level of Service (LOS) D or better in each section. The eastbound lanes experience some moderate congestion and delay during the morning peak period, while the westbound lanes experience the same during the afternoon peak hour. Existing I-70 and ramp volumes are reflected by **Exhibit A-1**.

In order to properly characterize operational elements, forecasts were developed showing future traffic growth and volumes. Forecasted volumes for both the no-build and preferred alternatives are provided in **Exhibits A-2** and **A-3**.

**Tables 12** and **13** provide both the HCS and VISSIM analysis of individual I-70 segments for both the no-build and build conditions. It should be noted, that while posted speed limits are 60 mph, a free flow speed of around 65 mph exists within the study area and was therefore utilized in the analysis.

**Table 12: HCS Results for I-70 Segments – 2040 No-Build vs. Build**

Segment	Direction	Type	Lanes	AM Peak Hour						PM Peak Hour					
				No-Build			Build			No-Build			Build		
				LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)
West of Bryan Road	Existing	Freeway	3	C	25.6	64.2	C	25.6	64.2	B	17.7	65.0	B	17.7	65.0
Bryan Road Off Ramp	EB	Diverge	4	C	25.1	57.6	C	25.1	57.6	B	19.0	58.1	B	19.0	58.1
Between Bryan Road Ramp	EB	Freeway	3	C	21.0	65.0	C	21.0	65.0	B	15.2	65.0	B	15.2	65.0
Bryan Road On Ramp	EB	Merge	4	D	31.0	56.5	D	31.0	56.5	C	25.8	58.1	C	25.8	58.1
Between Bryan Road and Route K	EB	Freeway	3	D	28.2	63.0	D	28.2	63.0	C	21.5	65.0	C	21.5	65.0
Route K Off Ramp	EB	Diverge	4	C	27.3	58.6	C	27.3	58.6	C	21.5	58.1	C	21.5	58.1
Between Route K Ramps	EB	Freeway	3	C	25.6	64.2	C	25.7	64.1	C	18.5	65.0	C	18.5	65.0
Between Route K and TR Hughes	EB	Weave	4	D	34.7	45.4				C	23.6	49.9			
SOR Off Ramp	EB	Diverge	4				C	25.2	57.7				B	19.6	57.9
Between SOR Ramps	EB	Freeway	3				C	21.1	65.0				B	15.6	65.0
SOR On Ramp	EB	Merge	4				D	33.1	55.5				C	25.9	58.0
Between TR Hughes Ramps	EB	Freeway	3	D	29.5	62.3	D	30.8	61.5	C	21.4	65.0	C	22.0	65.0
TR Hughes On Ramp	EB	Merge	5	C	21.8	55.9	C	21.3	56.1	B	11.2	60.3	B	11.1	60.3
Between TR Hughes and Route 79	EB	Weave	4	E	35.8	47.3	E	35.2	48.1	C	22.7	53.0	C	22.7	53.4
Between Route 79 Ramps	EB	Freeway	3	E	37.6	57.1	E	37.6	57.1	C	23.1	64.9	C	23.3	64.8
Route 79 SB On Ramp	EB	Add Lane	4	D	32.1	60.7	D	32.1	60.7	C	20.1	65.0	C	20.2	65.0
Route 79 NB On Ramp	EB	Add Lane	5	D	29.5	62.3	D	29.5	62.3	C	18.1	65.0	C	18.2	65.0
East of Route 79	WB	Freeway	5	B	13.9	65.0	B	13.9	65.0	D	34.4	59.2	D	34.4	59.2
Route 79 Off Ramp	WB	Diverge	5	A	5.8	61.0	A	5.8	61.0	C	20.5	58.1	C	20.5	58.1
Between Route 79 Ramps	WB	Freeway	4	B	12.6	65.0	B	12.6	65.0	D	31.0	61.4	D	31.0	61.4
Route 79 On Ramp	WB	Merge	5	A	9.8	61.4	A	9.8	61.4	C	24.8	57.6	C	24.8	57.6
Between Route 79 and TR Hughes	WB	Freeway	4	B	14.1	65.0	B	14.1	65.0	D	34.9	58.9	D	34.9	58.9
TR Hughes Off Ramp	WB	Diverge	4	B	18.5	61.4	B	18.5	61.5	E	36.8	58.0	E	36.7	58.3
Between TR Hughes Ramps	WB	Freeway	4	B	12.4	65.0				C	25.4	64.3			
TR Hughes On Ramp	WB	Merge	5	B	14.0	60.9				C	25.5	58.3			
Between TR Hughes and Route K	WB	Weave	4	B	15.3	58.0				D	32.8	53.5			
NOR Off Ramp	WB	Lane Drop	4				B	13.5	60.3				D	28.9	56.9
Between NOR Ramps	WB	Freeway	3				B	12.3	65.0				D	27.2	63.5
NOR On Ramp	WB	Merge	4				B	16.4	59.6				D	30.4	56.6
Between Route K Ramps	WB	Freeway	3	B	14.1	65.0	B	14.1	65.0	D	30.9	61.5	D	30.9	61.5
Route K On Ramp	WB	Merge	4	B	17.8	59.5	B	16.8	59.6	D	32.9	55.3	D	32.1	55.5
Between Route K and Bryan Road	WB	Freeway	3	B	16.1	65.0	B	16.1	65.0	E	36.2	58.0	E	36.2	58.0
Bryan Road Off Ramp	WB	Diverge	4	B	16.6	56.1	B	16.6	56.1	D	30.1	55.8	D	30.1	55.8
Between Bryan Road Ramps	WB	Freeway	3	B	11.4	65.0	B	11.4	65.0	C	23.8	64.7	C	23.8	64.7
Bryan Road On Ramp	WB	Merge	4	B	16.6	59.5	B	16.6	59.5	D	29.1	57.1	D	29.1	57.1
West of Bryan Road	WB	Freeway	3	B	13.4	65.0	B	13.4	65.0	D	27.5	63.3	D	27.5	63.3

Note: Cells are highlighted to indicate unacceptable LOS

**Table 13: VISSIM Results for I-70 Segments – 2040 No-Build vs. Build**

Segment	Direction	Type	Lanes	AM Peak Hour						PM Peak Hour					
				No-Build			Build			No-Build			Build		
				LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)	LOS	Density (pc/mi/ln)	Average Speed (mph)
West of Bryan Road	EB	Freeway	3	C	23.4	62.7	C	23.4	62.7	B	16.2	63.6	B	16.2	63.6
Bryan Road Off Ramp	EB	Diverge	4	B	18.2	60.6	B	17.7	62.1	B	12.2	63.1	B	12.7	61.3
Between Bryan Road Ramp	EB	Freeway	3	C	19.4	62.9	C	19.3	63.0	B	13.9	63.6	B	13.9	63.6
Bryan Road On Ramp	EB	Merge	4	B	19.9	60.0	B	19.9	60.2	B	14.9	61.8	B	14.9	61.9
Between Bryan Road and Route K	EB	Freeway	3	C	25.9	61.4	D	26.2	61.1	C	19.7	62.7	C	19.7	62.5
Route K Off Ramp	EB	Diverge	4	B	19.1	62.4	B	19.2	62.6	B	18.8	53.7	B	14.7	63.0
Between Route K Ramps	EB	Freeway	3	C	23.4	62.7	C	23.7	62.5	B	16.8	63.0	B	16.8	63.3
Between Route K and TR Hughes	EB	Weave	4	C	23.1	61.3				B	15.5	63.1			
SOR Off Ramp	EB	Diverge	4				B	17.6	61.8				B	12.5	62.6
Between SOR Ramps	EB	Freeway	3				C	19.4	63.3				B	14.0	63.8
SOR On Ramp	EB	Merge	4				C	21.9	57.5				B	14.7	61.0
Between TR Hughes Ramps	EB	Freeway	3	D	26.3	62.2	D	28.8	58.5	B	17.9	63.2	C	19.4	62.5
TR Hughes On Ramp	EB	Merge	5	B	19.6	62.1	B	19.6	61.9	B	12.6	63.4	B	13.1	63.4
Between TR Hughes and Route 79	EB	Weave	4	C	25.2	60.3	C	25.6	59.3	B	17.0	58.7	B	16.5	62.8
Between Route 79 Ramps	EB	Freeway	3	D	31.6	60.7	D	31.6	60.7	C	19.4	62.8	C	20.3	63.0
Route 79 SB On Ramp	EB	Add Lane	4	D	29.5	59.0	D	29.5	59.0	B	17.1	62.1	B	17.6	62.2
Route 79 NB On Ramp	EB	Add Lane	5	D	26.3	62.5	D	26.2	62.5	B	15.2	63.7	B	15.6	63.7
East of Route 79	WB	Freeway	5	B	12.7	63.9	B	12.7	63.7	D	32.4	56.3	D	32.3	56.4
Route 79 Off Ramp	WB	Diverge	5	B	12.7	63.9	B	12.7	63.6	D	31.1	58.6	D	30.9	58.9
Between Route 79 Ramps	WB	Freeway	4	B	11.4	64.2	B	11.5	64.1	D	27.6	61.5	D	27.5	61.8
Route 79 On Ramp	WB	Merge	5	B	10.3	63.8	B	10.3	63.8	C	24.3	60.4	C	23.7	61.2
Between Route 79 and TR Hughes	WB	Freeway	4	B	12.8	63.9	B	12.9	63.7	D	31.0	59.2	D	30.5	59.4
TR Hughes Off Ramp	WB	Diverge	4	B	12.9	63.7	B	12.9	63.6	D	34.1	53.7	D	30.0	60.1
Between TR Hughes Ramps	WB	Freeway	4	B	11.3	64.0				D	27.5	56.4			
TR Hughes On Ramp	WB	Merge	5	B	10.2	62.7				D	29.6	49.1			
Between TR Hughes and Route K	WB	Weave	4	B	12.7	62.7				E	40.3	41.5			
NOR Off Ramp	WB	Lane Drop	4				B	11.5	63.2				C	24.0	61.2
Between NOR Ramps	WB	Freeway	3				B	11.5	61.8				C	24.3	62.4
NOR On Ramp	WB	Merge	4				A	10.0	61.3				C	20.4	61.8
Between Route K Ramps	WB	Freeway	3	B	12.7	63.8	B	12.9	63.0	E	38.6	49.6	D	27.5	60.9
Route K On Ramp	WB	Merge	4	B	11.2	62.1	B	11.1	63.0	E	41.0	36.9	C	23.5	59.0
Between Route K and Bryan Road	WB	Freeway	3	B	14.7	63.3	B	14.8	63.2	D	33.4	54.6	D	34.5	53.9
Bryan Road Off Ramp	WB	Diverge	4	B	11.4	61.2	B	11.5	61.3	F	45.7	34.3	F	47.4	31.1
Between Bryan Road Ramps	WB	Freeway	3	A	10.3	64.2	A	10.3	64.2	C	21.3	61.7	C	22.0	61.0
Bryan Road On Ramp	WB	Merge	4	A	9.4	62.5	A	9.2	63.4	B	17.9	61.7	B	18.3	61.5
West of Bryan Road	WB	Freeway	3	B	12.3	63.8	B	12.2	63.9	C	23.8	62.0	C	24.2	61.8

Note: Cells are highlighted to indicate unacceptable LOS

It is evident in the VISSIM analysis that westbound I-70 conditions in the PM peak hour will be extremely congested and cause significant delays in the future if no improvements are made to the system. Additionally, HCS analysis shows that future volumes will have negative impacts on the existing weave segments between Route K/Main Street and TR Hughes Boulevard in both directions in both peak hours causing a reduction in speeds and unsafe speed differentials within the study area.

Both analysis tools show significant improvement to I-70 operations as a result of the proposed modifications. HCS indicates that replacing the weave segments with reversed ramps will significantly improve density and speeds in both directions in both peak hours. PM peak hour VISSIM analysis indicates that the failing segment of I-70 is due to the failing intersections at the Bryan Road interchange in both the no build and build conditions. Additionally the Route K on ramp segments is approaching failure in the no build condition and causing upstream congestion and reductions in speed. This segment to I-70 westbound will be vastly improved by volume shifts and an extended acceleration lane. Additionally, the replacement of the poorly performing westbound weave segment with reversed ramps will improve speeds by up to 20 mph.

### **Intersection Operations**

All intersections within the study area generally operate favorably, with peak period operating conditions (as calculated by the models) of Level of Service (LOS) D or better. Along the Route K there are several failing approaches where significant delay and queuing occur in both peak hours. Outside of the Route K corridor analysis shows that all approaches operate at LOS D or better. Existing intersection volumes are reflected by **Exhibit A-4**.

In order to properly characterize operational elements, forecasts were developed showing future traffic growth and volumes. Forecasted volumes for both the no-build and preferred alternatives are provided in **Exhibits A-5** and **A-6**.

**Tables 14** and **15** provide both the Synchro and VISSIM analysis of individual I-70 segments for both the no-build and build conditions.

In order to better accommodate future volumes, signal timings were updated in the no-build alternative, therefore some movements may show better operations than in the existing analysis, especially in the AM peak hour when volumes are not exceeding the capacity of the existing system.

Both analysis tools show significant improvement to signal operations at poorly performing intersections as a result of the proposed modifications. Along the Route K/Main Street corridor, the proposed improvements, are expected to significantly improve peak hour operation. It should be noted that the intersection of Route K and I-70 westbound ramps shows a slight increase in overall delay in both peak hours; however, this intersection will carry considerably more traffic in the build scenario as it replaces the Terra Lane intersection. Therefore, the delay of both intersections in the no-build scenario should be considered when comparing the build alternative. The intersection also shows significant improvements in queue lengths for the PM peak hour. Projected 95<sup>th</sup> percentile queue lengths are expected to be fully contained within the proposed storage lengths allowing for a free flowing U-turn movement.

In general, the intersections outside of the area of improvements maintain similar delays and queues between the no-build and build alternatives indicating that the improvements will not have a significant impact on them.

