

CHAPTER 6 – I-70 / I-435 INTERCHANGE IMPROVEMENTS

The I-70 / I-435 interchange is the significant highway system interchange linking north / south I-435 serving western metropolitan Kansas City to east / west I-70 that bisects the metro area. Many of the traffic movements through this interchange are able to travel at high speeds with minimal delays due to the nature of the interchange design and layout. There are three routes through the interchange that do encounter restricted operations due to the interchange design, namely northbound I-435 to westbound I-70, westbound I-70 to southbound I-435, and eastbound I-70 to northbound I-435. Each of these movements is routed through a small diameter loop ramp with a 30 mph speed limit. Operations at these three loop ramps are further constrained by the short weave sections that exist between the loop ramp terminals.

As part of this study, traffic counts were taken at key locations throughout the study area during both the weekday PM peak hour and the Saturday peak hour. When compared to the existing Saturday peak hour, the existing weekday PM peak hour has larger overall traffic volumes system wide. Analyses completed at this interchange and detailed in this chapter was completed based upon the weekday PM peak hour traffic flows.

6.1 EXISTING CONDITIONS

Analyses of the existing traffic flows using the existing high speed geometric configurations of the interchange of I-70 / I-435 were performed to determine the existing operational levels of service and improvement needs within the interchange influence area. The existing weekday PM peak hour design volumes are shown on **Exhibit 6.1.1** and the existing lanes and level of service (LOS) for weaves and merges / diverges are shown on **Exhibit 6.1.2**. The existing level of service by road segment is displayed in **Figure 6.1.1**.



Figure 6.1.1 – Roadway Levels of Service for Existing Weekday PM Peak Hour Traffic Volumes

As displayed in Figure 6.1.1, many of the roadway segments in the interchange area currently operate at good levels of service during the weekday PM peak traffic period, with the exception of the westbound I-70 ramp to southbound I-435, which currently operates at LOS D.

6.2 DESIGN YEAR 2040 NO BUILD IMPROVEMENTS

A future travel demand model, including widening improvements of State Avenue between I-435 and K-7, upgrading 118th Street between State Avenue and Donahoo Road, reconstructing the system interchange of I-70 / K-7 and widening of I-70 to 3 lanes in each direction through the study area, adding traffic signals at primary intersections throughout the study area, and other planned improvements listed in Chapter 2, was developed to reflect the anticipated Design Year 2040 land uses and the committed roadway network improvements anticipated to be completed by 2040 (i.e. No Build condition). After running this version of the travel demand model, traffic volume projections were developed that would be expected during the Design Year 2040 weekday PM peak hour, assuming no major improvements were constructed near the I-435 & I-70 system interchange. The expected Design Year 2040 traffic volumes with the existing I-70 / I-435 interchange configuration are displayed on **Exhibit 6.2.1**. **Figure 6.2.1** is a graphical representation of expected level of service for the Design Year 2040 No Build Improvements.