**Table 14: Synchro Results for Study Area Intersections – 2040 No-Build vs. Build**

Intersection/Approach	AM Peak Hour				PM Peak Hour			
	No Build		Build		No Build		Build	
	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)						
<b>Woodlawn Avenue &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	C (26.7)	147, 417	B (10.1)	66, 146	C (27.3)	127, 227	C (21.0)	100, 188
Westbound Approach	C (34.3)	102, 223	D (38.2)	116, 237	D (43.4)	208, 357	D (37.6)	216, 339
Northbound Approach	C (23.1)	88, 193	C (20.1)	60, 159	C (25.6)	210, 364	C (23.2)	154, 333
Southbound Approach	C (31.9)	126, 265	D (35.6)	142, 286	D (42.9)	263, 550	D (43.6)	271, 483
<b>Overall</b>	<b>C (28.4)</b>		<b>C (23.2)</b>		<b>C (34.3)</b>		<b>C (31.3)</b>	
<b>Woodlawn Avenue &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	B (19.1)	103, 211	B (19.4)	110, 226	B (18.5)	149, 242	B (19.0)	157, 247
Westbound Approach	B (16.5)	45, 106	B (14.6)	43, 103	C (23.7)	266, 414	C (23.8)	276, 413
Northbound Approach	B (19.5)	83, 164	B (16.1)	70, 138	C (28.1)	156, 314	C (27.2)	151, 270
Southbound Approach	B (16.6)	49, 97	B (18.5)	87, 170	C (26.7)	122, 234	C (30.6)	167, 341
<b>Overall</b>	<b>B (18.3)</b>		<b>B (17.4)</b>		<b>C (24.4)</b>		<b>C (25.4)</b>	
<b>Main Street &amp; Pitman Street (Signalized)</b>								
Eastbound Approach	C (29.7)	87, 148	C (30.2)	136, 217	D (37.0)	89, 138	D (37.0)	99, 157
Westbound Approach	C (25.8)	43, 81	C (24.4)	41, 79	D (43.5)	107, 170	D (42.1)	92, 158
Northbound Approach	D (40.0)	223, 338	C (24.7)	270, 269	B (19.3)	311, 434	B (16.3)	253, 423
Southbound Approach	D (35.2)	347, 434	C (31.1)	317, 399	B (19.3)	301, 418	B (19.6)	259, 329
<b>Overall</b>	<b>D (35.6)</b>		<b>C (28.4)</b>		<b>C (23.3)</b>		<b>C (22.5)</b>	
<b>Route K/Main Street &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	D (36.0)	146, 217			C (25.4)	40, 81		
Westbound Approach	D (46.7)	99, 163			<b>F (81.3)</b>	139, 239		
Northbound Approach	B (13.4)	200, 309			B (11.2)	43, 384		
Southbound Approach	D (38.9)	387, 460			<b>E (67.7)</b>	364, 482		
<b>Overall</b>	<b>C (30.6)</b>				<b>D (41.1)</b>			
<b>Route K &amp; Interstate 70 WB Ramps (Signalized)</b>								
Westbound Approach	D (38.3)	208, 259	D (35.6)	184, 230	D (44.7)	370, 502	D (44.4)	295, 422
Northbound Approach	A (6.8)	38, 103	B (13.1)	132, 129	C (26.4)	190, 343	C (31.1)	264, 465
Southbound Approach	A (8.0)	55, 332	B (14.3)	102, 209	C (33.3)	551, 688	C (28.6)	228, 282
<b>Overall</b>	<b>B (15.8)</b>		<b>C (20.7)</b>		<b>C (34.4)</b>		<b>D (35.3)</b>	
<b>Route K &amp; Interstate 70 EB Ramps (Signalized)</b>								
Eastbound Approach	D (44.3)	132, 210	D (36.0)	78, 132	D (53.1)	186, 264	D (40.4)	139, 228
Northbound Approach	B (10.3)	226, 329	A (4.4)	33, 142	A (5.7)	83, 177	A (7.2)	96, 151
Southbound Approach	A (9.9)	174, 357	B (12.4)	187, 210	A (5.8)	51, 201	A (9.3)	113, 133
<b>Overall</b>	<b>B (13.6)</b>		<b>B (10.8)</b>		<b>B (11.3)</b>		<b>B (12.0)</b>	
<b>Route K &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	<b>E (60.1)</b>	261, 450	D (39.5)	229, 322	<b>F (101.5)</b>	327, 526	D (52.9)	193, 341
Westbound Approach	D (39.7)	64, 123	C (32.1)	65, 106	<b>E (75.0)</b>	237, 412	<b>E (56.6)</b>	205, 374
Northbound Approach	C (29.9)	524, 662	C (24.5)	335, 420	D (47.3)	618, 801	C (35.0)	394, 466
Southbound Approach	C (21.2)	297, 252	A (9.4)	135, 119	<b>E (65.7)</b>	727, 862	D (39.9)	347, 566
<b>Overall</b>	<b>C (31.8)</b>		<b>C (22.6)</b>		<b>E (64.2)</b>		<b>D (41.8)</b>	

Note: Cells are highlighted to indicate unacceptable LOS

**Table 14 (cont'd)**

Intersection/Approach	AM Peak Hour				PM Peak Hour			
	No Build		Build		No Build		Build	
	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)						
<b>Sonderen Loop &amp; Terra Lane (Signalized No-Build, Unsignalized Build)</b>								
Eastbound Approach	A (5.6)	18, 42	NA	NA	A (3.3)	1, 25	NA	NA
Westbound Approach	B (10.2)	7,43	NA	NA	A (5.9)	0, 102	NA	NA
Southbound Approach	A (9.0)	5,33	C (19.1)	60	A (8.8)	0, 37	D (26.0)	59
<b>Overall</b>	<b>A (7.4)</b>				<b>A (5.7)</b>			
<b>Sonderen &amp; Sonderen Loop (Signalized)</b>								
Westbound Approach	A (7.8)	3, 23	A (6.5)	3, 14	B (10.2)	12,53	B (10.9)	12, 57
Northbound Approach	B (10.7)	25, 59	A (8.6)	24, 62	A (6.3)	21, 93	A (6.6)	23, 104
Southbound Approach	A (4.3)	14, 31	A (3.6)	13, 28	A (4.8)	48, 87	A (5.7)	48, 85
<b>Overall</b>	<b>A (7.0)</b>		<b>A (5.9)</b>		<b>A (6.1)</b>		<b>A (6.9)</b>	
<b>Sonderen &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	B (12.9)	40, 82	C (26.3)	78, 180	C (20.5)	64, 128	A (4.0)	1, 6
Westbound Approach	NA	NA	NA	NA	A (7.9)	2, 11	A (7.3)	11, 72
Northbound Approach	A (4.0)	12, 22	A (1.8)	9, 18	A (6.7)	17, 56	B (15.5)	58, 296
Southbound Approach	A (5.7)	15, 37	A (2.2)	3, 28	B (19.6)	150, 316	B (14.7)	48, 91
<b>Overall</b>	<b>A (9.2)</b>		<b>B (16.3)</b>		<b>B (17.0)</b>		<b>B (13.4)</b>	
<b>TR Hughes &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	C (28.9)	97, 154	C (25.9)	7, 25	B (11.3)	21, 47	C (20.3)	3, 16
Westbound Approach	C (24.9)	24, 60	C (30.4)	46, 76	D (52.0)	116, 173	D (53.8)	198, 286
Northbound Approach	B (16.5)	98, 197	A (7.0)	46, 180	B (18.1)	188, 300	B (12.3)	158, 317
Southbound Approach	C (20.4)	165, 227	A (9.6)	85, 174	B (18.5)	121, 169	B (18.0)	79, 180
<b>Overall</b>	<b>C (20.3)</b>		<b>A (9.8)</b>		<b>C (22.0)</b>		<b>C (20.3)</b>	
<b>TR Hughes &amp; Interstate 70 Ramps (Signalized)</b>								
Eastbound Approach	B (16.5)	103, 147	C (23.0)	246, 311	B (11.2)	64, 94	B (19.5)	153, 186
Westbound Approach	B (12.5)	44, 73	A (9.6)	37, 59	B (17.6)	276, 348	C (23.9)	306, 353
Northbound Approach	B (15.0)	76, 83	B (12.1)	55, 63	C (29.9)	201, 267	C (25.5)	105, 204
Southbound Approach	B (19.2)	194, 235	C (28.9)	98, 207	C (22.3)	138, 190	B (17.8)	185, 122
<b>Overall</b>	<b>B (16.5)</b>		<b>C (20.2)</b>		<b>C (20.7)</b>		<b>C (22.0)</b>	
<b>TR Hughes &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	E (56.7)	213, 327	D (41.1)	206, 315	C (34.1)	119, 178	C (31.9)	113, 180
Westbound Approach	C (22.4)	24, 55	C (20.8)	23, 54	C (27.8)	80, 134	C (30.2)	82, 137
Northbound Approach	C (22.5)	185, 256	C (23.0)	177, 277	B (13.9)	131, 188	B (18.0)	155, 212
Southbound Approach	B (11.9)	85, 141	B (12.5)	91, 159	A (5.6)	96, 271	A (8.5)	213, 367
<b>Overall</b>	<b>C (27.1)</b>		<b>C (23.5)</b>		<b>B (13.7)</b>		<b>B (16.2)</b>	

**Table 15: VISSIM Results for Study Area Intersections – 2040 No-Build vs. Build**

Intersection/Approach	AM Peak Hour				PM Peak Hour			
	No Build		Build		No Build		Build	
	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)
<b>Woodlawn Avenue &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	B (18.2)	38, 348	B (13.7)	24, 252	C (20.7)	30, 225	B (19.2)	32, 240
Westbound Approach	C (22.3)	35, 231	C (23.7)	39, 260	C (24.8)	50, 303	C (30.7)	79, 427
Northbound Approach	B (16.4)	31, 212	B (16.2)	23, 203	C (20.3)	41, 264	C (20.9)	52, 278
Southbound Approach	B (17.3)	33, 268	B (18.5)	35, 231	C (24.7)	65, 372	C (25.8)	40, 349
<b>Overall</b>	<b>B (18.2)</b>		<b>B (17.1)</b>		<b>C (22.7)</b>		<b>C (24.0)</b>	
<b>Woodlawn Avenue &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	B (13.9)	22, 212	B (15.2)	26, 224	B (17.5)	27, 248	C (20.3)	40, 285
Westbound Approach	B (12.1)	11, 114	B (14.2)	16, 165	B (18.5)	47, 457	B (16.9)	55, 478
Northbound Approach	B (14.2)	25, 178	B (14.8)	30, 202	B (17.3)	41, 300	C (21.2)	52, 335
Southbound Approach	B (15.1)	19, 159	B (17.0)	33, 232	B (19.8)	38, 205	C (21.8)	55, 308
<b>Overall</b>	<b>B (14.0)</b>		<b>B (15.5)</b>		<b>B (18.2)</b>		<b>B (19.9)</b>	
<b>Main Street &amp; Pitman Street (Signalized)</b>								
Eastbound Approach	C (29.8)	42, 273	C (29.1)	62, 369	D (49.4)	75, 387	D (44.9)	82, 356
Westbound Approach	C (25.8)	43, 81	C (34.3)	22, 141	D (43.3)	56, 281	D (43.3)	67, 305
Northbound Approach	B (12.7)	46, 254	B (16.3)	55, 343	B (17.4)	42, 362	B (17.7)	76, 438
Southbound Approach	B (17.1)	54, 353	B (19.4)	64, 369	B (16.9)	50, 394	B (19.4)	69, 363
<b>Overall</b>	<b>B (18.1)</b>		<b>C (21.2)</b>		<b>C (23.6)</b>		<b>C (24.2)</b>	
<b>Route K/Main Street &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	C (34.4)	63, 246			<b>F (119.9)</b>	155, 491		
Westbound Approach	D (48.9)	62, 257			<b>F (115.6)</b>	174, 593		
Northbound Approach	A (5.3)	24, 189			A (9.2)	97, 187		
Southbound Approach	B (16.7)	48, 357			C (27.1)	149, 626		
<b>Overall</b>	<b>B (19.1)</b>				<b>D (37.8)</b>			
<b>Route K &amp; Interstate 70 WB Ramps (Signalized)</b>								
Westbound Approach	C (34.8)	82, 299	D (37.2)	80, 315	<b>F (109.2)</b>	465, 1097	C (30.9)	116, 454
Northbound Approach	B (10.8)	32, 183	A (5.7)	20, 268	D (46.5)	257, 409	A (5.8)	73, 340
Southbound Approach	A (7.6)	22, 196	C (23.2)	56, 423	B (16.4)	248, 776	C (28.8)	114, 565
<b>Overall</b>	<b>B (16.0)</b>		<b>C (22.4)</b>		<b>E (55.0)</b>		<b>C (20.7)</b>	
<b>Route K &amp; Interstate 70 EB Ramps (Signalized)</b>								
Eastbound Approach	C (26.8)	50, 296	C (25.0)	31, 143	<b>E (76.0)</b>	254, 895	B (18.6)	31, 151
Northbound Approach	A (7.8)	64, 379	A (5.9)	35, 325	<b>E (55.0)</b>	194, 340	A (6.2)	17, 149
Southbound Approach	A (7.6)	39, 320	B (10.5)	112, 386	B (14.8)	148, 405	A (6.6)	71, 285
<b>Overall</b>	<b>A (9.7)</b>		<b>A (9.7)</b>		<b>D (36.1)</b>		<b>A (7.4)</b>	
<b>Route K &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	<b>E (55.3)</b>	117, 559	D (39.0)	97, 457	<b>F (88.0)</b>	162, 464	D (42.7)	117, 500
Westbound Approach	<b>E (75.6)</b>	65, 182	D (53.0)	50, 178	<b>E (77.6)</b>	154, 770	D (50.9)	125, 646
Northbound Approach	D (46.0)	403, 1104	C (20.6)	75, 341	<b>F (172.9)</b>	1547, 1701	C (30.4)	150, 799
Southbound Approach	C (22.1)	120, 457	A (8.8)	44, 325	C (31.2)	303, 516	B (19.6)	134, 485
<b>Overall</b>	<b>D (39.9)</b>		<b>C (21.7)</b>		<b>E (79.5)</b>		<b>C (30.4)</b>	

Note: Cells are highlighted to indicate unacceptable LOS

**Table 15 (cont'd)**

Intersection/Approach	AM Peak Hour				PM Peak Hour			
	No Build		Build		No Build		Build	
	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)	LOS (Delay) [sec/veh]	50th, 95th % Queues (ft)
<b>Sonderen Loop &amp; Terra Lane (Signalized No-Build, Unsignalized Build)</b>								
Eastbound Approach	A (4.2)	2, 85	NA	NA	A (3.9)	1, 76	NA	NA
Westbound Approach	A (6.8)	1, 82	A (0.5)	0, 0	A (5.3)	3, 91	A (1.2)	0, 22
Southbound Approach	A (6.3)	2, 130	A (9.9)	3, 152	A (6.3)	2, 118	C (16.6)	8, 152
<b>Overall</b>	<b>A (5.3)</b>		<b>A (1.5)</b>		<b>A (5.1)</b>		<b>A (2.3)</b>	
<b>Sonderen &amp; Sonderen Loop (Signalized)</b>								
Westbound Approach	A (2.7)	0, 37	A (2.5)	1, 55	A (7.7)	4, 94	A (5.0)	3, 84
Northbound Approach	B (16.9)	12, 169	A (6.7)	3, 102	A (4.5)	3, 95	A (3.8)	2, 104
Southbound Approach	A (7.9)	8, 118	A (1.7)	1, 60	A (4.4)	5, 120	A (3.2)	3, 119
<b>Overall</b>	<b>B (10.1)</b>		<b>A (3.6)</b>		<b>A (4.9)</b>		<b>A (3.7)</b>	
<b>Sonderen &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	A (9.2)	15, 188	C (26.6)	49, 302	B (12.1)	10, 135	B (12.2)	20, 174
Westbound Approach	NA	NA	NA	NA	B (13.1)	1, 62	A (8.1)	1, 78
Northbound Approach	A (4.8)	2, 66	A (2.7)	1, 66	A (6.3)	6, 102	A (3.3)	2, 70
Southbound Approach	A (8.7)	3, 106	A (4.2)	3, 116	B (11.6)	20, 311	A (8.0)	17, 238
<b>Overall</b>	<b>A (8.2)</b>		<b>B (17.0)</b>		<b>B (10.5)</b>		<b>A (8.4)</b>	
<b>TR Hughes &amp; Widel Lane (Signalized)</b>								
Eastbound Approach	B (15.2)	1, 86	B (15.3)	2, 84	A (4.8)	1, 65	A (9.4)	2, 84
Westbound Approach	C (22.7)	6, 122	C (22.2)	6, 121	C (25.8)	21, 176	C (27.1)	23, 172
Northbound Approach	A (3.6)	6, 141	A (5.7)	9, 139	A (5.4)	17, 301	A (4.6)	11, 227
Southbound Approach	A (5.6)	9, 189	A (6.9)	19, 265	A (7.1)	8, 112	A (5.7)	6, 103
<b>Overall</b>	<b>A (5.7)</b>		<b>A (7.2)</b>		<b>A (7.7)</b>		<b>A (7.1)</b>	
<b>TR Hughes &amp; West Terra Lane (Signalized)</b>								
Eastbound Approach	C (27.9)	38, 195	B (15.2)	2, 39	C (30.6)	23, 99	C (22.3)	2, 40
Westbound Approach	C (32.3)	15, 129	B (15.1)	7, 111	<b>E (55.6)</b>	71, 257	D (42.0)	65, 268
Northbound Approach	B (12.1)	37, 238	A (5.8)	18, 205	B (12.3)	54, 357	A (8.9)	34, 164
Southbound Approach	B (15.6)	60, 313	A (6.0)	13, 261	B (16.8)	35, 219	A (7.7)	14, 200
<b>Overall</b>	<b>B (16.8)</b>		<b>A (6.5)</b>		<b>C (20.2)</b>		<b>B (13.4)</b>	
<b>TR Hughes &amp; Interstate 70 Ramps (Signalized)</b>								
Eastbound Approach	B (17.8)	54, 257	C (21.3)	88, 375	B (13.4)	24, 152	B (19.6)	53, 264
Westbound Approach	B (14.7)	21, 116	A (7.9)	10, 273	C (20.5)	83, 346	C (21.6)	96, 527
Northbound Approach	B (13.2)	40, 261	B (12.0)	44, 268	C (27.6)	77, 255	C (27.7)	124, 398
Southbound Approach	B (18.2)	64, 287	B (16.5)	52, 210	C (21.1)	66, 229	C (21.6)	66, 256
<b>Overall</b>	<b>B (16.1)</b>		<b>B (15.9)</b>		<b>C (21.3)</b>		<b>C (22.6)</b>	
<b>TR Hughes &amp; Veterans Memorial Pkwy (Signalized)</b>								
Eastbound Approach	D (35.6)	75, 388	C (34.7)	76, 351	C (35.4)	59, 247	C (32.3)	48, 198
Westbound Approach	C (24.9)	11, 76	C (26.7)	10, 76	C (31.8)	37, 168	C (28.6)	31, 173
Northbound Approach	C (21.6)	65, 468	C (21.7)	77, 470	B (14.9)	35, 304	B (14.8)	37, 298
Southbound Approach	B (14.4)	45, 198	B (16.1)	46, 230	A (6.1)	23, 240	A (6.0)	22, 242
<b>Overall</b>	<b>C (22.5)</b>		<b>C (23.1)</b>		<b>B (14.8)</b>		<b>B (14.0)</b>	

Note: Cells are highlighted to indicate unacceptable LOS

**Travel Times**

In addition, interstate and major corridor travel times were measured in VISSIM for both the No-Build and Build scenarios. A summary of this analysis is provided in **Table 16**. The analysis indicates that there would be an improvement of about 25 seconds per vehicle in the westbound direction during the PM peak hour. Additionally, significant decreases in travel times are expected along the Route K/Main Street corridor with approximately a 30 second improvement for both directions in the AM peak hour and an almost 40 second improvement for the southbound direction in the PM peak hour. Most notably, the northbound direction, which is expected to experience extreme delays in the future, shows a **6 minute** improvement in the PM peak hour. Along the TR Hughes Boulevard corridor, an increase in travel time occurs during the AM peak hour due to the added eastbound U-turn movement at the signal conflicting with through volumes. In the PM peak hour, the heavy westbound volumes balance the added U-turn volumes, so that there are no negative impacts in travel time for through movements.

**Table 16: VISSIM Travel Time Summary – 2040 No-Build vs. Build**

Segment	AM Peak Hour		PM Peak Hour	
	No-Build (sec)	Build (sec)	No-Build (sec)	Build (sec)
I-70 Eastbound from Bryan Road to Route 79	256.5	257.7	251.1	250.7
I-70 Eastbound from Route K to TR Hughes	68.4	67.4	66.8	66.1
I-70 Westbound from Route 79 to Bryan Road	250.5	248.4	292.0	267.4
I-70 Westbound from TR Hughes to Route K	66.3	66.9	83.1	67.2
Route K Northbound from south of Veterans Memorial Parkway to north of Pitman Street	138.4	107.3	476.4	116.7
Route K Southbound from north of Pitman Street to south of Veterans Memorial Parkway	141.0	111.0	179.2	140.7
TR Hughes Northbound from south of Veterans Memorial Parkway to north of Widell Lane	85.4	103.0	94.5	83.5
TR Hughes Southbound from north of Widell Lane to south of Veterans Memorial Parkway	87.6	93.3	96.4	90.4

**Conceptual Signage Plan**

Finally, in order to verify that the proposed I-70 access would remain intuitive to users and that appropriate guidance could be clearly and simply displayed to the motoring public, a conceptual signage plan was developed. The anticipated signage would be relatively minimal and compatible with existing installations within the area of influence of the I-70 corridor. The conceptual signage plan is provided in **Exhibit 2**.



**SAFETY ANALYSES**

Safety conditions of the proposed improvements were evaluated by means of a predictive safety analysis of I-70 mainline for the entire project corridor extended to the next interchange in each direction using the Interchange Safety Analysis Tool Enhanced (ISATe). The analysis extends begin to the west with the mainline ramp gores on the east side of the Bryan Road interchange and end to the east with the mainline ramp gores on the west side of the MO Route 79 interchange. The analysis included both the No-Build condition and the Preferred Alternative (Build) configuration as of January 15, 2016.

Additional details on the analysis methodology are found in a previous section of this report.

**Limitations and Assumptions**

The Interchange Safety Analysis Tool Enhanced (ISATe) has known limitations. Many of these limitations are documented within the software tool and its user manual and are not explicitly recounted in project documentation.

In order to complete the detailed safety analysis within a reasonable level of effort, a number of assumptions were required. For the No-Build condition, this entailed assumptions that address the variation within the corridor, striking a balance between capturing changes in cross-sectional components and limiting the number of segments. For the Preferred Alternative (Build) configuration, this entailed assumptions that address the gaps in the roadway design due to the preliminary nature of the current level of roadway design. The most notable assumptions related to the determination of AADT for mainline segments and ramps given that traffic volume data was developed in a peak hour format.

Throughout the predictive safety analysis, assumptions were made with the intent of maintaining a fair comparison between the No-Build condition and the Preferred Alternative (Build) configuration within the limitations of the ISATe. Specific assumptions and related details are included **Appendix B**.

**Quantitative Results and Conclusions**

The results of the ISATe predictive safety analysis for the No-Build condition and Preferred Alternative (Build) configuration are summarized in **Table 17**. The predicted crash frequencies for the analysis years of 2021 to 2040 show moderately lower crash frequencies at all severity levels.

**Table 17: Summary of Predicted Crashes for Mainline I-70 between Bryan Road and MO Route 79**

ALTERNATIVE	STUDY PERIOD (YEARS)	PREDICTED # OF CRASHES BY SEVERITY DURING STUDY PERIOD (CRASHES)			PREDICTED AVERAGE CRASH FREQUENCY DURING STUDY PERIOD (CRASHES/YEAR)			PREDICTED # OF CRASHES DURING STUDY PERIOD (CRASHES)	
		FATAL [K]	DISABLING [A]	OTHER [B + C + PDO]	FATAL [K]	DISABLING [A]	OTHER [B + C + PDO]	SEVERE [K + A]	TOTAL [K + A + B + C + PDO]
No-Build	20	14.0	37.2	2771.4	0.7	1.9	138.6	51.2	2822.6
Preferred Alt.	20	13.0	34.7	2515.8	0.7	1.7	125.8	47.7	2563.5

Individual output summaries for No-Build and Build configurations are included in **Appendix B**.

The reduction in predicted crashes for the Preferred Alternative (Build) configuration relative to the No-Build condition is summarized in **Table 18**. Fatal and disabling injuries crash frequencies are estimated to be nearly 7% lower in the Build configuration. Total crashes frequency is estimated to over 9% lower in the Build configuration.

**Table 18: Reduction in Predicted Crashes Profile for Mainline I-70 between Bryan Road and MO Route 79**

DIFFERENCE FROM NO-BUILD							
PREDICTED # OF CRASHES DURING STUDY PERIOD <sup>1</sup> (CRASHES)				PERCENT DIFFERENCE <sup>2</sup> (PERCENT)			
FATAL [K]	DISABLING [A]	SEVERE [K + A]	TOTAL	FATAL [K]	DISABLING [A]	SEVERE [K + A]	TOTAL
-1.0	-2.5	-3.5	-259.1	-7.14%	-6.72%	-6.84%	-9.18%

<sup>1</sup>Difference in number of crashes is computed with respect to the *No-Build* scenario. *Negative* value indicates *decrease* and *positive* value indicates *increase* with respect to the *No-Build* scenario.

<sup>2</sup>Percent difference is computed with respect to the *No-Build* scenario. *Negative* value indicates *decrease* and *positive* value indicates *increase* with respect to the *No-Build* scenario.

Based on the specified safety analysis and the result presented herein, it is evident that the improvements proposed in the current Preferred Alternative (Build) configuration do not have an adverse impact on highway safety and, in fact, are expected to improve safety along mainline I-70 within the project and analysis limits.

### Qualitative Summary

With improvements in operations and the elimination of weaving segments, safety of the interstate facility will be improved in the proposed condition. Additionally intersection improvements along Route K, including combining the closely space intersections of the Terra Lane and I-70 westbound ramp, will significantly improve operations and safety along the corridor. The addition of a concrete median barrier south of the I-70 eastbound ramps will prevent unsafe left turn movements in a very congested stretch of roadway.

The conversion of two-way Terra Lane to a one-way north outer road presents some challenges in access and design. There are a number of private driveways along the existing roadway which will remain in the new configuration. While this is not an ideal situation, similar conditions exist along I-64 and Route 364 in the St. Louis area and safety has not been an issue in these locations. At half a mile in length, analysis shows that the weave segment will operate effectively through the design year. The businesses along this segment are not significant trip generators and their impact on the outer road are expected to be minimal.

Additionally connections to sections of Terra Lane, which will be cut off from the outer road system, are being made via a connector road just west of TR Hughes Boulevard and by a connection to School Street west of Route K/Main Street. The School Street connection includes a transition back to the two-way Terra Lane to the west. This transition, as well as the closely spaced intersections of the outer road and the new access roadway, are being critically analyzed for safety and operational concerns. It is anticipated that the volume of traffic utilizing this connection will be minimal. Operationally, it is expected to operate very effectively with minimal delay at either intersection. Safety concerns of wrong way drivers will be addressed with strong channelization and signage.

## POLICY POINT #4

*The proposed access connects to a public road only and will provide for all traffic movements. Less than “full interchanges” may be considered on a case-by-case basis for applications requiring access for managed lanes. The proposed access will be designed to meet or exceed current standards.*

It should be reiterated that the proposed changes do not reflect a net increase or change in access to the Interstate, but rather just modifications to the locations of existing ramps. The modifications would include the reversal of sequence between the existing ramps between Route K/Main Street and TR Hughes Boulevard and the addition of a new public outer road on the south side of the I-70.

As such, all of the I-70 access will continue to connect to public roads and provide for all traffic movements. In fact, the proposed addition of the one-way outer road system between these interchanges will enhance I-70 access and provide connections which do not currently exist.

The proposed access modification has been submitted with one design exception for substandard shoulder widths to match existing conditions. The design exception form is included in **Appendix C**. All other components will be designed to meet or exceed all current standards. The interchange and roadway designs for this project will meet current standards specified in the *Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials (AASHTO).

Additionally, the design will accommodate for the addition of a fourth through lane to I-70 in both directions, should the interstate be widened in the future.

## POLICY POINT #5

*The proposal considers and is consistent with local and regional land use and transportation plans.*

As noted previously, the City of O'Fallon, St. Charles County, and MoDOT have been collaborating on this project for several years. Route K interchange improvements were included in East-West Gateway's (MPO) Regional Transportation Plan 2040. As part of the cost share program, it is being designed and constructed using funds from the MPO, City, and County as well as MoDOT. The cost share agreement has been executed, and the project has been added to the Statewide Transportation Improvement Plan.

The proposed modifications are consistent with long-standing planning processes by all three agencies. The City of O'Fallon (in conjunction with St. Charles County, MoDOT and East-West Gateway) studied traffic flow improvement for the portion of I-70 between Mid Rivers Mall Drive on the east, and Bryan Road on the west. Based on the study results and the project's public involvement plan the proposal to improve the area between TR Hughes Boulevard and Woodlawn Avenue emerged.

## POLICY POINT #6

*In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan.*

No new interchanges or other access modifications are proposed or envisioned along I-70 between Bryan Road and Route 79.

An extension of the proposed one-way outer road system may be pursued in the future, but as with this project, the extension would not add any additional interchanges or gore points.

## POLICY POINT #7

*When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements.*

The proposed modifications are being requested in response to significant population growth and deficiencies of the existing roadway system. Current or planned future development or land use have not had any influence on the preferred alternative.

## POLICY POINT #8

*The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing.*

The environmental evaluation is being completed concurrently with this document. The project is currently being processed as a Categorical Exclusion (CE) and is currently in the review stage.