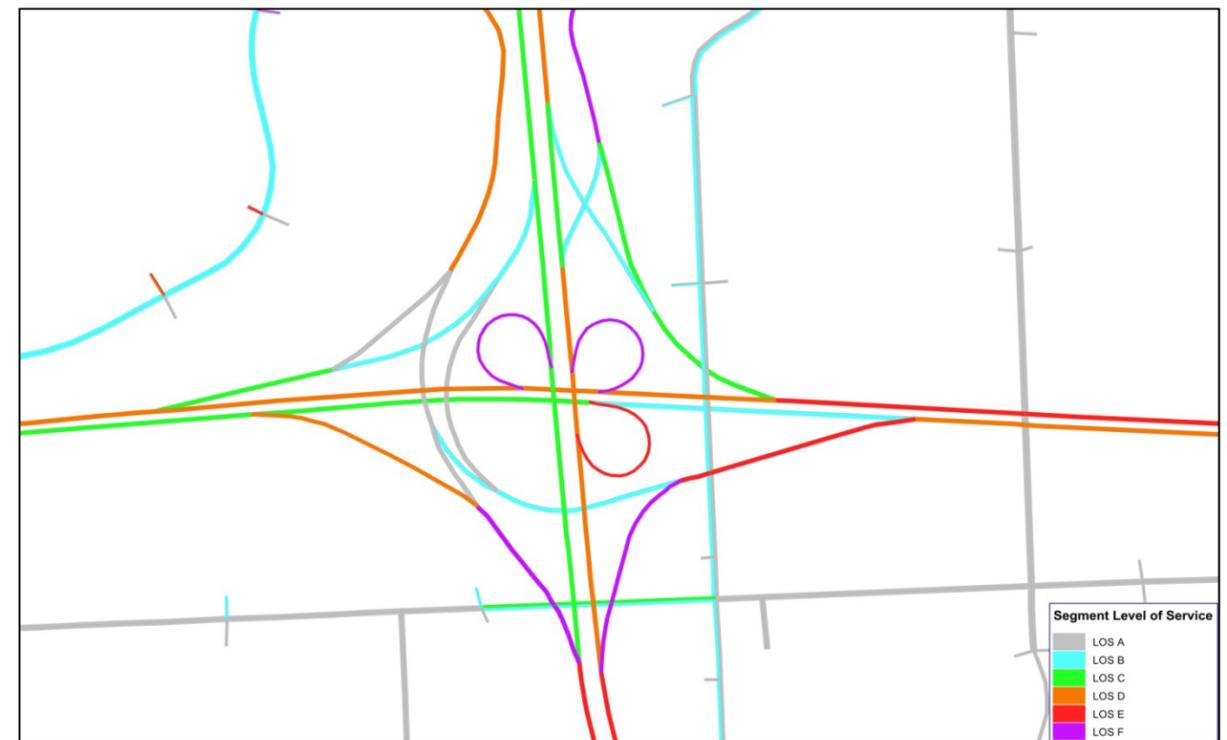


Figure 6.2.1 – Roadway Levels of Service for No Build Design Year 2040 Weekday PM Peak Hour Traffic Volumes

The Year 2040 No Build travel demand model analysis indicates specific movements at the interchange of I-70 / I-435 would be expected to operate at a LOS E or to fail during the 2040 PM peak traffic period. The weaving segment between the eastbound I-70 to northbound I-435 loop ramp and the northbound I-435 to westbound I-70 loop ramp and the weaving segment between the northbound I-435 to westbound I-70 loop ramp and the westbound I-70 to southbound I-435 loop ramp would also be expected to fail.

As the No Build analysis was completed at the I-70 / I-435 interchange, it was clear this interchange needed further review. A travel demand model was constructed to evaluate an alternative interchange configuration that included a flyover ramp from northbound I-435 to westbound I-70, replacing the existing loop ramp.

6.3 DESIGN YEAR 2040 I- 70 / I-435 INTERCHANGE IMPROVEMENT

The existing interchange of I-70 / I-435 was evaluated with the addition of a northbound I-435 to westbound I-70 flyover ramp, which replaces the northbound I-435 to westbound I-70 loop ramp. This configuration eliminates the failing weave sections on both northbound I-435 and on westbound I-70. This model scenario also includes the interchange improvements on State Avenue as detailed in Chapter 4.

The Design Year 2040 weekday PM peak period traffic volumes for the interchange improvement scenario are shown on **Exhibit 6.3.1**. As displayed in **Figure 6.3.1**, the flyover ramp would also be expected to operate at a poor LOS F due to the large future demand for this movement. However, when compared to Design Year 2040 No Build scenario (see Section 6.2), the flyover ramp would be expected to carry at least 400 additional vehicles when compared to the existing configuration of the loop ramp. The westbound I-70 to southbound I-435 loop ramp would be expected to carry the same number of vehicles in the PM peak period while the eastbound I-70 to northbound I-435 loop ramp would be expected to carry almost 100 more vehicles in the PM peak period. In general, with this interchange flyover improvement, the traffic carrying capacity of this type of improvement would be expected to increase by 3-5% within the interchange influence area.



Figure 6.3.1 –Roadway Levels of Service for Flyover Design Year 2040 Weekday PM Peak Hour Traffic Volume

It should be noted the addition of a flyover ramp to the I-70 / I-435 interchange is beneficial, not only due to the slight increase in overall interchange capacity, but would also be expected to improve the safety and overall operations of the interchange by eliminating the short weaving sections on northbound I-435 and on westbound I-70. Each of these existing weaving sections severely constrain both turning operations in the interchange and also effect the operations of the through traffic movements. The flyover alternative eliminates the weaves and greatly reduces mainline congestion through the primary interchange area.

As shown in Figure 6.3.1, under this scenario the southeast and northwest loop ramps would be expected to operate at LOS E and LOS F respectively. This poor level of service is due to the capacity constrained nature of the loop ramps.

Adding a second lane to the loop ramps would increase the capacity of the each ramp and improve the level of service. However, the addition of a lane would very difficult to design and construct in accordance with KDOT standards and AASHTO Green book standards.

A dual-lane flyover ramp alternative was also evaluated to determine if the traffic demand would be expected to exist to justify a dual-lane improvement. The additional capacity of a dual-lane flyover ramp would only be expected to carry about 300 additional vehicles when compared to the single-lane flyover. In addition to increasing the traffic by only 15%, it would be very difficult geometrically to construct a dual-lane flyover ramp in accordance with KDOT standards and AASHTO Green book standards due to the spacing requirements, therefore this dual lane alternative was not reviewed beyond this point.