## POLICY POINT PROMPT LIST

<b>Addressed Adequately?</b>			<b>Question</b>	<b>Reference Location</b>
<b>Yes</b>	<b>No</b>	<b>N/A</b>		
<b>Policy Point 1:</b> “The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands.”				
X			Does the access request clearly describe the need and purpose of the proposal and identify project goals and objectives that are specific and measurable? <ul style="list-style-type: none"> <li>• No additional access requested. Reversal of access proposed to incorporate new outer road system.</li> </ul>	<ul style="list-style-type: none"> <li>• Summary (p. 3)</li> <li>• Introduction – Purpose and Need (p. 11)</li> <li>• Policy Point #1 (p. 29)</li> </ul>
X			Is the proposal in the best interest of the travelling public, or does it merely serve a narrow interest? <ul style="list-style-type: none"> <li>• Proposal is consistent with the wishes of the City of O’Fallon, St. Charles County and MoDOT to provide improved connectivity and circulation for the traveling public.</li> </ul>	<ul style="list-style-type: none"> <li>• Summary (p. 3)</li> <li>• Introduction – Consistency with Local Planning (p. 11)</li> <li>• Policy Point #1 (p. 29)</li> </ul>
X			Is the proposal serving a regional transportation need, or is it merely compensating for deficiencies in the local network of arterials and collectors? <ul style="list-style-type: none"> <li>• The addition of the one-way outer road system will remove traffic from the I-70 improving efficiency of the interstate system, thus serving a regional transportation need.</li> </ul>	<ul style="list-style-type: none"> <li>• Summary – Project Goals &amp; Objectives (p. 3)</li> <li>• Introduction – Purpose and Need (p. 11)</li> </ul>
X			In lieu of granting new access, is there any reasonable alternative consisting of improvements to the existing roadway(s) or adjacent access points that could serve the need and purpose? <ul style="list-style-type: none"> <li>• No additional access requested. While the reversal of access to incorporate new outer road system will modify the system, it will replace all existing movements and will not add anything that doesn’t already exist.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction – Purpose and Need (p. 11)</li> <li>• Policy Point #1 (p. 29)</li> </ul>
X			Has the evaluation of existing interchanges and the local road network taken into account all proposed improvements currently identified in the State and/or Regional Long Range Plan? <ul style="list-style-type: none"> <li>• No other projects are currently planned along I-70 in this vicinity.</li> <li>• Future plans including widening I-70 to 4 through lane within the project limits. The potential for this widening is accommodated in the preferred alternative.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction – Relationship to Other Projects (p. 9)</li> </ul>
X			Will the proposed change in access result in needed upgrades or improvements to the cross road for a significant distance away from the interchange? <ul style="list-style-type: none"> <li>• Improvements to Route K/Main Street are proposed and are being considered to improve existing deficiencies in the local network.</li> <li>• All other cross streets were analyzed for potential impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction –Project Description (p. 7); Area of Influence (p. 8)</li> <li>• Policy Point #3 – Operational Analyses (p. 31)</li> </ul>

<b>Policy Point 2:</b> “The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access.”				
<b>Addressed Adequately?</b>			<b>Question</b>	<b>Reference Location</b>
<b>Yes</b>	<b>No</b>	<b>N/A</b>		
X			Was FHWA actively involved in preliminary studies and decisions? If not, then more detailed information may be required in support of proposed action. <ul style="list-style-type: none"> <li>FHWA has been active participant throughout this study process.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #2 (p. 30)</li> </ul>
X			Did the study area cover sufficient area to allow for an evaluation of all reasonable alternatives? <ul style="list-style-type: none"> <li>Following the 2011 study of numerous interchange options at Route K, the study area was expanded to encompass TR Hughes Boulevard and Woodlawn Avenue. Additional options beyond this study area have been considered, but are not being pursued at this time.</li> </ul>	<ul style="list-style-type: none"> <li>Summary (p. 3)</li> <li>Introduction – Area of Influence (p. 8); Project History (p. 9)</li> <li>Policy Point #2 (p. 30)</li> </ul>
X			Was a No-Build Alternative evaluated? <ul style="list-style-type: none"> <li>Yes, all evaluations included a 2040 No Build Scenario</li> </ul>	<ul style="list-style-type: none"> <li>Methodology (p. 23)</li> <li>Policy Point #3 – Operational Analyses (p. 31) &amp; Safety Analyses (p. 41)</li> </ul>
		X	Considering the context of the proposal, is this the best location for the proposed new interchange? <ul style="list-style-type: none"> <li>No “new” interchange or additional access points are being proposed.</li> </ul>	N/A
X			Were different interchange configurations (Tight diamond, SPDI, Parclo) considered? <ul style="list-style-type: none"> <li>Yes, seven different interchange configurations were considered for the three existing overpasses, though none were deemed “reasonable”; they were limited by right-of-way and funding constraints; and they were not conducive to traffic patterns or the existing one-way outer road system.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #2 (p. 30)</li> </ul>
X			Were pedestrians and bicyclists considered in the alternative evaluation? <ul style="list-style-type: none"> <li>The planning process considered pedestrian and bicycle accommodations within the entire study area and included a number of upgrades to existing pedestrian facilities.</li> </ul>	<ul style="list-style-type: none"> <li>Existing Conditions – Existing Transit &amp; Non-Motorized Accommodations (p. 22)</li> <li>Policy Point #2 (p. 30)</li> </ul>
X			Was there an evaluation of different intersection configurations (stop control, signal, roundabout, free right turns, etc.)? <ul style="list-style-type: none"> <li>Alternative intersection configurations were considered at locations throughout the study area to improve connectivity and operations.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #2 (p. 30)</li> </ul>
X			Have Transportation Systems Management (i.e. HOV, ITS, Ramp Metering, Transit etc.) options been evaluated as an alternative to a new or modification to an existing interchange? <ul style="list-style-type: none"> <li>The one-way outer road system will provide some TSM benefits by diverting traffic away from crossing arterials.</li> <li>Options were considered, but because many of the existing issues are along the Route K corridor, it is not expected that these options would improve the system.</li> </ul>	<ul style="list-style-type: none"> <li>Existing Conditions – Existing Transit &amp; Non-Motorized Accommodations (p. 22)</li> <li>Policy Point #2 (p. 30)</li> </ul>

X			<p>Did the report discuss how TSM alternatives were evaluated and eliminated from consideration?</p> <ul style="list-style-type: none"> <li>TSM alternatives were not completely eliminated, however it is not expected that they would satisfy the goal of improving operations along the Route K corridor.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #2 (p. 30)</li> </ul>
X			<p>Does the proposal consider any future planned TSM strategies and is the design consistent with the ability to implement the future TSM strategies?</p> <ul style="list-style-type: none"> <li>TSM strategies are not explicitly proposed as part of current requests, but they could be incorporated in the future.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #2 (p. 30)</li> </ul>
<p><b>Policy Point 3:</b> “An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network. Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative.”</p>				
<b>Addressed Adequately?</b>			<b>Question</b>	<b>Reference Location</b>
Yes	No	N/A		
X			<p>Does the report demonstrate that a proper traffic operational analysis was conducted? The analysis should include the applicable basic freeway segments, freeway weaving segments, freeway ramp segments, ramp junctions and crossroad intersections related to the proposed access point and at least the two adjacent interchanges.</p> <ul style="list-style-type: none"> <li>All components of the highway system and crossing arterials were evaluated in keeping with the identified scope for the AJR.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X			<p>Does the report include a safety analysis of the mainline, ramps and intersections of the proposed access point and the nearest adjacent interchange (provided they are near enough that it is reasonable to assume there may be impacts)?</p> <ul style="list-style-type: none"> <li>Safety analyses were conducted for the mainline based on the premise that the proposed actions should have nominal impacts on interstate operations.</li> </ul>	<ul style="list-style-type: none"> <li>Methodology – Safety Analysis Procedures (p. 25)</li> <li>Policy Point #3 – Safety Analyses (p. 41)</li> </ul>
X			<p>Has the design traffic volume been validated?</p> <ul style="list-style-type: none"> <li>All forecasts were previously submitted to MoDOT District Traffic personnel for review and approval, for the modeling effort conducted for the AJR.</li> </ul>	<ul style="list-style-type: none"> <li>Methodology – Traffic Forecasts (p. 23)</li> </ul>
X			<p>Has a conceptual signing plan been provided?</p> <ul style="list-style-type: none"> <li>The conceptual signage plan is provided as Exhibit 2 within the Operational Analyses section.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X			<p>Is guidance signing (i.e., way-finding or trail blazing signs) clear and simple?</p> <ul style="list-style-type: none"> <li>The proposed actions would require very modest modifications to the existing signage in the corridor. Outer road signage would be consistent with other existing installations and only one additional exit would need to be marked for mainline traffic.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X			<p>Do the results of the operational analysis result in a significant adverse impact to existing or future conditions?</p>	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses</li> </ul>

		<ul style="list-style-type: none"> <li>The proposed actions provide an overall improvement to freeway operating conditions. Travel times on the mainline would be expected to remain fairly consistent between the No-Build and Build scenarios for both peak hours and directions, with the exception of the westbound direction in the PM peak hour which is expected to show significant improvement.</li> <li>Moreover, the proposed modifications provide significant improvements to the Route K/Main Street corridor when comparing the No Build and Build Conditions for the Design Year.</li> </ul>	(p. 31)
X		<p>Will the proposed change in access result in needed upgrades or improvements to the cross road for a significant distance away from the interchange? If so, have impacts to the local network been disclosed and fully evaluated?</p> <ul style="list-style-type: none"> <li>Improvements to adjacent roadways are included as part of the conversion of the north outer road from two-way to one-way, mostly in the vicinity of Route K. Additional improvements along Route K are not driven by the interstate access changes.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #1 (p. 29)</li> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X		<p>Are the cross roads or adjacent surface level roads and intersections affected by the proposed access point analyzed to the extent (length) where impacts caused or affecting the new proposed access point are disclosed to the appropriate managing jurisdiction?</p> <ul style="list-style-type: none"> <li>The impacts from the proposed changes on the crossing arterials would be beneficial and managing jurisdictions have been involved in the development of the preferred alternative.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Consistency with Local Planning Processes (p. 11)</li> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X		<p>Are pedestrian and/or bicycle facilities included (as appropriate) and do these facilities provide for reasonable accommodation?</p> <ul style="list-style-type: none"> <li>Pedestrian and bicycle facilities are included as part of the preferred alternative. Currently there are no pedestrian accommodations through the Route K interchange, no crosswalks at the VMP signal, and no contiguous sidewalks from Mariae Lane to VMP. Proposed improvements include a shared use path on the west side of Route K, a 6' sidewalk along the east side of Route K from VMP to SOR, crosswalks at Route K intersections, and share the road markings on outer roads.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 8)</li> <li>Policy Point #2 (p. 30)</li> </ul>
X		<p>Does the proposed access secure sufficient Limits of Access adjacent to the Interchange ramps?</p> <ul style="list-style-type: none"> <li>Access controls on the crossing arterials would remain unchanged and access to the proposed outer roads is limited to specifically defined locations.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 7)</li> </ul>
X		<p>Does the proximity of the nearest crossroad intersections to the ramps contribute to safety or operational problems? Can they be mitigated?</p> <ul style="list-style-type: none"> <li>The preferred alternative was adapted to ensure that sufficient spacing is provided between ramp terminals, crossing arterials and access points to maintain safe and efficient operations.</li> </ul>	<ul style="list-style-type: none"> <li>Summary of Preferred Alternatives (p. 27)</li> <li>Policy Point #3 (p. 31)</li> </ul>
X		<p>In addition to HCS, what analysis tools were employed and were they appropriate?</p> <ul style="list-style-type: none"> <li>Synchro and VISSIM were also applied throughout this analysis depending on the type of facility being evaluated. Cumulative impacts were measured using VISSIM models of the study corridors.</li> </ul>	<ul style="list-style-type: none"> <li>Methodology – Operational Analysis Procedures (p. 24)</li> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>

X			<p>Has the proposal distinguished between nominal safety (i.e. adherence to design policies and standards) and substantive safety (actual and expected safety performance)?</p> <ul style="list-style-type: none"> <li>Both the nominal and substantive safety performance evaluations were performed in support of this analysis. It should be acknowledged that these analyses were predicated on the relatively minor nature of the proposed changes (shifts in location of existing interstate ramps).</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #3 – Safety Analyses (p. 41)</li> </ul>
X			<p>Will any individual elements within the recommended alternative be degraded operationally as a result of this action? If yes, are reasons provided to accept them?</p> <ul style="list-style-type: none"> <li>Based on HCS analysis, the proposed actions will generally provide benefits throughout the interstate system. Minor degradation will occur at a few locations due to increased volume through the segment.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X			<p>In evaluating whether the proposal has a "significant adverse impact" on safety, has the State Strategic Highway Safety Plan been used as a benchmark?</p> <ul style="list-style-type: none"> <li>No, but Average Statewide Crash Rates were referenced.</li> </ul>	
X			<p>Are the proposed interchange design configurations able to satisfactorily accommodate the design year traffic volumes?</p> <ul style="list-style-type: none"> <li>Design year operating conditions are favorable throughout the system.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
		X	<p>If the project is to be built in stages, has the traffic operational and safety analyses considered the interim stages of the proposal?</p> <ul style="list-style-type: none"> <li>The project will not be built in stages.</li> </ul>	<ul style="list-style-type: none"> <li>Summary (p. 3)</li> <li>Alternatives (p. 27)</li> </ul>
<p><b>Policy Point 4:</b> "The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards."</p>				
<b>Addressed Adequately?</b>			<b>Question</b>	<b>Reference Location</b>
Yes	No	N/A		
X			<p>Does the proposed access connect to a public road?</p> <ul style="list-style-type: none"> <li>All ramp connections and outer road connections would be public facilities.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 7)</li> <li>Policy Point #4 (p. 43)</li> </ul>
X			<p>Are all traffic movements for full interchange access provided?</p> <ul style="list-style-type: none"> <li>All traffic movements for the existing full interchanges at both Route K/Main Street and TR Hughes Boulevard will be replaced.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 7)</li> <li>Policy Point #4 (p. 43)</li> </ul>
		X	<p>If a partial interchange is proposed, is there sufficient justification for providing only a partial interchange?</p> <ul style="list-style-type: none"> <li>A partial interchange is not proposed.</li> </ul>	N/A
		X	<p>If a partial interchange is proposed; was a full interchange evaluated as an alternative and is there sufficient justification to eliminate or discard it?</p>	N/A
		X	<p>Is sufficient ROW available (or being acquired) to provide a full interchange at a future date (staged construction)?</p>	N/A
		X	<p>Are you comfortable with how the missing movements will be accommodated on the surface streets and adjacent interchanges?</p>	N/A
		X	<p>If not, is the proposed access for special purposes such as transit vehicles, HOV's, and/or a park and ride lot?</p>	N/A

X			Does FHWA support the selection of design controls/criteria and desired operational goals? <ul style="list-style-type: none"> <li>FHWA has been an active participant in this study and concurred with the study approach and methodology as well as the proposed design.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Area of Influence (p. 8)</li> </ul>
X			Does the proposed access meet or exceed current design standards for the Interstate System? <ul style="list-style-type: none"> <li>One design exception has been proposed for substandard shoulder widths to match existing conditions.</li> <li>No other design variances are needed to accommodate the proposed actions.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #4 (p. 43)</li> </ul>
		X	If not, have anticipated design exceptions been identified and reviewed (at least conceptually)?	N/A
		X	If expected design exceptions could have significant operational impacts on the Interstate and/or Crossroad system, are mitigation measures described?	N/A
		X	If expected design exceptions could have significant safety impacts on the Interstate and/or Crossroad system, are mitigation measures described?	N/A
X			Will the length of access control along the crossroad provide for acceptable operations and safety? (100-300' is a minimum. Additional access control is strongly encouraged when needed for safety and operational enhancement) <ul style="list-style-type: none"> <li>Access control is already in-place on each crossing arterial and would remain unchanged with the requested actions. Access to the proposed outer roads is limited to specifically defined locations.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 7)</li> </ul>
X			Does FHWA support selection of opening and design years? <ul style="list-style-type: none"> <li>FHWA was a participant in the original scoping for this study and concurred with the study approach and methodology.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Area of Influence (p. 5)</li> </ul>
X			Have all design criteria (including but not limited to the following) been adequately addressed?	
X			a. Sight distance at ramp terminals (Don't overlook signal heads obscured by structures.)	AASHTO Greenbook 2004 Pg. 841
X			b. Sufficient storage on ramp to prevent queues from spilling on to the Interstate (based on current and/or future projected traffic demand)	<ul style="list-style-type: none"> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
X			c. Vertical clearance	AASHTO "A Policy on Design Standards Interstate System" 2005
X			d. Pedestrian access through the interchange	AASHTO Greenbook 2004 Pg. 864
X			e. Length of accel/decel lanes	AASHTO Greenbook 2004 Pg. 823, 847
X			f. Length of tapers	AASHTO Greenbook 2004 Pg. 849
X			g. Spacing between ramps	Greenbook pg 843 & Ex. 10-68 and operational analysis
X			h. Lane continuity	AASHTO Greenbook 2004 Pg. 810

X			i. Lane balance	AASHTO Greenbook 2004 Pg. 810
X			j. Uniformity in interchange design and operational patterns (i.e. right-side ramps, exit design consistent w/adjacent interchanges)	AASHTO Greenbook 2004 Pg. 807
X			Has each movement of the proposal been "tested" for ease of operation? <ul style="list-style-type: none"> <li>Ease of operation is expected to improve as weave segments are removed from the interstate.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 7)</li> <li>Policy Point #3 – Operational Analyses (p. 31)</li> </ul>
<b>Policy Point 5:</b> “The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, the adopted Statewide or Metropolitan Transportation Improvement Program, and the Congestion Management Process within transportation management areas.”				
<b>Addressed Adequately?</b>			<b>Question</b>	<b>Reference Location</b>
Yes	No	N/A		
X			Does the AJR discuss or include (as appropriate) other project(s), studies or planned actions that may have an effect on the report analysis results? <ul style="list-style-type: none"> <li>The study reflects the influence of previous studies in the area</li> <li>No other projects are currently planned</li> </ul>	<ul style="list-style-type: none"> <li>Introduction - Relationship to Other Projects (p. 9); Project History (p. 9)</li> <li>Policy Point #6 (p. 45)</li> </ul>
X			Does the project conform to the local planning, MPO or other related plans? <ul style="list-style-type: none"> <li>The proposed transportation improvements are consistent with all regional plans</li> </ul>	<ul style="list-style-type: none"> <li>Summary (p. 3)</li> <li>Introduction - Consistency with Local Planning (p. 11)</li> <li>Policy Point #5 (p. 44)</li> </ul>
X			Is the access request located within a <i>Transportation Management Areas</i> ? <ul style="list-style-type: none"> <li>The study area is located entirely within the St. Louis Regional Transportation Management Area.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction (p. 7)</li> </ul>
X			Is the access request located within a non-attainment area for air quality? <ul style="list-style-type: none"> <li>The St. Louis region is a non-attainment area.</li> </ul>	N/A
X			Is the project included in the TIP/STIP and LRTP? <ul style="list-style-type: none"> <li>The proposed actions are reflected in the regional LRTP as improvements to the Route K interchange. The project has been added to the STIP. TAP and CMAQ funds will be added to the TIP.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #5 (p. 44)</li> </ul>
		X	Is the access point covered as a part of an Interstate corridor study or plan? <ul style="list-style-type: none"> <li>Additional access is not requested</li> </ul>	N/A
		X	If the project is to be built in stages, are follow-on stages included in the STIP?	N/A
		X	If the project is to be built in stages, are the funding commitments consistent with state and local government transportation plans?	N/A
<b>Policy Point 6:</b> “In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan.”				
<b>Addressed Adequately?</b>				

Yes	No	N/A	Question	Reference Location
X			Is it possible that new interchange(s) not addressed in the AJR could be added within an area of influence to the proposed access point? (If so, could the proposal preclude or otherwise be affected by any future access points?) <ul style="list-style-type: none"> <li>No new interchanges or other access modifications are proposed or envisioned along I-70 between Bryan Road and Route 79.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #6 (p. 45)</li> </ul>
		X	Does the AJR report include the traffic volumes generated by any future additional interchanges within a vicinity of influence that are proposed? <ul style="list-style-type: none"> <li>No new interchanges or other access modifications are proposed or envisioned along I-70 between Bryan Road and Route 79.</li> </ul>	N/A
		X	Does the AJR report fail to include any other proposed interstate access points within a vicinity of influence that are being proposed or are in the current long range construction program? <ul style="list-style-type: none"> <li>No new interchanges or other access modifications are proposed or envisioned along I-70 between Bryan Road and Route 79.</li> </ul>	N/A

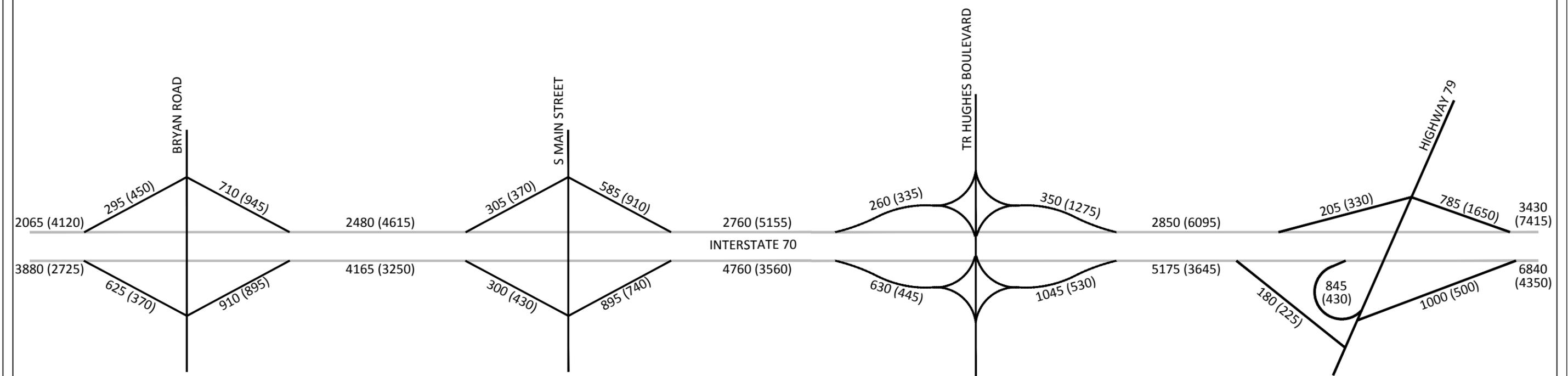
**Policy Point 7:** “When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements. The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point.”

Addressed Adequately?			Question	Reference Location
Yes	No	N/A		
		X	Does the access request adequately demonstrate that an appropriate effort of coordination has been made with appropriate proposed developments? <ul style="list-style-type: none"> <li>Current or planned future development or land use have not had any influence on the preferred alternative.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #7 (p. 46)</li> </ul>
X			Are the proposed improvements compatible with the existing street network or are other improvements needed? <ul style="list-style-type: none"> <li>The proposed actions are an expansion of the existing street network (notably the outer road system) and they are complimented by improvements to the crossing arterials.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction – Project Description (p. 7)</li> <li>Policy Point #1 (p. 29)</li> <li>Policy Point #7 (p. 46)</li> </ul>
		X	Are there any pre-condition contingencies required in regards to the timing of other improvements? <ul style="list-style-type: none"> <li>The requested actions could be implemented independently of other improvements or projects.</li> </ul>	N/A
		X	If pre-condition contingencies are required, are pertinent parties in agreement with these contingencies and is this documented?	N/A
		X	If the proposed improvements are founded on the need for providing access to new development, are appropriate commitments in place to ensure that the development will likely occur as planned?	N/A
		X	If project is privately funded, are appropriate measures in place to ensure improvements will be completed if the developer is unable to meet financial obligations?	N/A
		X	If the purpose and need to accommodate new development/traffic demands that aren't fully known, is a worst case scenario used for future	N/A

			traffic?	
X			<p>Does the project require financial or infrastructure commitments from other agencies, organizations or private entities?</p> <ul style="list-style-type: none"> <li>A cost share agreement is in place between MoDOT and the City of O’Fallon.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #5 (p. 44)</li> </ul>
<p><b>Policy Point 8:</b> “The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing.”</p>				
<b>Addressed Adequately?</b>			<b>Question</b>	<b>Reference Location</b>
<b>Yes</b>	<b>No</b>	<b>N/A</b>		
X			<p>Are there any known social or environmental issues that could affect the proposal?</p> <ul style="list-style-type: none"> <li>There are no known social issues.</li> <li>There are potential environmental issues, including potential hazardous materials as well as noise impacts. However, these issues are not expected to affect the proposal.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #8 (p. 47)</li> </ul>
X			<p>Is the project consistent with the current TIP/STIP and LRTP and/or proposed amendments to the plan?</p> <ul style="list-style-type: none"> <li>The current plan is included on the STIP.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #5 (p. 44)</li> </ul>
X			<p>Although NEPA is a separate action, is an environmental overview for the proposed improvements included?</p> <ul style="list-style-type: none"> <li>A Categorical Exclusion has been submitted for review.</li> </ul>	<ul style="list-style-type: none"> <li>Policy Point #8 (p. 47)</li> </ul>
X			<p>Is it appropriate to emphasize to the project stakeholders that the access approval will be handled as a two-step process? (i.e. Step 1: Engineering and Operational Acceptability and Step 2: Environmental Approvals)</p> <ul style="list-style-type: none"> <li>That process has been conveyed to the stakeholders.</li> </ul>	N/A

# APPENDIX A

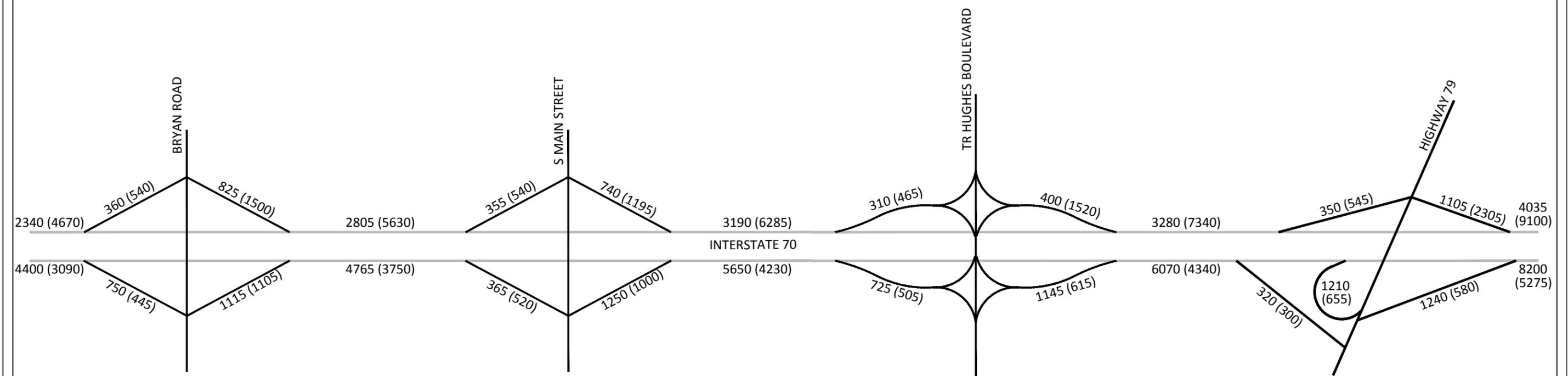
## VOLUME EXHIBITS



AM PEAK HOUR TRAFFIC - 7:00 AM TO 8:00 AM  
PM PEAK HOUR TRAFFIC - (4:15 PM TO 5:15 PM)



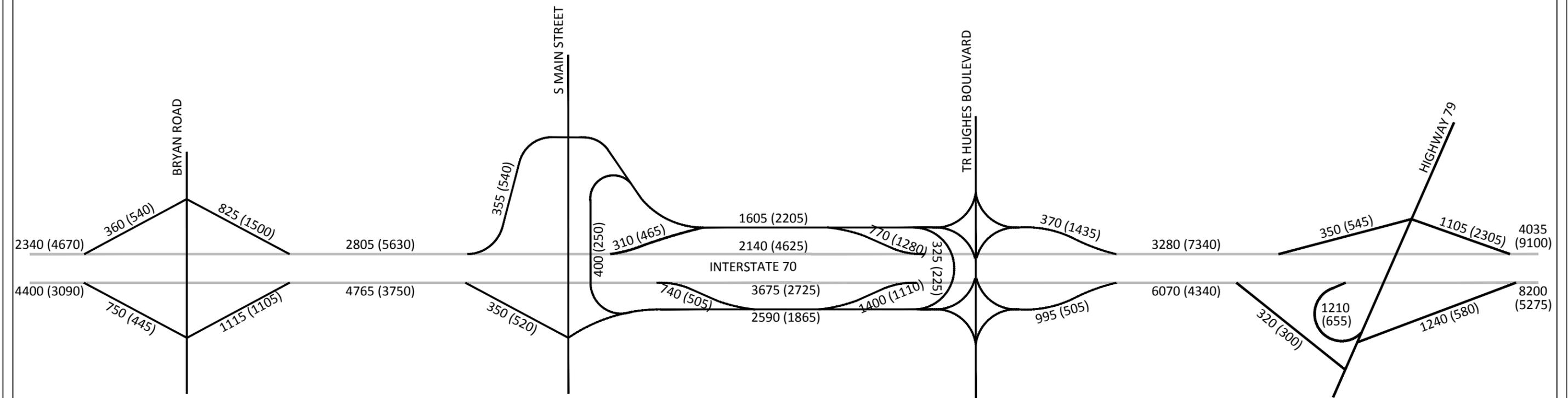
### EXHIBIT A-1: 2015 EXISTING TRAFFIC VOLUMES