6.4 PRELIMINARY IMPROVEMENTS AND ESTIMATES

Based on the completed detailed operational analysis and the preliminary schematics of required interchange enhancements, detailed geometric layouts and cost estimates were prepared for construction of the flyover ramp from northbound I-435 to westbound I-70. See **Exhibit 6.4.1** for a schematic of the interchange enhancement at I-70 / I-435.

There are many factors that have been evaluated in the development of the cost estimates. The total project costs include estimates of roadway / bridge / retaining wall construction, major utility relocations, project design, construction observation fees, and other major items that typically contribute to the overall cost of a project. The cost estimates were developed based on 2010 planning and program estimates and do not include inflation for future year construction.

The Flyover interchange improvement has a total project cost of about \$25,300,000, with \$20,500,000 in construction, \$121,000 in utility relocations, and \$4,700,000 in design and construction observation services. A detailed breakdown of the project cost estimates is displayed in **Figure 6.4.1** on the following page.

I-435 NB TO I-70 WB FLYOVER				GBA
Wyandotte County				April 30, 2010
Design Study Plans -- Engineer's Opinion of Probable Construction Costs				
Item	Quantity	Unit	Unit Cost	Amount
FLYOVER CONSTRUCTION				
Removal of Existing Structures	1	Lumpsum	\$ 5,000.00	\$ 5,000
Contractor Construction Staking	1	Lumpsum	\$ 240,000.00	\$ 240,000
Mobilization	1	Lumpsum	\$ 320,000.00	\$ 320,000
Clearing and Grubbing	1	Lumpsum	\$ 5,000.00	\$ 5,000
Common Excavation	5,300	C.Y.	\$ 10.00	\$ 53,000
Common Excavation (Contractor Furnished)	10,600	C.Y.	\$ 10.00	\$ 106,000
Rock Excavation (includes Pavement Removal)	3,400	C.Y.	\$ 20.00	\$ 68,000
Compaction of Earthwork (Type A) (MR-5-5)	15,900	C.Y.	\$ 10.00	\$ 159,000
Bridge	1	Lumpsum	\$ 13,210,000.00	\$ 13,210,000
Permanent Concrete Safety Barrier Type II (F-Shape)	200	L.F.	\$ 150.00	\$ 30,000
Concrete Pavement	11,700	Sq. yd.	\$ 60.00	\$ 702,000
Shoulder	6,100	Sq. yd.	\$ 55.00	\$ 335,500
Concrete Treated Base	17,800	Sq. yd.	\$ 10.00	\$ 178,000
Subgrade Treatment	18,700	Sq. yd.	\$ 10.00	\$ 187,000
Permanent Signing	1	Lumpsum	\$ 250,000.00	\$ 250,000
Permanent Pavement Marking	1	Lumpsum	\$ 100,000.00	\$ 100,000
Street Lighting	1	Lumpsum	\$ 50,000.00	\$ 50,000
Drainage	1	Lumpsum	\$ 10,000.00	\$ 10,000
Erosion Control	1	Lumpsum	\$ 160,000.00	\$ 160,000
Construction Traffic Control & Temp. Pavements (10%)				\$ 1,617,000
Contingency (15%)				\$ 2,668,000
FLYOVER CONSTRUCTION SUBTOTAL				\$ 20,453,500
Surveys, PS&E Design, and Bidding Assistance (10%)				\$ 2,045,350
Geotechnic Design Services				\$ 25,000
Post Design Services				\$ 25,000
Full Time LPA Project Observation (12.5%)				\$ 2,556,688
UTILITY RELOCATIONS				
Utility Relocations - Misc	1	Lumpsum		\$ 100,000
Utility Construction Traffic Control (5%)				\$ 5,000
Contingency (15%)				\$ 15,750
UTILITY RELOCATION SUBTOTAL				\$ 120,750
Utility Relocations Management and Observation (5%)				\$ 6,038
DESIGN AND OBSERVATION SUBTOTAL				\$ 4,658,075
PROJECT TOTAL				\$ 25,232,325

Figure 6.4.1 - I-70 / I-435 Flyover Preliminary Estimates of Probable Construction Costs

6.5 I-70 / I-435 INTERCHANGE RECOMMENDATIONS

Due to the complex nature of the existing directional interchange, there are limited geometric improvement options that can be realistically considered at this location that would be both reasonable in cost and extent. The construction of a northbound I-435 to westbound I-70 flyover, while expensive, does fit into the general interchange layout. This improvement would be expected to increase the capacity of some critical movements within the interchange, while also providing improved safety and overall operations. This flyover concept should be considered for further future evaluation and implementation if overall traffic conditions and safety continue to degrade as projected due to the three loop ramps and associated mainline weaving sections. This interchange recommendation layout is only a preliminary concept and further analysis will be necessary for final design of the improvement.