AM PEAK HOUR TRAFFIC - 7:00 AM TO 8:00 AM  
PM PEAK HOUR TRAFFIC - (4:15 PM TO 5:15 PM)



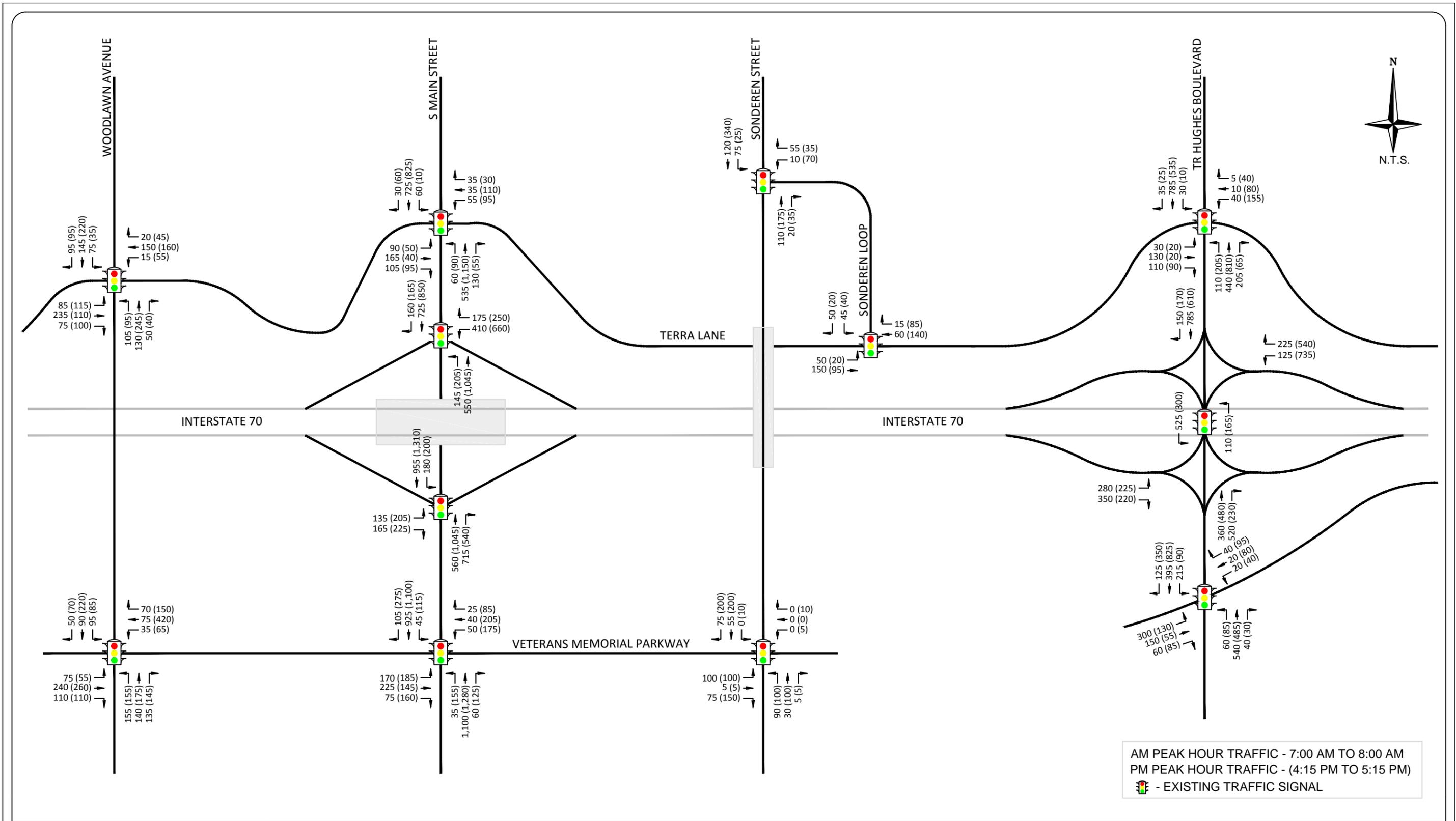
### EXHIBIT A-2: 2040 NO-BUILD TRAFFIC VOLUMES



AM PEAK HOUR TRAFFIC - 7:00 AM TO 8:00 AM  
 PM PEAK HOUR TRAFFIC - (4:15 PM TO 5:15 PM)

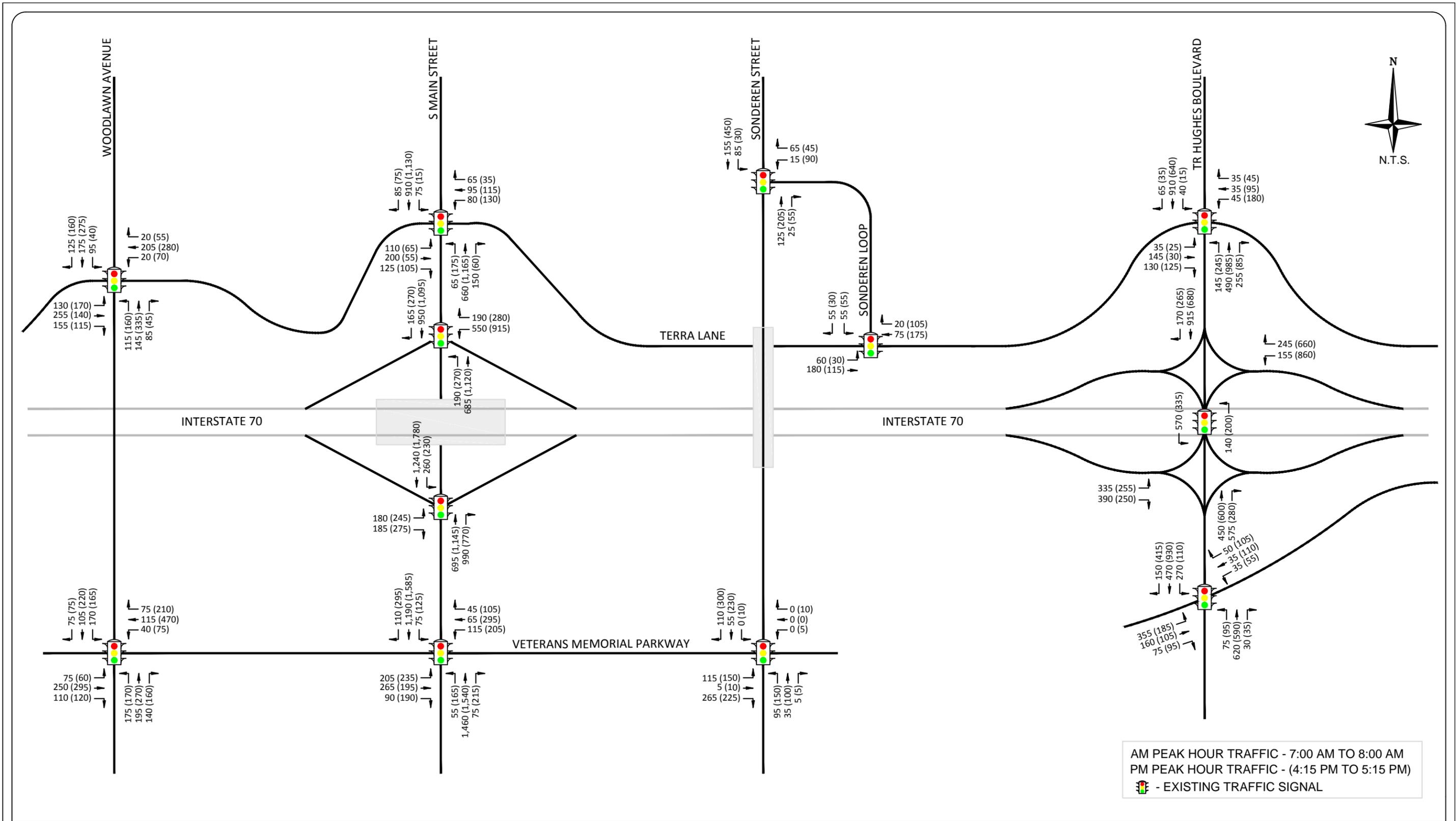


### EXHIBIT A-3: 2040 BUILD TRAFFIC VOLUMES (PROPOSED IMPROVEMENTS)

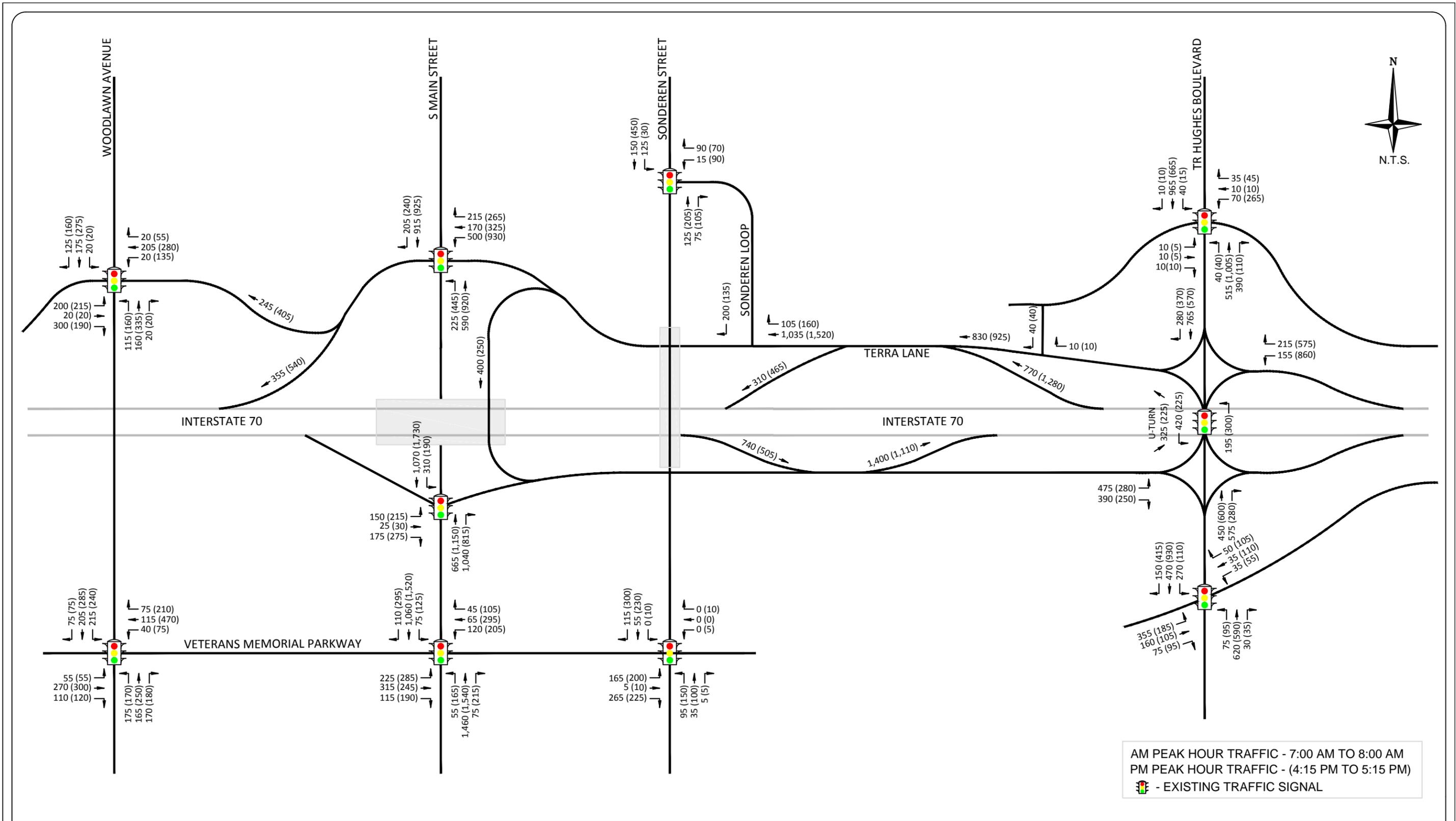


AM PEAK HOUR TRAFFIC - 7:00 AM TO 8:00 AM  
 PM PEAK HOUR TRAFFIC - (4:15 PM TO 5:15 PM)  
 - EXISTING TRAFFIC SIGNAL

**EXHIBIT A-4: 2015 EXISTING TRAFFIC VOLUMES**



**EXHIBIT A-5: 2040 NO-BUILD TRAFFIC VOLUMES**



**EXHIBIT A-6: 2040 BUILD TRAFFIC VOLUMES (SPUI ALTERNATIVE)**

# **APPENDIX B**

## **SAFETY ANALYSIS**

Interstate Accident Summary  
I-70 EB from Bryan to MO 79

Summary	2010	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0	0
Disabling Injury	3	2	1	0	0	6
Minor Injury	24	17	17	17	22	97
PDO	91	96	78	99	81	445
Total	118	115	96	116	103	548
AADT	59713	58964	55408	56904	58229	

**1 Year Statewide Rate**

Accident Rate	122.93	121.32	107.78	126.81	110.04	
STATE RATE-IS	103.84	98.33	80.56	88.14	87.86	Route Desg
STATE RATE-FREEWAY	104.51	99.05	81.96	89.4	87.47	Rdway_Type

**Accident Class**

MAL DRAWN VEH OR RIDDEN ANIMAL	0	0	0	0	0	0
ANIMAL NOT DEER/DOG/FARM ANIMAL	0	0	0	1	0	1
ANIMAL OTHER THAN DEER	0	0	0	0	0	0
AVOIDING	1	2	1	1	2	7
BACKING	0	0	0	0	0	0
CHANGING LANE	2	4	4	2	1	13
CROSS MEDIAN	0	0	0	0	0	0
DEER	0	1	1	1	1	4
DOG	0	0	0	0	0	0
DUAL LEFTS COLLIDE	0	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0	0
FARM ANIMAL	0	0	0	0	0	0
FIXED OBJECT	0	0	3	0	0	3
HEAD ON	0	0	0	0	0	0
JACKKNIFE	0	0	0	0	0	0
LEFT TURN	0	0	0	1	0	1
LEFT TURN RIGHT ANGLE COLLISION	1	0	0	0	0	1
OTHER	10	13	7	8	7	45
OUT OF CONTROL	25	14	9	15	19	82
PARKING OR PARKED CAR	1	0	0	1	0	2
PASSING	6	13	14	10	18	61
PEDALCYCLE	0	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0	0
REAR END	71	68	57	76	52	324
RIGHT ANGLE	0	0	0	0	3	3
RIGHT TURN	0	0	0	0	0	0
RIGHT TURN RIGHT ANGLE COLLISION	0	0	0	0	0	0
SIDESWIPE	1	0	0	0	0	1
TOWED UNIT DISCONNECTS	0	0	0	0	0	0
U - TURN	0	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0	0

Selected Travelway	Offset	Designation	Travelway	Direction	Selected City
		IS	70	E	NONE SPECIFIED

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From	District	County	County Log	Continuous Log
	5	ST. CHARLES	12.628	215.98

To	District	County	County Log	Continuous Log
	5	ST. CHARLES	17.032	220.384

**Intersecting Travelways**

	Designation	Travelway	Direction
From	CST	BRYAN RD	N
To	MO	79	N

**Interstate Accident Summary  
I-70 WB from Bryan to MO 79**

<b>Summary</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>Total</b>
Fatal	0	0	0	0	0	0
Disabling Injury	2	5	0	1	0	8
Minor Injury	18	15	14	8	9	64
PDO	93	79	60	59	71	362
Total	113	99	74	68	80	434
AADT	51525	50769	55419	56915	57480	

**1 Year Statewide Rate**

Accident Rate	136.27	121.17	82.97	74.24	86.48	
STATE RATE-IS	103.84	98.33	80.56	88.14	87.86	Route Desg
STATE RATE-FREEWAY	104.51	99.05	81.96	89.40	87.47	Rdway_Type

**Accident Class**

ANIMAL DRAWN VEH OR RIDDEN ANIMAL	0	0	0	0	0	0
ANIMAL NOT DEER/DOG/FARM ANIMAL	0	0	0	0	0	0
ANIMAL OTHER THAN DEER	0	0	0	0	0	0
AVOIDING	0	0	0	0	1	1
BACKING	0	0	0	0	0	0
CHANGING LANE	5	7	2	3	1	18
CROSS MEDIAN	0	0	0	0	0	0
DEER	1	0	0	2	0	3
DOG	0	0	0	0	0	0
DUAL LEFTS COLLIDE	1	0	0	0	1	2
DUAL RIGHTS COLLIDE	0	0	0	0	0	0
FARM ANIMAL	0	0	0	0	0	0
FIXED OBJECT	1	0	3	0	0	4
HEAD ON	0	0	0	0	1	1
JACKKNIFE	0	0	0	0	0	0
LEFT TURN	1	0	0	0	0	1
LEFT TURN RIGHT ANGLE COLLISION	0	0	0	0	0	0
OTHER	3	6	4	7	8	28
OUT OF CONTROL	12	17	8	11	14	62
PARKING OR PARKED CAR	1	1	0	5	0	7
PASSING	10	7	17	11	12	57
PEDALCYCLE	0	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0	0
REAR END	77	61	38	29	40	245
RIGHT ANGLE	0	0	1	0	1	2
RIGHT TURN	0	0	1	0	0	1
RIGHT TURN RIGHT ANGLE COLLISION	0	0	0	0	1	1
SIDESWIPE	1	0	0	0	0	1
TOWED UNIT DISCONNECTS	0	0	0	0	0	0
U - TURN	0	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0	0

**Selected Travelway**

Offset	Designation	Travelway	Direction
	IS	70	W

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From	District	County	County Log	Continuous Log
	5	ST. CHARLES	9.716	29.635

To	District	County	County Log	Continuous Log
	5	ST. CHARLES	14.125	34.044

**Intersecting Travelways**

	Designation	Travelway	Direction
From	CST	SALT LICK RD	S
To	CST	BRYAN RD	S

## Intersection Crash Summary Main Street at Terra Lane

Summary	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	0	0	0	0
Minor Injury	2	3	3	5	13
PDO	14	13	7	12	46
Total	16	16	10	17	59
AADT	31435	34865	34408	34040	

### 1 Year Statewide Rate

Accident Rate	1.39	1.26	0.8	1.37
STATE RATE	N/A	N/A	N/A	N/A

### Accident Class

MAL DRAWN VEH OR RIDDEN ANIMAL	0	0	0	0	0
ANIMAL NOT DEER/DOG/FARM ANIMAL	0	0	0	0	0
ANIMAL OTHER THAN DEER	0	0	0	0	0
AVOIDING	0	0	0	0	0
BACKING	1	0	0	0	1
CHANGING LANE	0	0	0	0	0
CROSS MEDIAN	0	0	0	0	0
DEER	0	0	0	0	0
DOG	0	0	0	0	0
DUAL LEFTS COLLIDE	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0
FARM ANIMAL	0	0	0	0	0
FIXED OBJECT	0	0	0	0	0
HEAD ON	0	0	1	3	4
JACKKNIFE	0	0	0	0	0
LEFT TURN	4	3	1	0	8
LEFT TURN RIGHT ANGLE COLLISION	0	0	1	1	2
OTHER	0	0	0	0	0
OUT OF CONTROL	0	5	0	3	8
PARKING OR PARKED CAR	0	0	0	0	0
PASSING	0	0	0	0	0
PEDALCYCLE	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0
REAR END	10	6	6	8	30
RIGHT ANGLE	1	1	1	0	3
RIGHT TURN	0	0	0	0	0
RIGHT TURN RIGHT ANGLE COLLISION	0	1	0	2	3
SIDESWIPE	0	0	0	0	0
TOWED UNIT DISCONNECTS	0	0	0	0	0
U - TURN	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0

### Selected Travelway

Offset	Designation	Travelway	Direction	Selected City
	RT	K	S	NONE SPECIFIED

From	District	County	County Log	Continuous Log
	5	ST. CHARLES	0	0

To	District	County	County Log	Continuous Log
	5	ST. CHARLES	0	0

### Intersecting Travelways

	Designation	Travelway	Direction
From	CST	TERRA LN	E
To	CST	TERRA LN	W

## Intersection Crash Summary Route K at WB I-70 Ramps

Summary	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	0	0	0	0
Minor Injury	1	1	1	2	5
PDO	0	3	2	5	10
Total	1	4	3	7	15
AADT	35994	48027	47735	47556	

### 1 Year Statewide Rate

Accident Rate	0.08	0.23	0.17	0.4
STATE RATE	N/A	N/A	N/A	N/A

### Accident Class

MAL DRAWN VEH OR RIDDEN ANIMAL	0	0	0	0	0
ANIMAL NOT DEER/DOG/FARM ANIMAL	0	0	0	0	0
ANIMAL OTHER THAN DEER	0	0	0	0	0
AVOIDING	0	0	0	0	0
BACKING	0	0	0	0	0
CHANGING LANE	0	0	0	0	0
CROSS MEDIAN	0	0	0	0	0
DEER	0	0	0	0	0
DOG	0	0	0	0	0
DUAL LEFTS COLLIDE	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0
FARM ANIMAL	0	0	0	0	0
FIXED OBJECT	0	0	0	0	0
HEAD ON	0	0	0	0	0
JACKKNIFE	0	0	0	0	0
LEFT TURN	0	0	2	1	3
LEFT TURN RIGHT ANGLE COLLISION	0	2	0	0	2
OTHER	0	0	0	0	0
OUT OF CONTROL	0	0	0	0	0
PARKING OR PARKED CAR	0	0	0	0	0
PASSING	0	0	0	0	0
PEDALCYCLE	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0
REAR END	1	2	1	6	10
RIGHT ANGLE	0	0	0	0	0
RIGHT TURN	0	0	0	0	0
RIGHT TURN RIGHT ANGLE COLLISION	0	0	0	0	0
SIDESWIPE	0	0	0	0	0
TOWED UNIT DISCONNECTS	0	0	0	0	0
U - TURN	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0

### Selected Travelway

Offset	Designation	Travelway	Direction	Selected City
	RT	K	S	NONE SPECIFIED

From	District	County	County Log	Continuous Log
	5	ST. CHARLES	0.025	0.025

To	District	County	County Log	Continuous Log
	5	ST. CHARLES	0.025	0.025

### Intersecting Travelways

	Designation	Travelway	Direction
From	RP	IS70W TO RTK	N
To	RP	RTK TO IS70W	W

## Intersection Crash Summary Route K at EB I-70 Ramps

Summary	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	1	0	0	1
Minor Injury	0	1	1	1	3
PDO	1	9	10	12	32
Total	1	11	11	13	36
AADT	35994	42776	42458	42136	

### 1 Year Statewide Rate

Accident Rate	0.08	0.7	0.71	0.85
STATE RATE	N/A	N/A	N/A	N/A

### Accident Class

MAL DRAWN VEH OR RIDDEN ANIMAL	0	0	0	0	0
ANIMAL NOT DEER/DOG/FARM ANIMAL	0	0	0	0	0
ANIMAL OTHER THAN DEER	0	0	0	0	0
AVOIDING	0	0	0	0	0
BACKING	0	0	0	0	0
CHANGING LANE	0	0	0	0	0
CROSS MEDIAN	0	0	0	0	0
DEER	0	0	0	0	0
DOG	0	0	0	0	0
DUAL LEFTS COLLIDE	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0
FARM ANIMAL	0	0	0	0	0
FIXED OBJECT	0	1	0	0	1
HEAD ON	0	0	1	0	1
JACKKNIFE	0	0	0	0	0
LEFT TURN	0	0	1	3	4
LEFT TURN RIGHT ANGLE COLLISION	0	0	0	1	1
OTHER	0	0	0	0	0
OUT OF CONTROL	1	0	2	0	3
PARKING OR PARKED CAR	0	0	0	0	0
PASSING	0	2	0	0	2
PEDALCYCLE	0	0	0	0	0
PEDESTRIAN	0	0	0	0	0
REAR END	0	8	7	8	23
RIGHT ANGLE	0	0	0	0	0
RIGHT TURN	0	0	0	0	0
RIGHT TURN RIGHT ANGLE COLLISION	0	0	0	1	1
SIDESWIPE	0	0	0	0	0
TOWED UNIT DISCONNECTS	0	0	0	0	0
U - TURN	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0

### Selected Travelway

Offset	Designation	Travelway	Direction	Selected City
	RT	K	S	NONE SPECIFIED

From	District	County	County Log	Continuous Log
	5	ST. CHARLES	0.094	0.094

To	District	County	County Log	Continuous Log
	5	ST. CHARLES	0.094	0.094

### Intersecting Travelways

	Designation	Travelway	Direction
From	RP	IS70E TO RTK	S
To	RP	RTK TO IS70E	E

**Intersection Crash Summary  
Rte K at Veterans Memorial Pkwy**

Summary	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0
Disabling Injury	0	0	0	0	0
Minor Injury	1	6	3	6	16
PDO	20	24	22	26	92
Total	21	30	25	32	108
AADT	40632	43176	42600	42148	

**1 Year Statewide Rate**

Accident Rate	1.42	1.9	1.61	2.08
STATE RATE	N/A	N/A	N/A	N/A

**Accident Class**

MAL DRAWN VEH OR RIDDEN ANIMAL	0	0	0	0	0
ANIMAL NOT DEER/DOG/FARM ANIMAL	0	0	0	0	0
ANIMAL OTHER THAN DEER	0	0	0	0	0
AVOIDING	0	0	0	0	0
BACKING	0	0	0	0	0
CHANGING LANE	0	1	0	1	2
CROSS MEDIAN	0	0	0	0	0
DEER	0	0	0	0	0
DOG	0	0	0	0	0
DUAL LEFTS COLLIDE	0	0	0	0	0
DUAL RIGHTS COLLIDE	0	0	0	0	0
FARM ANIMAL	0	0	0	0	0
FIXED OBJECT	0	0	0	0	0
HEAD ON	0	0	0	2	2
JACKKNIFE	0	0	0	0	0
LEFT TURN	2	2	0	4	8
LEFT TURN RIGHT ANGLE COLLISION	1	1	1	2	5
OTHER	0	0	0	0	0
OUT OF CONTROL	0	2	0	2	4
PARKING OR PARKED CAR	0	0	0	1	1
PASSING	1	2	0	2	5
PEDALCYCLE	0	0	0	0	0
PEDESTRIAN	0	0	1	0	1
REAR END	15	21	22	18	76
RIGHT ANGLE	1	0	1	0	2
RIGHT TURN	0	1	0	0	1
RIGHT TURN RIGHT ANGLE COLLISION	1	0	0	0	1
SIDESWIPE	0	0	0	0	0
TOWED UNIT DISCONNECTS	0	0	0	0	0
U - TURN	0	0	0	0	0
WRONG WAY ON DIVIDED HIGHWAY	0	0	0	0	0

**Selected Travelway**

Offset	Designation	Travelway	Direction	Selected City
	RT	K	S	NONE SPECIFIED

From	District	County	County Log	Continuous Log
	5	ST. CHARLES	0.217	0.217

To	District	County	County Log	Continuous Log
	5	ST. CHARLES	0.217	0.217

**Intersecting Travelways**

	Designation	Travelway	Direction
From	CST	VETERANS MEMORIAL PKWY	E
To	OR	70	W



- 6) Calibration factors – The Missouri Calibration Factor for 6-lane freeway segments provided in *Mid-America Transportation Center Report #MATC-MU: 177* was applied within the ISATe spreadsheets to 4-lane, 6-lane, 8-lane, and 10-lane segments. Because of limitation of the spreadsheet in terms of locked cells, the calibration factors had to be applied consistently across all number of lanes variations.

## No-Build Analysis

The following assumptions are valid for the predictive analysis of the No-Build condition:

- 1) Where barrier does not exist, it is assumed that clear zone is equal to or greater than 30’.
- 2) AADT was calculated by taking the higher of the 2040 No-Build AM and PM two-way volumes and multiplying by a factor of 10. That is, the sum of the two volumes (EB and WB) is calculated for the AM peak hour and the PM peak hour. The higher two-way total is then multiplied by ten to estimate the total AADT.
- 3) AADT for ramps was calculated by utilizing the ramp volume for the peak hour period that corresponds to the higher of the mainline two-way peak hour volumes. In this case, the PM peak hour produced higher total two-way volumes on the mainline. As such, the PM ramp volumes were utilized and multiple by a factor of 10 to determine an assumed ramp AADT.
- 4) The AADTs for 2021 were back-calculated using an annually compounded growth rate of 0.5%. Interim years between 2021 and 2040 were left blank and are calculated by the software based on linear growth.
- 5) Minor, localized variations in median offset and inside shoulder width at overpass locations are not inputted into the software.
- 6) It is assumed that rumble strips are present and continuous on the outside of the traveled way along the entire extents. It is also assumed that rumble strips are not present on the inside of the traveled way for the entire extents.
- 7) The two-lane eastbound entrance from T R Hughes Blvd in segment No-Build-05 includes a lane add with a 1030’ long speed change lane. Entrance input into spreadsheet as an LANE ADD entrance.

## Preferred Alternative Analysis

The following assumptions are valid for the predictive analysis of the Preferred Alternative:

- 1) Roadside barrier for the Preferred Alternative is assumed to be a combination of existing roadway barrier location plus any new wall or barrier location based on new ramp configurations. The assumed barrier locations are depicted in the segmentation file.
- 2) AADT was calculated by taking the higher of the 2040 Build AM and PM two-way volumes and multiplying by a factor of 10. That is the sum of the two volumes (EB and WB) is calculated for the AM peak hour and the PM peak hour. The higher two-way total is then multiplied by ten to estimate the total AADT.
- 3) AADT for ramps was calculated by utilizing the ramp volume for the peak hour period that corresponds to the higher of the mainline two-way peak hour volumes. In this case, the PM peak hour produced higher total two-way volumes on the mainline. As such, the PM ramp volumes were utilized and multiple by a factor of 10 to determine an assumed ramp AADT.
- 4) The AADTs for 2021 were back-calculated using an annually compounded growth rate of 0.5%. Interim years between 2021 and 2040 were left blank and are calculated by the software based on linear growth.

- 5) Minor, localized variations in median offset and inside shoulder width are not inputted into the software.
- 6) It is assumed that rumble strips are present and continuous on the outside of the traveled way along the entire extents. It is also assumed that rumble strips are not present on the inside of the traveled way for the entire extents.
- 7) The two-lane eastbound entrance from T R Hughes Blvd in segment Build-05 includes a lane add with a 1030' long speed change lane. Entrance input into spreadsheet as an LANE ADD entrance.
- 8) The input location of roadside (outside) barrier is limited to a minimum value equal to the width of the roadway shoulder. For this reason, the offset input must be increased to the reported outside shoulder width for a select number of barrier segments on narrow shoulder adjacent to the new ramps. This situation is limited to a few relatively short segments of outside barrier in segments Build-02, Build-03, and Build-04.

**Output Summary**

**General Information**

Project description:	I-70 & Highway K Improvements in O'Fallon, Missouri - No-Build Analysis					
Analyst:	Ritter, James/STL	Date:	5/13/2016	Area type:	Urban	
First year of analysis:	2021					
Last year of analysis:	2040					

**Crash Data Description**

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

**Estimated Crash Statistics**

<b>Crashes for Entire Facility</b>	<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Estimated number of crashes during Study Period, crashes:	2822.6	14.0	37.2	225.7	492.1	2053.6
Estimated average crash freq. during Study Period, crashes/yr:	141.1	0.7	1.9	11.3	24.6	102.7

**Crashes by Facility Component**

	<b>Nbr. Sites</b>	<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Freeway segments, crashes:	6	2822.6	14.0	37.2	225.7	492.1	2053.6
Ramp segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

**Crashes for Entire Facility by Year**

	<b>Year</b>	<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Estimated number of crashes during the Study Period, crashes:	2021	131.2	0.7	1.8	10.6	23.2	95.0
	2022	132.2	0.7	1.8	10.7	23.3	95.7
	2023	133.3	0.7	1.8	10.8	23.5	96.5
	2024	134.3	0.7	1.8	10.8	23.6	97.3
	2025	135.3	0.7	1.8	10.9	23.8	98.2
	2026	136.4	0.7	1.8	11.0	23.9	99.0
	2027	137.4	0.7	1.8	11.0	24.1	99.8
	2028	138.4	0.7	1.8	11.1	24.2	100.6
	2029	139.5	0.7	1.8	11.2	24.4	101.4
	2030	140.5	0.7	1.9	11.2	24.5	102.2
	2031	141.6	0.7	1.9	11.3	24.7	103.0
	2032	142.7	0.7	1.9	11.4	24.8	103.9
	2033	143.7	0.7	1.9	11.5	25.0	104.7
	2034	144.8	0.7	1.9	11.5	25.1	105.5
	2035	145.9	0.7	1.9	11.6	25.3	106.4
	2036	146.9	0.7	1.9	11.7	25.4	107.2
	2037	148.0	0.7	1.9	11.7	25.6	108.0
	2038	149.1	0.7	1.9	11.8	25.7	108.9
	2039	150.2	0.7	2.0	11.9	25.9	109.7
	2040	151.2	0.7	2.0	11.9	26.0	110.6
2041							
2042							
2043							
2044							

**Distribution of Crashes for Entire Facility**

<b>Crash Type</b>	<b>Crash Type Category</b>	<b>Estimated Number of Crashes During the Study Period</b>					
		<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Multiple vehicle	Head-on crashes:	7.2	0.1	0.2	1.2	2.6	3.0
	Right-angle crashes:	43.5	0.3	0.8	4.7	10.2	27.5
	Rear-end crashes:	1449.9	7.2	19.1	115.9	253.8	1053.9
	Sideswipe crashes:	501.7	1.7	4.6	28.0	61.4	405.9
	Other multiple-vehicle crashes:	52.1	0.3	0.8	4.7	10.2	36.1
	Total multiple-vehicle crashes:	2054.3	9.6	25.5	154.5	338.2	1526.5
Single vehicle	Crashes with animal:	12.4	0.0	0.0	0.3	0.6	11.5
	Crashes with fixed object:	551.8	3.2	8.5	51.3	110.9	378.0
	Crashes with other object:	86.3	0.2	0.6	3.7	8.0	73.8
	Crashes with parked vehicle:	11.7	0.1	0.2	1.0	2.2	8.2
	Other single-vehicle crashes:	106.1	0.9	2.5	14.9	32.1	55.7
	Total single-vehicle crashes:	768.3	4.4	11.8	71.1	153.9	527.1
Total crashes:		2822.6	14.0	37.2	225.7	492.1	2053.6

**Output Summary**

**General Information**

Project description:	I-70 & Highway K Improvements in O'Fallon, Missouri - Build Analysis					
Analyst:	Ritter, James/STL	Date:	5/13/2016	Area type:	Urban	
First year of analysis:	2021					
Last year of analysis:	2040					

**Crash Data Description**

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

**Estimated Crash Statistics**

<b>Crashes for Entire Facility</b>	<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Estimated number of crashes during Study Period, crashes:	2563.6	13.0	34.7	210.3	444.9	1860.6
Estimated average crash freq. during Study Period, crashes/yr:	128.2	0.7	1.7	10.5	22.2	93.0

**Crashes by Facility Component**

	<b>Nbr. Sites</b>	<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Freeway segments, crashes:	6	2563.6	13.0	34.7	210.3	444.9	1860.6
Ramp segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

**Crashes for Entire Facility by Year**

	<b>Year</b>	<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Estimated number of crashes during the Study Period, crashes:	2021	119.3	0.6	1.6	9.9	21.0	86.2
	2022	120.2	0.6	1.6	10.0	21.1	86.9
	2023	121.2	0.6	1.7	10.0	21.2	87.6
	2024	122.1	0.6	1.7	10.1	21.4	88.3
	2025	123.0	0.6	1.7	10.2	21.5	89.0
	2026	123.9	0.6	1.7	10.2	21.6	89.7
	2027	124.9	0.6	1.7	10.3	21.8	90.5
	2028	125.8	0.6	1.7	10.4	21.9	91.2
	2029	126.7	0.6	1.7	10.4	22.0	91.9
	2030	127.7	0.7	1.7	10.5	22.2	92.6
	2031	128.6	0.7	1.7	10.5	22.3	93.4
	2032	129.5	0.7	1.8	10.6	22.4	94.1
	2033	130.5	0.7	1.8	10.7	22.6	94.8
	2034	131.4	0.7	1.8	10.7	22.7	95.6
	2035	132.4	0.7	1.8	10.8	22.8	96.3
	2036	133.3	0.7	1.8	10.9	23.0	97.0
	2037	134.3	0.7	1.8	10.9	23.1	97.8
	2038	135.3	0.7	1.8	11.0	23.3	98.5
	2039	136.2	0.7	1.8	11.1	23.4	99.3
	2040	137.2	0.7	1.8	11.1	23.5	100.0
2041							
2042							
2043							
2044							

**Distribution of Crashes for Entire Facility**

<b>Crash Type</b>	<b>Crash Type Category</b>	<b>Estimated Number of Crashes During the Study Period</b>					
		<b>Total</b>	<b>K</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>PDO</b>
Multiple vehicle	Head-on crashes:	6.4	0.1	0.2	1.1	2.3	2.7
	Right-angle crashes:	38.9	0.3	0.7	4.3	9.1	24.6
	Rear-end crashes:	1301.5	6.7	17.8	107.6	228.3	941.1
	Sideswipe crashes:	450.4	1.6	4.3	26.1	55.4	362.9
	Other multiple-vehicle crashes:	46.3	0.3	0.7	4.3	9.1	32.0
	Total multiple-vehicle crashes:	1843.6	8.9	23.7	143.4	304.3	1363.4
Single vehicle	Crashes with animal:	11.5	0.0	0.0	0.2	0.5	10.7
	Crashes with fixed object:	517.1	3.0	8.0	48.2	101.3	356.7
	Crashes with other object:	81.6	0.2	0.6	3.5	7.4	69.9
	Crashes with parked vehicle:	10.8	0.1	0.2	1.0	2.0	7.6
	Other single-vehicle crashes:	98.9	0.9	2.3	14.0	29.5	52.3
	Total single-vehicle crashes:	720.0	4.2	11.1	66.9	140.7	497.2
Total crashes:		2563.6	13.0	34.7	210.3	444.9	1860.6

# APPENDIX C

## DESIGN EXCEPTION FORM

## DESIGN EXCEPTION INFORMATION

**Route:** I-70    **County:** St. Charles    **Job No.:** J6I2418

**A. Design Stage:**

Conceptual Plan   
 R/W Certification   
 Preliminary Plan   
 Final (PS&E)   
 Other (    )

**B. Provide data for only those items that are proposed to have a design exception.**

Functional Classification: IS

Design ADT: 68,354

Criteria	Existing Condition	Standard	Proposed	Location
1. Design Speed				
2. Lane Width				
3. Shoulder Width Inside Outside	7' 10'	12' 12'	7' 10'	STA 737+00 to STA 822+00
4. Bridge Width				
5. Horizontal Alignment				
6. Superelevation				
7. Vertical Alignment				
8. Grade %				
9. Stopping Site Distance				
10. Cross Slope				
11. Vertical Clearance				
12. Lateral Offset to Obstruction				
13. Structural Capacity				
14. Other (Non-Controlling) (Describe)				

**C. Give reasons for requesting design exceptions for each design element.**

Project J6I2418 consists of constructing a 2-lane one-way south outer road between Route K and TR Hughes, convert the existing north outer road to a 2-lane one-way roadway, modifying the on and off ramps between Route K and TR Hughes to allow more access to the parcels along the outer roads, and widening and sidewalk construction along Route K from north of I-70 to 1000 feet south of Veterans Memorial Parkway. Although standards dictate a 12' inside and outside shoulder, the inner shoulder and concrete barrier and outside shoulders are in satisfactory condition, so there is no need to replace them. Additional shoulder width is unavailable due to the barrier wall/opposing median shoulder. After the roadway was built, a third lane was added by filling in the median, and the extra available median space became the existing inside shoulder. A fourth lane and 10 foot shoulder were added on the outside. The 7 foot inside shoulder width is consistent for most of I-70 from the Missouri River to the Route 61 interchange, about 20 miles. The added time, labor, and costs of shoulder widening outweigh the benefits of an expanded shoulder. The majority of crashes that occur along this stretch of highway are rear ends collisions, which can be attributed to congestion, not a smaller shoulder (see below for a more detailed safety analysis).

**D. Detail any safety considerations (including the HSM analysis, if applicable)**

In order to quantify the safety impact of the proposed design exception for inside and outside shoulder width, the project's HSM-based predictive safety analysis was modified to provide a net predicted safety impact. The Build version of the ISATe spreadsheet which was previously developed for the project AJR was modified to reflect the Preferred Alternative (Build) design with standard 12' inside shoulder and 12' outside shoulder. Comparing the output of the standard 12-foot shoulder design to the Build analysis output with the reduced shoulder design yields the net predicted safety impact.

The below tables reflect the output of predictive safety analysis for a 20-year study period from 2021-2040. The limits of the analysis were ramp gores at Bryan Road to the west and MO Route 79 to the east. The shoulder widths were only modified within the approximate limits of the project improvements which span from Woodlawn Avenue in the west and T R Hughes in the east.

The summary of the predictive safety output for the two scenarios on a *crashes per year basis* are shown in the following table:

ALTERNATIVE	STUDY PERIOD (YEARS)	PREDICTED AVERAGE CRASH FREQUENCY DURING STUDY PERIOD (CRASHES/YEAR)			PREDICTED # OF CRASHES DURING STUDY PERIOD (CRASHES)	
		FATAL [K]	DISABLING [A]	OTHER [B + C + PDO]	SEVERE [K + A]	TOTAL [K + A + B + C + PDO]
12' Shoulders	20	0.6	1.7	118.9	45.4	2422.5
Preferred Alt.	20	0.6	1.7	122.3	47.1	2492.1

The summary of the *difference in total crashes* between the two scenarios over the 20-year analysis period are shown in the following table:

DIFFERENCE FROM STANDARD SHOULDER WIDTH DESIGN							
PREDICTED NUMBER OF CRASHES (CRASHES)				PERCENT DIFFERENCE (PERCENT)			
FATAL [K]	DISABLING [A]	SEVERE [K + A]	TOTAL	FATAL [K]	DISABLING [A]	SEVERE [K + A]	TOTAL
0.5	1.2	1.7	69.6	4.03%	3.64%	3.74%	2.87%

As shown in the tables above, severe and disabling injury crashes are identical on a crashes per year basis with a slight increase in crashes per year for minor injury and property damage only crashes. Over the 20-year study period, the increase in predicted severe (fatal or disabling injury) crashes is 1-2 crashes. Over the same period, the increase in total predicted crashes is 70 crashes, representing a 2-3% increase over the 12-foot standard shoulder width design. The majority of these crashes are minor injury and property damage only crashes.

In summary, the proposed reduced shoulder width design results in very minor safety impact over a 20-year analysis period. Given the limited length and scope of the project which focuses on interchange and the outer road system improvements rather than continuous mainline improvements, the minimal benefits of upgrading the freeway shoulders to 12-foot standard width would be outside the scope of the project and would result in the project being cost prohibitive.

Request for Design Exceptions:

By: \_\_\_\_\_  
MoDOT Transportation Project Manager

Date: \_\_\_\_\_

Approved: (Include only applicable signatures.)

By: \_\_\_\_\_  
District Engineer

Date: \_\_\_\_\_

Comments:

By: \_\_\_\_\_  
State Design Engineer

Date: \_\_\_\_\_

Comments:

By: \_\_\_\_\_  
FHWA

Date: \_\_\_\_\_

Comments: