

I-44 Corridor Traffic Operations Analysis and Conceptual Improvements Study

Final Report

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EFK♦Moen, LLC

I-44 Corridor Traffic Operations Analysis and Conceptual Improvements Study

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Executive Summary

Within the St. Louis area, Interstate 44 (I-44) is recognized as a vital commuter route for residents into downtown St. Louis and to suburban employment centers. It is also a heavily traveled freight corridor. In recent years, owing in part to their design as well as to increased traffic, the interchanges at Missouri Route 141 and I-270 have become choke points in that network. Over the past several years, Route 141 (the mainline and the interchange with I-44) has routinely experienced congestion problems that have not only degraded overall traffic operations but have also contributed to safety problems as well. Further, geometric deficiencies, e.g., narrow bridge widths, a lack of shoulders on the bridge over the Meramec River and the bridges over railroad lines, inadequate turn lanes at arterial and collector roads, closely-spaced signals and insufficient drainage – resulting in severe flooding during major storm events – have all added to the problems in the area, in general, and the I-44/Route 141 interchange, in particular. Additional capacity constraints along Route 141, at Vance Road intersection in particular, exacerbate traffic constraints at the I-44 interchange.

Given this set of identified problems, the goals of this study are to develop and recommend a reasonable suite of conceptual alternative solutions for improving future traffic operations within the study area, identify practical near- and long-term alternative solutions, and identify related capital and operating cost for the alternatives.

The areas of concern discussed were the focus of the alternatives development process. The study team (MoDOT, CBB, EFKMoen) held a stakeholder workshop to brainstorm preliminary concepts aimed at addressing geometric, traffic and hydraulic issues identified through existing and committed network conditions analysis. Stakeholders included EWGCOG, St Louis County Division of Highways and Traffic, St Louis County Police, St Louis County Parks, Metro, Great Rivers Greenway, Trailnet, the City of Fenton and the City of Valley Park. Several concepts were developed and screened resulting in a set of final alternatives for detailed evaluation.

Alternatives selected for detailed evaluation were evaluated based on a detailed traffic operations analysis and conceptual geometric and hydraulic analysis. The following is a list of recommended feasible alternatives:

I-44/MO 141 Interchange (South of Meramec River Bridges to Centurion)

- Widen eastbound off-ramp to provide additional storage length and triple eastbound left-turns. This is a short-term solution to enhance available capacity.
- Build detention basin and resurface Route 141 to address local flooding events.
- Construct southbound to eastbound flyover ramp. The ramp can be constructed either as a left-exit or as a right-exit. Left-exit ramp provides cost and driver expectation benefits. However, detailed geometric evaluation is needed to determine the appropriate option. This is a mid-term solution.
- Construct a direct connection between North Outer Road and Elam Avenue and a northbound to westbound loop ramp. This, along with the southbound to eastbound flyover ramp is a long-term solution for the I-44 / Route 141 interchange.
- Reconstruct Route 141 over I-44 to address major flooding issues associated with the Meramec River Flooding.

Route 141 Vance and Marshall Intersections

- A split-flow intersection at Route 141 and Vance Road provides mid-term solution that addresses existing capacity constraints but does not address 2035 travel demand
- Construction of an overpass north of existing signal and a right-in / right-out access at Vance Road provides long-term operational benefits.

I-44 between I-270 and Route 141

- Widen westbound I-44 to provide four through lanes between I-270 and Route 141, as a mid-term solution.
- Relocate southbound to westbound off-ramp at I-44/I-270 interchange, as a mid-term solution.
- Reconstruct Meramec River Bridges along I-44 to include five travel lanes and shoulders, as a long-term solution.

I-44/I-270/Lindbergh Interchange Complex

- Widen westbound to southbound flyover ramp to 2-lanes at I-44/I-270 interchange. Additionally, widen and reconfigure the westbound C-D road along I-44 between Lindbergh Boulevard and I-270. This improvement is recommended as a long-term solution.
- Provided braided ramps to eliminate the weaving between traffic entering from Lindbergh Boulevard and traffic exiting to I-270 along westbound I-44. This is recommended as an ultimate fix.

BRT Station along I-44 Mainline

- Route 141 and Mraz Lane provide opportunities for BRT station location. Within the scope of this study, Mraz Lane location provides ease of access to and from I-44. However, detailed study by Metro would be needed to determine corridor and station locations.

Pedestrian and Bicycle Facilities

- Construct a mixed-use path for bike and pedestrian use on the west side of Route 141. This includes a new structure that provides Meramec River crossing.
- Provide pedestrian and bike accommodations at the I-44 / Route 141 interchange.

Introduction

Within the St. Louis area, Interstate 44 (I-44) is recognized as a vital commuter route for residents into downtown St. Louis and to suburban employment centers. It is also a heavily traveled freight corridor. I-44 is part of a network of connecting interstate routes, including I-270, I-70, I-64 and I-55, over which a sizable amount of the region's freight (as well cross-state goods) travels. In recent years, owing in part to their design as well as to increased traffic, the interchanges at Missouri Route 141 and I-270 have become choke points in that network. Traffic volumes on I-44, between the I-44/Route 141 and I-44/I-270 interchanges, from 2004 to 2007, have increased by almost five percent – from approximately 92,400 to 98,100, respectively. Truck volumes on I-44, between the two interchanges, account for approximately 15 percent of total daily volumes.

Presently, Route 141 carries an estimated 47,000 vehicles per day through the interchange with I-44. Over the past several years, Route 141 (the mainline and the interchange with I-44) has routinely experienced congestion problems that have not only degraded overall traffic operations but have also contributed to safety problems as well. Congestion is evident at the Route 141/I-44 eastbound on- and westbound off-ramps; and through the interchange along northbound Route 141, during AM peak travel times. Congestion is also evident southbound on Route 141 during PM peak travel times. Further, geometric deficiencies, e.g., narrow bridge widths, a lack of shoulders on the bridge over the Meramec River and the bridges over railroad lines, inadequate turn lanes at arterial and collector roads, closely-spaced signals and insufficient drainage – resulting in severe flooding during major storm events – have all added to the problems in the area, in general, and the I-44/Route 141 interchange, in particular. Analysis of crash data along Route 141 indicates that 56% of the total crashes comprise of rear-end crashes, further establishing traffic congestion related safety issues along this corridor. Moreover, approximately 40% of the total crashes in this segment occur at the I-44 interchange. Additional capacity constraints along Route 141, at Vance Road intersection in particular, exacerbate traffic constraints at the I-44 interchange.

Goals and Objectives

Given this set of identified problems, the goals of this study are to:

- Develop and recommend a reasonable suite of conceptual alternative solutions for improving future traffic operations within the study area.
- Identify practical near- and long-term alternative solutions.
- Identify related capital and operating cost for the alternatives.

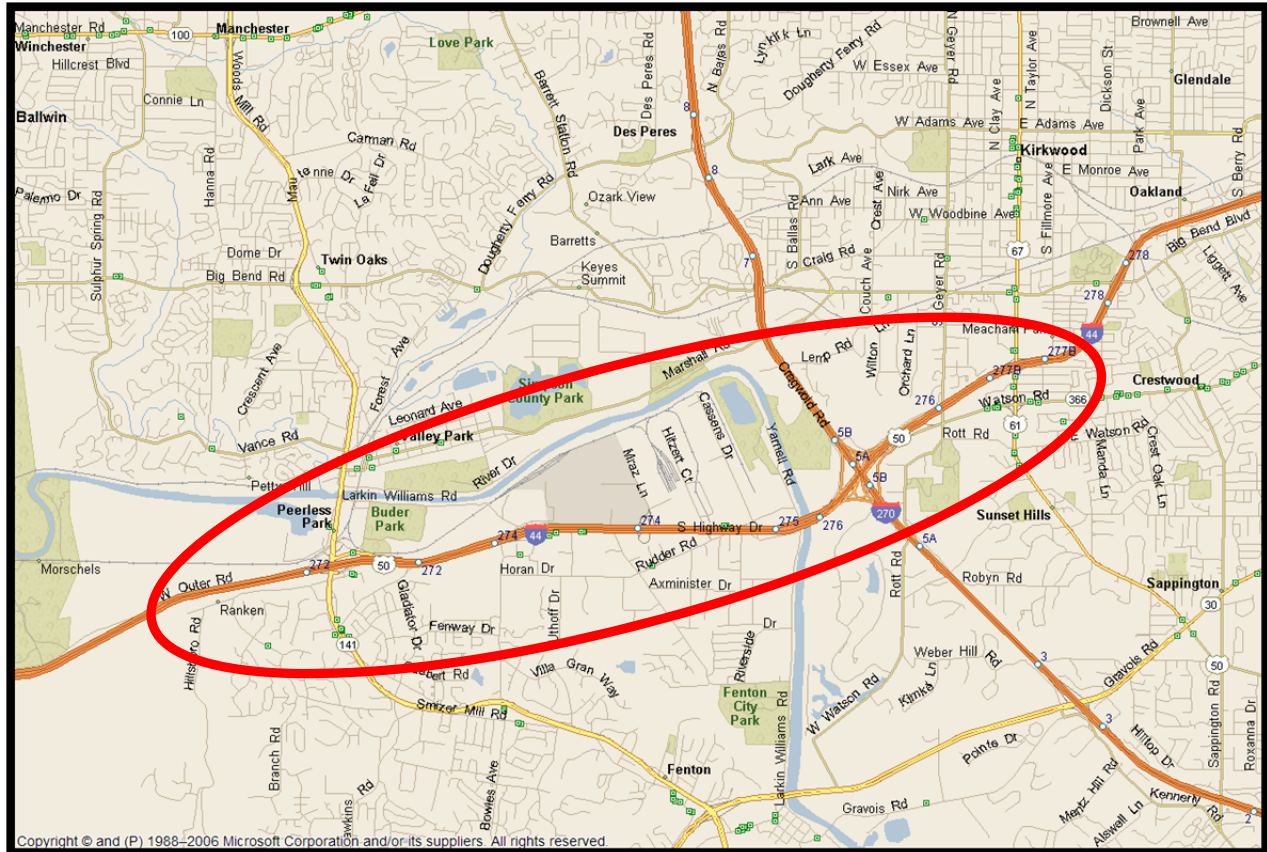
The objectives are to:

- Document existing geometric and existing and anticipated future capacity, traffic operations and safety problems at the I-44/Route 141 interchange, mainline and adjacent roadways.
- Develop traffic simulation models to be used in analyzing current and future projected traffic operations.
- Develop and analyze interchange and mainline improvement alternatives that will increase traffic flow, address geometric deficiencies, address chronic flooding issues, and make overall traffic operations better.
- Identify capital and operating costs for the developed suite of alternatives.

Study Area

The study area, depicted in Figure 1, is in southwestern St. Louis County and includes the I-44 corridor from west of the Route 141 interchange to east of the Lindbergh Boulevard Interchange.

Figure 1: Study Area



Specifically, the study area includes:

- I-44 corridor from west of Route 141 to east of Lindbergh Boulevard, including interchanges, slip ramps and one-way frontage roads as applicable at:
 - Route 141,
 - Bowles Avenue,
 - Mraz Lane,
 - Rudder Road,
 - Soccer Park Road,
 - I-270, and
 - Lindbergh Boulevard.
- Route 141 from north of Vance Road to south of Centurion Drive including intersections at:
 - Vance Road,
 - Marshall Road,

- o Elam Avenue,
- o North Outer Road,
- o I-44 ramp termini,
- o Drury Drive (right-in/right-out),
- o Meramec Station Road, and
- o Centurion Drive.

Additionally, the I-270 corridor, between Dougherty Ferry Road and Gravois Road, is included in the modeling extent for this study to capture influence on the I-44 interchange at I-270.

Existing Conditions Methodology and Analysis

As a first step in identifying geometric, traffic flow and hydraulic needs and opportunities within the study area, it is critical to identify and document existing issues and constraints. This section of the report summarizes the existing traffic, geometric and hydraulic constraints and issues along the I-44 and Route 141 corridors.

Data Collection and Inventory

Traffic Volume Data

2010 mainline traffic volumes for I-44 and I-270 were obtained from Traffic.com. Extensive traffic volume data was evaluated to identify traffic patterns and flow rates. Traffic volumes at system interchanges, slip-ramps, one-way frontage roads, and along Route 141 corridor intersections were collected by the Missouri Department of Transportation (MoDOT) in April 2010. Additionally, CBB collected manual turning movement counts along Maritz Overpass and Bowles Avenue in June 2010 to supplement the data provided by MoDOT. Available traffic data from 2009 was used as base data for I-270 interchanges with Dougherty Ferry Road, Big Bend Boulevard, and Gravois Road. Exhibits 1 and 2 in Appendix A show existing traffic volumes for the study area.

Traffic Forecasting Data

CBB met with staff from the East West Gateway Council of Governments (EWGCOG) to obtain regional travel demand model files for base (2010) and forecast (2035) years. These model files were utilized during traffic forecast development. A detailed description of traffic forecasting methodology is shown in the Traffic Forecasts section of this document.

Traffic Observations and Field Data

CBB conducted a detailed field reconnaissance of the study area to document traffic operational conditions. A photograph record was established. Additional data collected include typical travel patterns, origin/destination patterns, queue lengths and travel times along Route 141 corridor and I-44 corridor.

Geometric Design and Hydraulic Data

MoDOT microfilm of the existing horizontal and vertical geometrics was obtained by EFK Moen for Route 141, I-44, I-270 near I-44, and Lindbergh Blvd. A Design Criteria Memorandum, shown in Appendix B, was created for Route 141, the interstates, and Lindbergh Blvd. This Memo was used to identify substandard horizontal and vertical geometrics of the respective roadways. This encompasses standards and guidelines identified in MoDOT's Engineering Policy Guide (EPG), the ASSHTO Green Book, and the Roadside Design Guide.

A field check was done of the roadways to confirm that the microfilm was up to date, and to identify minor substandard features which may not have been readily identifiable from the microfilm. This includes field adjustments to the as-built geometry, which may have eliminated or narrowed shoulders, narrowed lanes, adjustments from routine maintenance or changing traffic conditions, or adjustments from smaller projects which may not have been microfilmed. Permanent traffic control features such as lighting, signing, and traffic signals were also reviewed for substandard features. Traffic volumes and known traffic congestion were reviewed to identify apparent substandard storage lengths, number of turn lanes, turning radii, and needs for additional through or turn lanes.

Finally, the EPG was used to identify features which are not desirable if designed today. These features include access guidelines, entrance location, drainage features, minimum length of turn lanes, standard features such as lane width, shoulder width, lane offsets to roadway obstacles, etc.

EFK Moen met with staff from MoDOT's maintenance section to review and obtain information regarding flooding events at the I-44 / Route 141 interchange. Previous hydraulic studies were reviewed to identify other issues.

Capacity Analysis Methodology

A detailed capacity analysis was undertaken to determine the anticipated roadway operating conditions for the existing, no-build, and build conditions. Various tools were used to evaluate the operating conditions of the different scenarios. SYNCHRO, VISSIM, and the Highway Capacity Software (HCS+) traffic evaluation packages were used in the analysis to capitalize on the strengths of each tool and to compare the results of various packages for further verification.

SYNCHRO and HCS+ analysis procedures are based upon the methodologies outlined in the "Highway Capacity Manual" (HCM), by the Transportation Research Board (TRB). The HCM, used universally by highway and traffic engineers to measure roadway capacity, establishes criteria for six Levels of Service (LOS): LOS A ("Free Flow") through LOS F ("Breakdown Conditions"). SYNCHRO was used to evaluate the operating conditions at the signalized intersections in the study area. HCS+ was utilized to evaluate the merge, diverge, and basic freeway segments along mainline I-44. VISSIM is a micro-simulation model used to analyze complex transportation systems. It allows the user to observe simulated traffic conditions. Output from VISSIM models was used to evaluate at-grade intersection and freeway operations. Updated driving behavior parameters for version 5.20 were used in this analysis to reflect typical saturation flow rates and merging behavior for I-44 and Route 141 corridors.

These various packages together formed a powerful tool for analyzing conditions on a system network like the one found in the study area. For example, traffic signal optimization was completed in SYNCHRO and exported into the VISSIM models. Moreover, the VISSIM models were built with origin destination tables, rather than turning movements at each individual intersection. This structure ensures more realistic vehicle paths through the model network and also allows for more efficient testing of multiple alternatives.

Several Measures of Effectiveness (MOE) were used in this evaluation including: LOS, volume to capacity ratios (v/c), intersection capacity utilization (ICU), vehicular delay, density, travel speed, and queue lengths. LOS is directly related to control delay. At signalized intersections, the LOS criteria differ from that at unsignalized intersections primarily because different transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes and, consequently, may experience greater delay than an unsignalized intersection. Table 1 summarizes the LOS thresholds used in the analysis for intersections. Typically LOS D is considered acceptable in urban areas for both freeways and arterial roadways.

Table 1: Intersection Level of Service Thresholds

Level of Service (LOS)	Control Delay per Vehicle (seconds/vehicle)	
	Signalized Intersections/Roundabouts	Unsignalized Intersections
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

In addition to LOS, v/c ratios and ICU rates provide important measures to describe an intersection's operations. Intersection movements can have acceptable LOS (D or better) yet still have unacceptably high v/c ratios and ICU rates. In general, v/c ratios and ICU rates around 0.9 result in occasional queuing and cycle failure, v/c ratios and ICU rates between 0.9 and 1.0 result in frequent queuing and cycle failure, and v/c ratios and ICU rates over 1.0 result in general failure of the movement. Therefore, it is important to consider v/c ratios and ICU rates in addition to LOS and vehicular delay when evaluating an intersection's operations.

The mainline I-44 operating conditions analysis was performed using VISSIM and HCS+. Both analysis techniques used density as an MOE to determine LOS along a freeway. Although speed is a major indicator of service quality to drivers, 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 up to capacity, resulting in an MOE that is sensitive to a broad range of flows. For these reasons, density is the parameter used to define LOS for the freeway and ramp sections, as shown in Table 2.

Table 2: Freeway Level of Service Criteria

Level of Service	Freeway Weaving Segment Density (pc/mi/ln)*	Merging and Diverging Segment Density (pc/mi/ln)*	Basic Freeway Segment Density (pc/mi/ln)*
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 – 43	> 35	> 35 – 45
F	> 43	Demand exceeds capacity	> 45

* pc/mi/ln = passenger cars per mile per lane

Appendix C shows a detailed summary of measures of effectiveness for existing conditions.

I-44 Corridor

Interstate 44 extends from Oklahoma City, OK to St. Louis, MO and provides a key connection from southwest Missouri and suburbs to St. Louis area, including downtown St. Louis. Consequently, I-44 is a heavily used corridor with through traffic heading across the state and commuter traffic throughout the

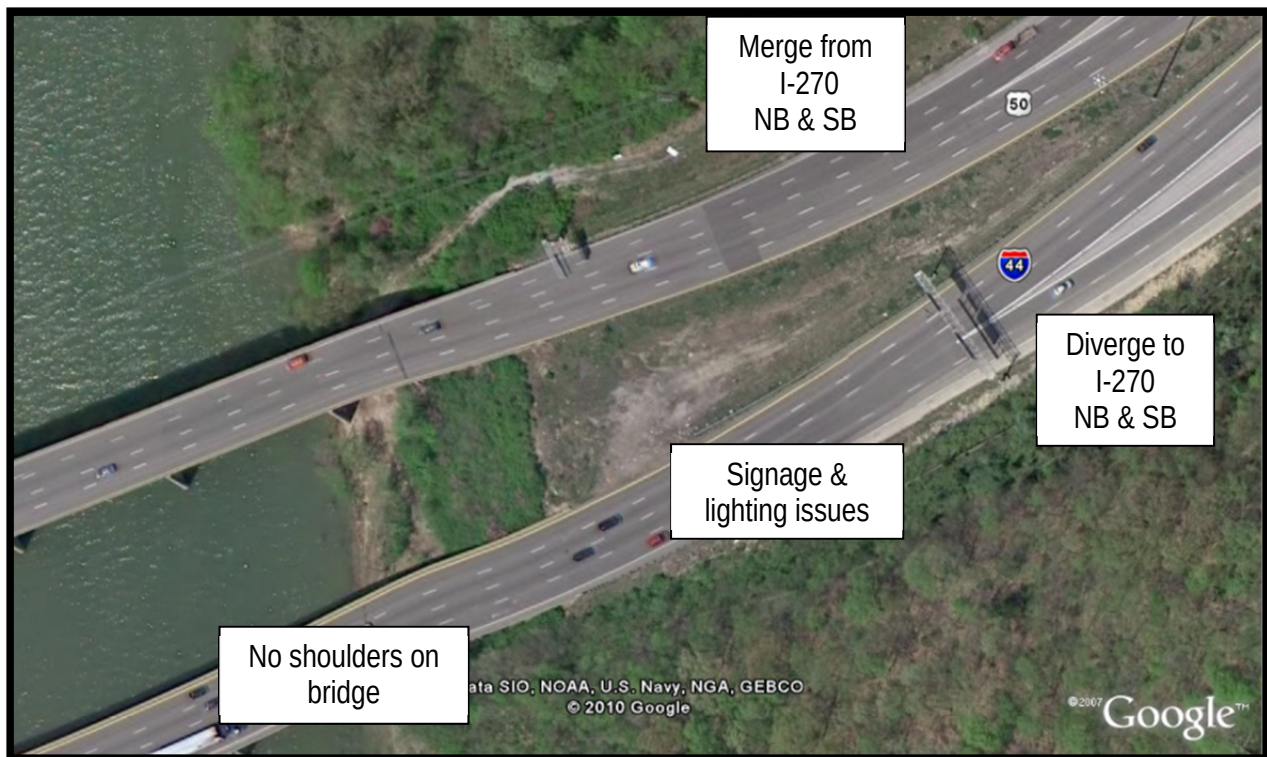
study area, providing connections for businesses and residences in the southwestern part of the metropolitan area. I-44 also provides important connections to some of the St. Louis region's major commuter routes: Route 141, I-270, and Lindbergh Boulevard. In the study area, I-44 mostly has three basic through lanes in each direction.

I-44 between Route 141 and I-270 Interchanges

Within the study area, the segment along I-44 between the Route 141 and I-270 interchanges has three through lanes in each direction and auxiliary lanes at the east end of the segment. Detailed existing conditions analysis of Route 141 interchange is described later in this section. In this segment, access to and from I-44 to local cross streets is provided via a system of one-way frontage roads and slip-ramps to Bowles Avenue, Mraz Lane, Rudder Road and Soccer Park Road.

The Meramec River Bridge along I-44 on the eastern end of this segment has significant geometric constraints that create uncomfortable and turbulent traffic conditions in the vicinity of the Bridge. To maximize the number of travel lanes on the bridges, both east bound and westbound directions over the Meramec River are striped without usable shoulders and shared through/exit lanes. Moreover, the bridge also provides a transition/weaving for traffic between I-270, I-44, Soccer Park Road, North Highway Drive, South Highway Drive and Rudder Road. In total, the geometric constraints and heavy traffic volumes result in turbulent traffic conditions. This is exacerbated by outdated signage and inadequate lighting. Figure 2 shows a graphical summary of existing constraints over the Meramec River Bridge and Figure 3 shows an example of outdated signage for shared lanes on the eastbound span of the bridge.

Figure 2: I-44 Meramec River Bridge Constraints



Traffic operations analysis of this segment using HCS+ and VISSIM shows that all merge, diverge and basic freeway segments in this section of I-44 have adequate capacity to handle 2010 traffic volumes and can operate at acceptable levels of service, LOS D or better. However, as will be described in detail later in this section, downstream capacity constraints along I-270 and I-44/I-270 interchange cause traffic backups along eastbound I-44 between Bowles Avenue and I-270 ramps. As such, given the downstream constraint, segments along eastbound I-44 east of Bowles Avenue frequently operate at failing conditions (LOS F) in the morning peak hour.

Figure 3: Example of Outdated Signage for Shared Lane along EB I-44 (Looking East)



I-44 / I-270 Interchange including Collector- Distributor (C-D) Road System

The I-44 / I-270 interchange handles high traffic volumes during the day and is one of the busiest interchanges in the state of Missouri. This interchange is a system interchange with directional ramps for all eight ramp movements; including one-lane flyover ramps for the eastbound to northbound and westbound to southbound movements and loop ramps for the northbound to westbound and southbound to eastbound movements.

Traffic operations along the I-270 corridor north of this interchange have significant influence on the operations at the interchange itself. Many recent studies for I-270 corridor have documented that the eight-lane section of I-270 from north of I-44 to Dougherty Ferry Road acts as a significant bottleneck for traffic flow both during the morning and evening peak hours.

During the morning peak, traffic demand on northbound I-270 exceeds available capacity in the 4-lane segment and creates significant congestion and backups into and beyond the I-44 interchange. Additionally, the merge area along northbound I-270 with ramps from I-44 has occasional independent breakdowns that are made worse by the downstream congestion. As a result, northbound traffic flow along I-270 backs up on a regular basis to the south to Route 30 interchange and to Route 21 in extreme cases. Figure 4 shows an example of this traffic backup. As a result of this capacity constraint, traffic backups

occur along eastbound I-44 up to Bowles Avenue and in extreme cases up to Route 141. The typical recurring congestion is exacerbated by non-recurring capacity constraints resulting from incidents.

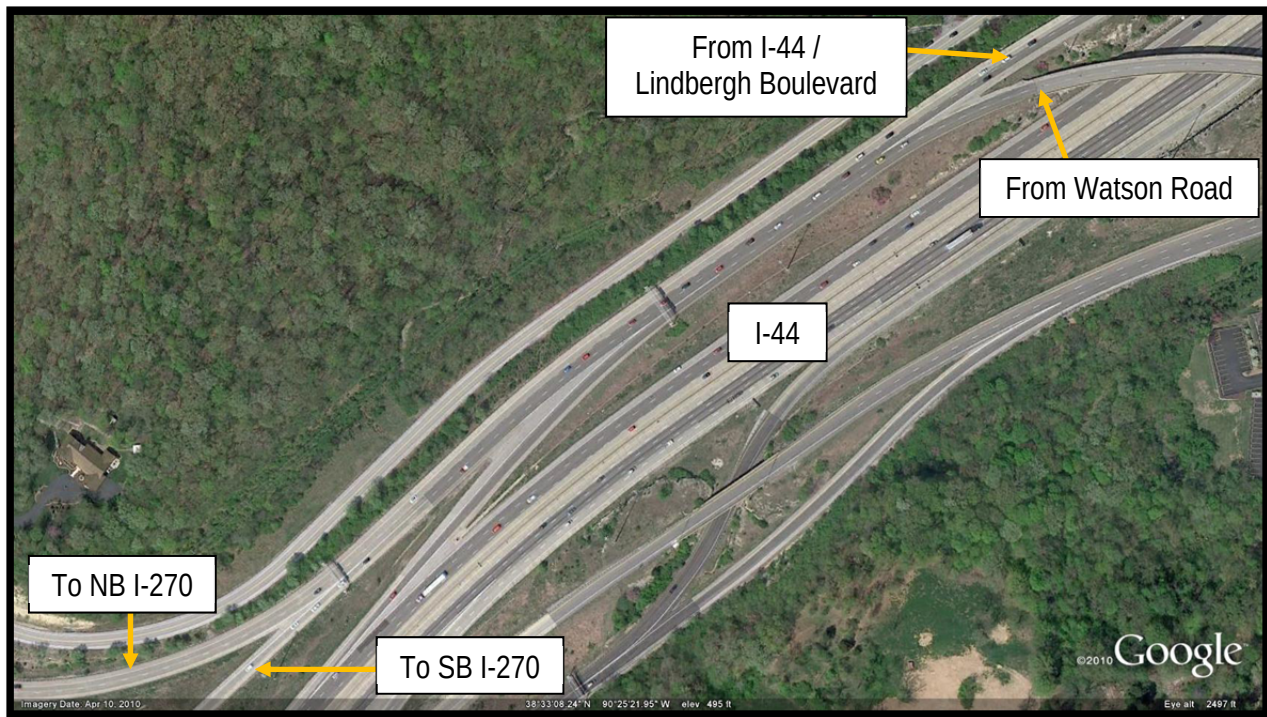
Another constraint at this interchange is the southbound to eastbound loop-ramp. The travel demand for this movement during the morning peak hour is approximately 1500 vehicles per hour and is approaching the theoretical capacity of a one-lane loop ramp. As such, occasional local queuing is observed at the diverge along I-270 for this loop-ramp.

Figure 4: Northbound I-270 Congestion to I-44 (Morning)



Another constraint at this interchange is the C-D Road system along westbound I-44 between Lindbergh Boulevard on-ramp merge and I-270. The C-D Road system handles traffic originating at I-44, Lindbergh Boulevard and Watson Road and traveling to I-44 and I-270. The C-D road has geometric constraints with complex lane configurations that can be classified as a non-standard Type C weaving segment (Figure 5). This along with heavy traffic volumes in the evening peak hour cause traffic flow breakdowns in the weaving segment. Additionally, the travel demand on the one-lane westbound to southbound flyover ramp (PM peak hour volume approximately 1900 vph) is at or over the theoretical capacity of a one-lane ramp. As a result, the traffic operations in the C-D Road weaving segment are worsened by the inadequate capacity of this movement. Traffic Operations Analysis with VISSIM show that this C-D Road system operates at failing levels of service (LOS F) during the evening peak hour and operates at acceptable conditions during the morning peak.

Figure 5: Westbound I-44 Weave Between Watson Road and I-270



I-44 / Lindbergh Boulevard Interchange

I-44 / Lindbergh Boulevard interchange is a standard diamond interchange and is at the eastern limits of this study area. Lindbergh Boulevard handles significant north-south traffic flow both during the morning and evening peak hours, providing access to residences and businesses as well as acting as a reliever to I-270 corridor. As such, the demand at this interchange exceeds available capacity provided by the standard diamond interchange. Synchro analysis shows that this interchange operates at failing conditions (LOS E/F) during the morning peak hour and acceptable conditions (LOS D) in the evening peak hour.

I-270 Corridor

Interstate 270 from north of Dougherty Ferry Road to south of Route 30 is included in this study's modeling extent to capture system wide traffic operations. Crawford Bunte Brammeier has completed several studies for MoDOT to evaluate traffic operations along I-270 corridor. At the most basic level, the traffic flow breakdowns are the result of a lack of capacity on I-270. Capacity is particularly limited between I-44 and Dougherty Ferry Road, where the freeway narrows to four lanes (in each direction) under overpasses carrying the BNSF and UP Railroads. The widths of these structures constrain I-270 to 4 standard-width lanes in each direction. Elsewhere, it is common for I-270 to have 5 lanes in each direction between adjacent interchanges. The typical recurring congestion is exacerbated by non-recurring capacity constraints resulting from incidents.

Typically, northbound I-270 is congested from near Dougherty Ferry Road to north of Gravois Road in the morning. On occasion, the congestion extends beyond Gravois Road and can reach as far as I-55. It can also adversely affect I-44, causing eastbound traffic to backup as far as Highway 141. The major bottleneck is the four-lane section between Big Bend Road and Dougherty Ferry Road. However, the

merge into the four-lane section immediately north of I-44 can also constrict traffic flows and meter traffic, thus easing the flow of traffic into the four-lane section. On some days, congestion first appears just north of I-44. However, even on these days, the major traffic failures typically stem from capacity limitations between Big Bend Road and Dougherty Ferry Road.

In the afternoon, southbound I-270 is typically congested from near Big Bend Road to I-64. However, it's not uncommon for slowed traffic to start further north near Page Avenue or for the congestion to spillback onto I-64, causing eastbound slowdowns that start before Mason Road. The severity of the congestion varies in relation to weather, incidents, seasonal traffic volume fluctuations, etc. Again, the major bottleneck is the four-lane section between Big Bend Road and Dougherty Ferry Road.

The westbound I-44 to southbound I-270 fly-over ramp is prone to congestion during the PM peak, frequently causing traffic flow breakdowns on the approaching collector-distributor roadway and occasionally producing queues that can extend back onto I-44. Separate from the constraints on I-270, these conditions are a function of traffic demands that are too heavy for a single-lane ramp.

Our observations indicate that the overarching characteristics of the current congestion are consistent with the previous studies. Not very much has changed since the detailed study that was conducted in 2009.

As such, I-270 capacity enhancement project between I-44 and Dougherty Ferry Road being planned by MoDOT, is included as a committed project for this study. This project includes restriping/widening of existing 8-lane section of I-270 between I-44 and Dougherty Ferry Road to a 10-lane facility. Previous studies done by CBB for MoDOT have documented the capacity constraint along I-270 and the inability of I-270 corridor to sustain additional growth in travel demand in the absence of capacity enhancements. As such, to ensure that I-44 corridor can be tested without the metering effect resulting from the I-270 corridor, it is essential to assume that the bottleneck on I-270 be eliminated. Accordingly, the "Committed Network" for this study includes I-270 capacity enhancement project.

I-270 / Dougherty Ferry Interchange

The I-270 / Dougherty Ferry interchange is a standard diamond interchange at the northern limits of the study area. The Dougherty Ferry overpass was rebuilt in the last five years and provides efficient traffic operations (LOS C or better from Synchro analyses) for both the morning and afternoon peak hours. This interchange offers primary access to many residences to the west of I-270, thus it experiences a heavy northbound left-turn in the afternoon peak hour.

I-270 / Big Bend Road Interchange

The I-270 / Big Bend Road interchange only has ramps to and from the north, there is no access to the south, making this a partial diamond interchange. This interchange has a signal at the off-ramp terminus, but is unsignalized at the on-ramp terminus. Big Bend Road is a four-lane cross section to the east of the interchange and becomes a prominent corridor heading east towards Richmond Heights. However, Big Bend Road narrows down to a two lane cross-section to the west of I-270. The interchange does not experience a lot of through or turning traffic volumes on a regular basis, thus it only has one signal and operates at acceptable operations for both morning and afternoon peak hours (LOS B).

I-270 / Route 30 Interchange

The I-270 / Route 30 interchange, commonly referred to as Gravois Road, is a standard diamond interchange at the southern limits of the study area. Gravois Road is a major arterial carrying a significant

east/west volume of traffic during the morning and afternoon peak hours. Gravois Road originates in the City of St. Louis and extends across the state of Missouri, towards the southwest. This route is a major connection for residents, businesses, and offers connections to many traffic generators. The interchange is shown to operate at slightly less than favorable conditions (LOS E or better). There are heavy movements during each peak hour that cause operational inefficiencies.

Route 141 Corridor

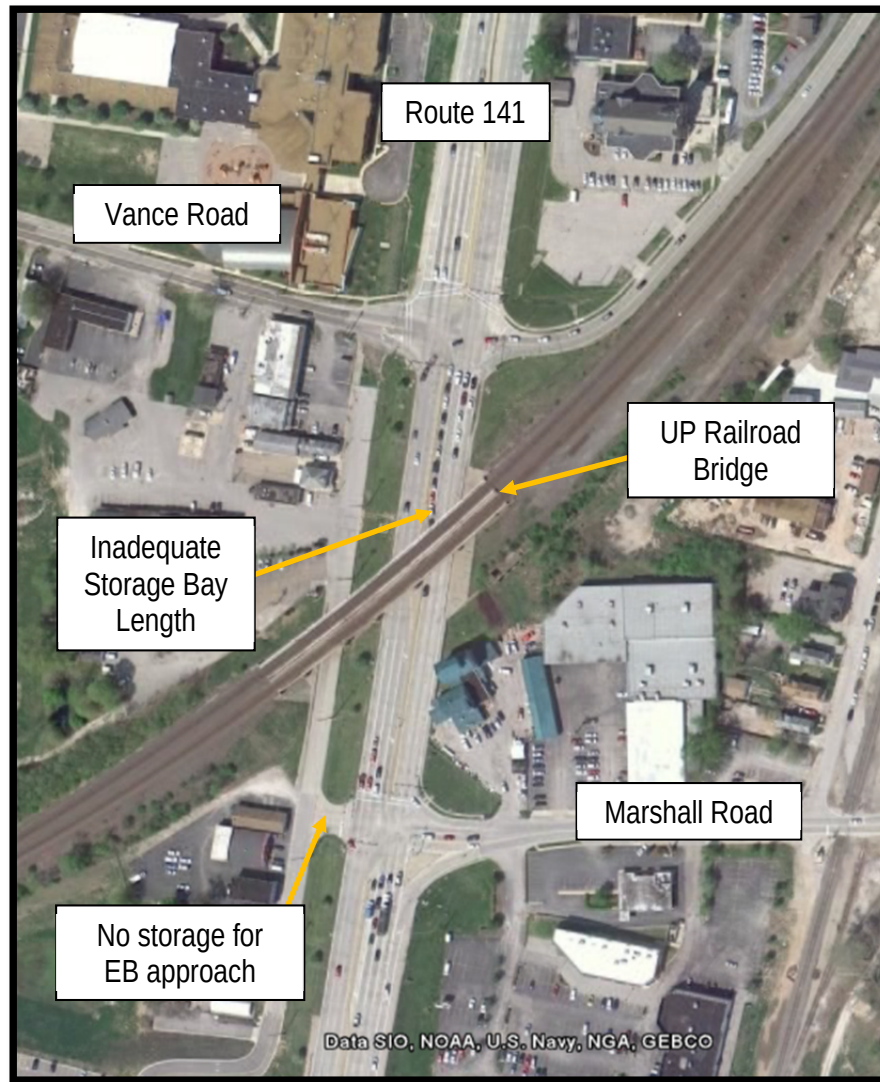
Missouri Route 141 is a north/south expressway in St. Louis County providing connectivity between I-64 and I-55. Additionally, through indirect connections at the north end via Woods Mill Road, Maryland Heights Expressway and Earth City Expressway, northern connectivity extends to Route 370. Route 141 handles very high traffic volumes as a result of serving as a commuter route as well as providing relief to I-270 corridor.

Within the study area, Route 141 has three travel lanes in each direction, with limited shoulders, sub-standard signal spacing and inadequate throat depth (less than 5 vehicle storage) along side-streets. Even though the through volumes along Route 141 are very high during both morning and evening peak hours, side-street connectivity plays a significant role to ensure viable access to businesses and residences along Route 141. As such, providing optimal signal timing plans to support though traffic flow is challenging.

Vance Road/Forest Avenue and Marshall Road Intersections

The northern most signalized intersection along Route 141 in the study area is at Vance Road. Marshall Road signalized intersection is approximately 700 feet to the south on Route 141, as shown in Figure 6. Both Vance Road/Forest Avenue and Marshall Road intersections provide important access and connectivity to residences and businesses and have to cater to high side-street traffic volumes, especially at Vance Road/Forest Avenue. Moreover, anecdotal evidence suggests that Vance Road/Forest Avenue also provides a cut-through route for traffic. The Union Pacific Railroad Bridge that crosses over Route 141 physically constrains geometrics for both intersections and acts as a significant capacity constraint.

Figure 6: Route 141 at Vance Road and Marshall Road



The railroad overpass constrains the available northbound left-turn storage bay length at Vance Road intersection to 200 feet. As a result, heavy northbound left-turn movement spills out of the available storage bay and blocks the left through travel lane on Route 141 on a regular basis and two through lanes in extreme cases (Figures 7 and 8). Backups resulting from this condition extend up to Elam Avenue and I-44 interchange in extreme cases and severely impact northbound traffic flow along Route 141. Moreover, heavy traffic flow along southbound Route 141 and westbound Forest Avenue cause significant congestion on these approaches (Figure 9). Traffic operations analysis with Synchro shows that the Vance Road / Forest Avenue intersection operates at failing LOS (LOS F) during both morning and evening peak hours. Because of the relatively low side-street volumes, Marshall Road intersection operates at overall acceptable conditions; albeit constrained side street operations exist.

Figure 7: Route 141 at Vance Road NBLT Blocking NBT Evening Peak Hour (Looking North)



Figure 8: Route 141 at Vance Road NBLT Blocking NBT Evening Peak Hour

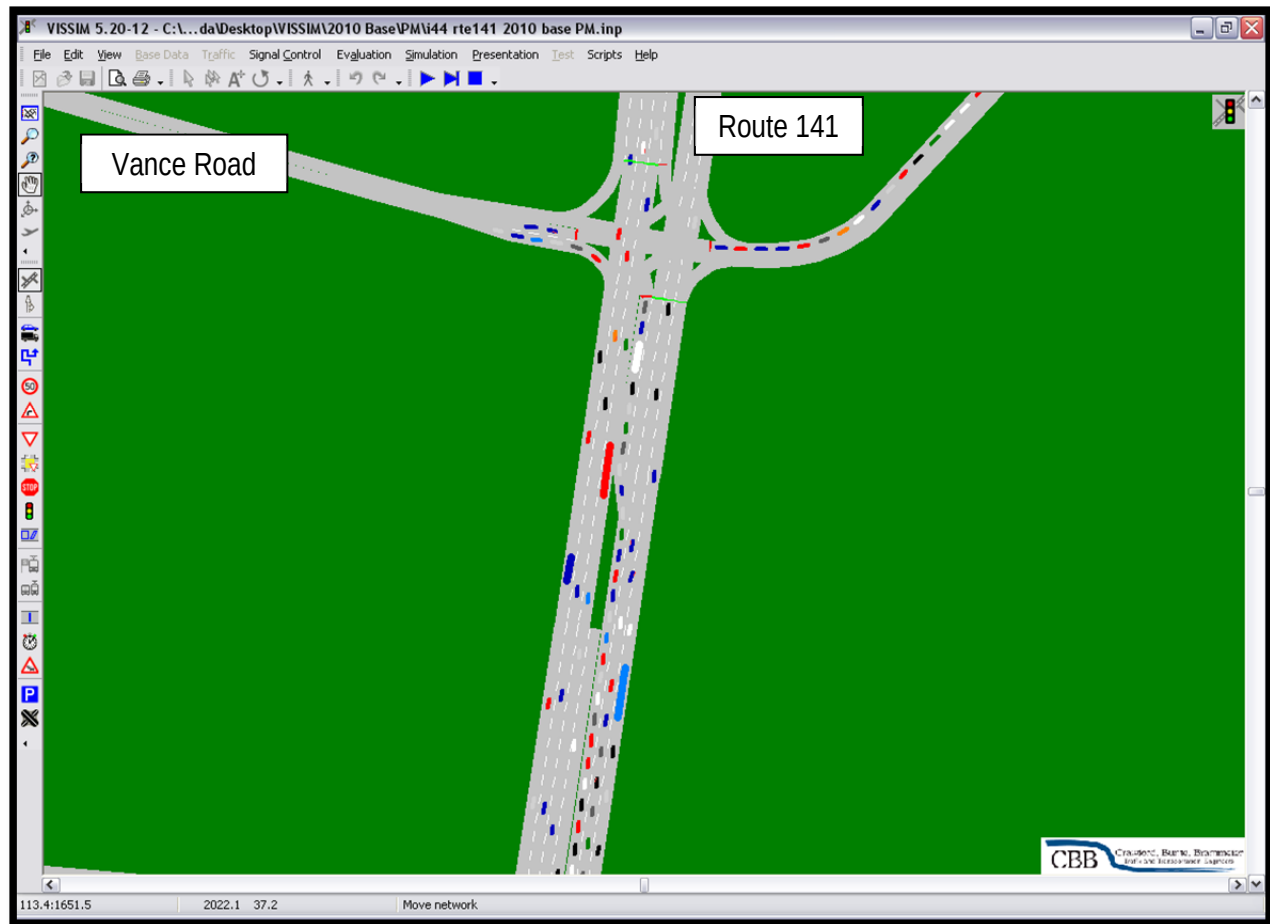


Figure 9: Forest Avenue Approach at Route 141 Afternoon Peak Hour (Looking West)



Elam Avenue Intersection

Similar to the signalized intersection at Marshall Road, Elam Avenue intersection also has geometric constraints at the eastbound approach. There is only about 80 feet of storage before the road turns north/south and the businesses have access in close proximity of this intersection, as shown in Figure 10. Because of the relatively low traffic volumes on the side-street, this intersection overall operates at acceptable conditions by itself. However, traffic backups from adjacent intersections on either side of this intersection along Route 141 impact traffic operations at this intersection. Additionally, because of the BNSF Railroad immediately to the south of this intersection, there is no direct connection to the North Outer Road from Elam Avenue. This limits access to the industrial area along Elam Avenue via this signalized intersection only.

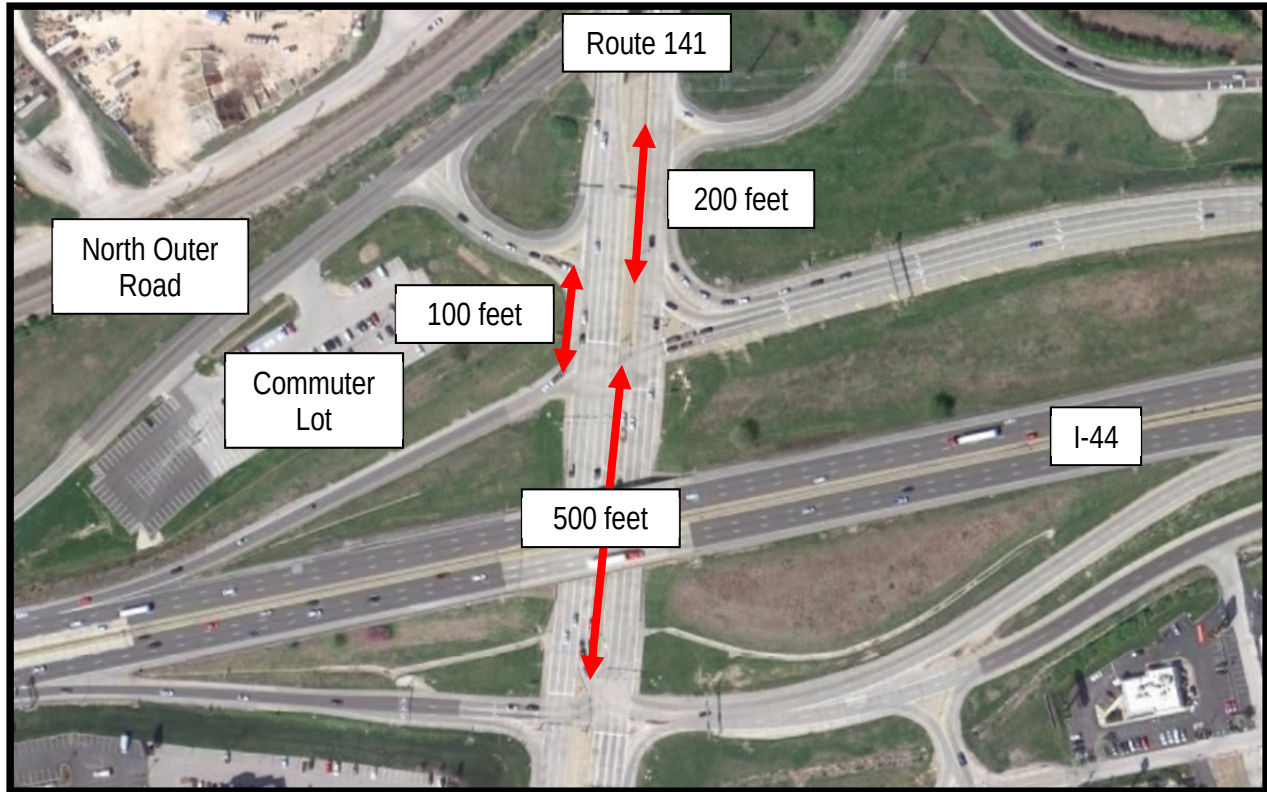
Figure 10: Route 141 at Elam Avenue



I-44 Interchange including Outer Roads

I-44 / Route 141 interchange handles extremely high traffic volumes and is a significant bottleneck within the study area. The interchange is configured as a standard diamond interchange. The proximity of right-in /right-out intersections (Figure 11) adds to the constrained traffic operations at this interchange. As mentioned earlier, lack of direct connectivity between Elam Avenue and the North Outer Road exacerbates this constraint.

Figure 11: Route 141 at I-44 and the North Outer Road



This interchange serves north-south commuter traffic traveling to and from I-44 as well as traffic avoiding I-270 corridor congestion. As a result, all three competing approaches at both westbound and eastbound ramp terminals have heavy traffic volumes. Specifically, heavy eastbound, northbound and southbound movements create capacity constraint at the eastbound ramp terminal in the morning peak hour and heavy northbound, southbound and westbound movements create a capacity constraint at the westbound ramp terminal in the evening peak hour.

In the morning peak hour, the southbound left-turn movement spills out of the available storage bay length and blocks one through southbound lane along Route 141 on a regular basis and two through lanes occasionally. Backup along northbound Route 141 extend beyond Meramec Station Road on a regular basis and beyond Centurion Drive occasionally (Figures 12 and 13). Similarly, eastbound off-ramp from I-44 queues onto I-44 (Figure 14).

Figure 12: Southbound and Northbound Congestion – AM Peak Hour (Looking South)



Figure 13: Southbound Left-turn blocking Through Lanes – AM Peak Hour

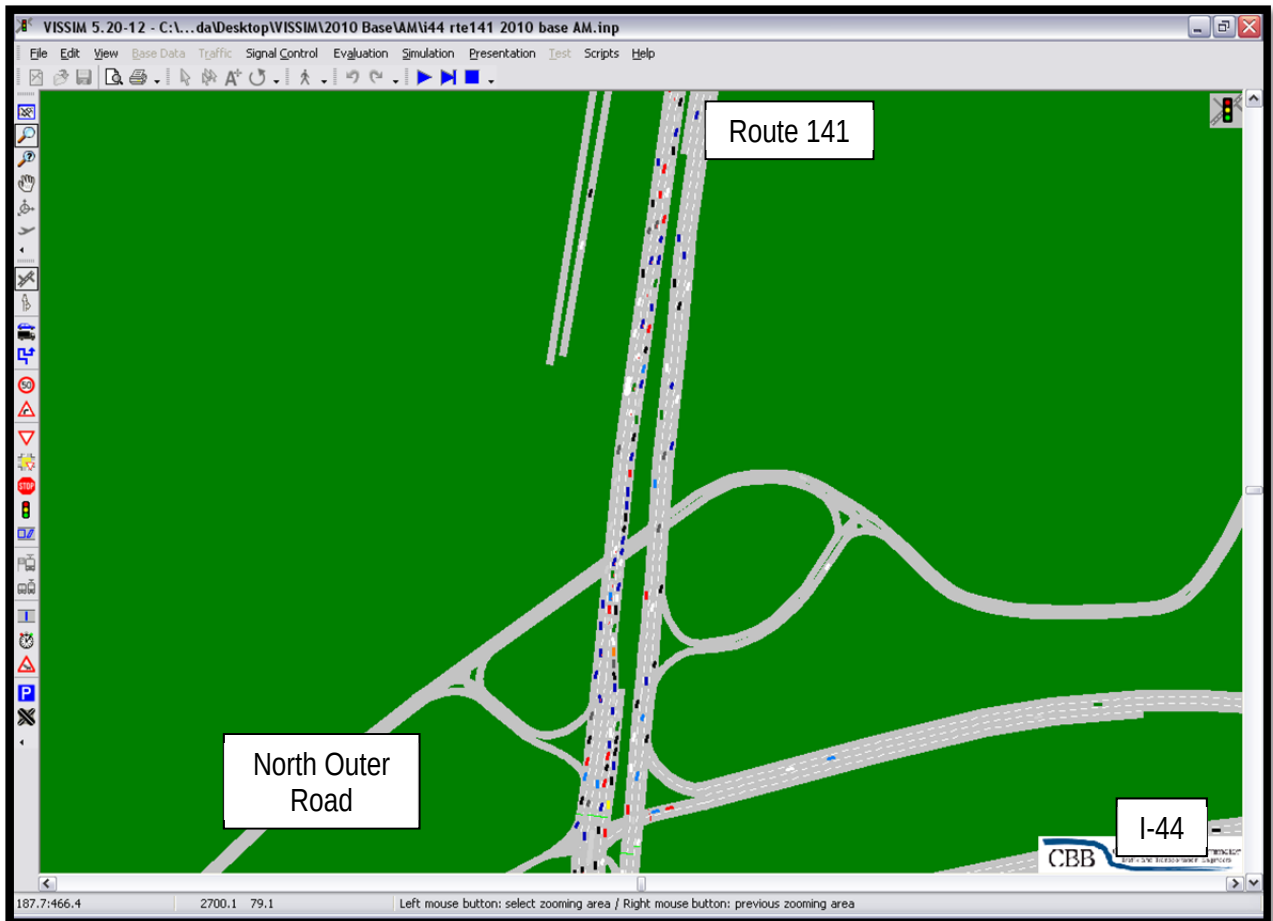


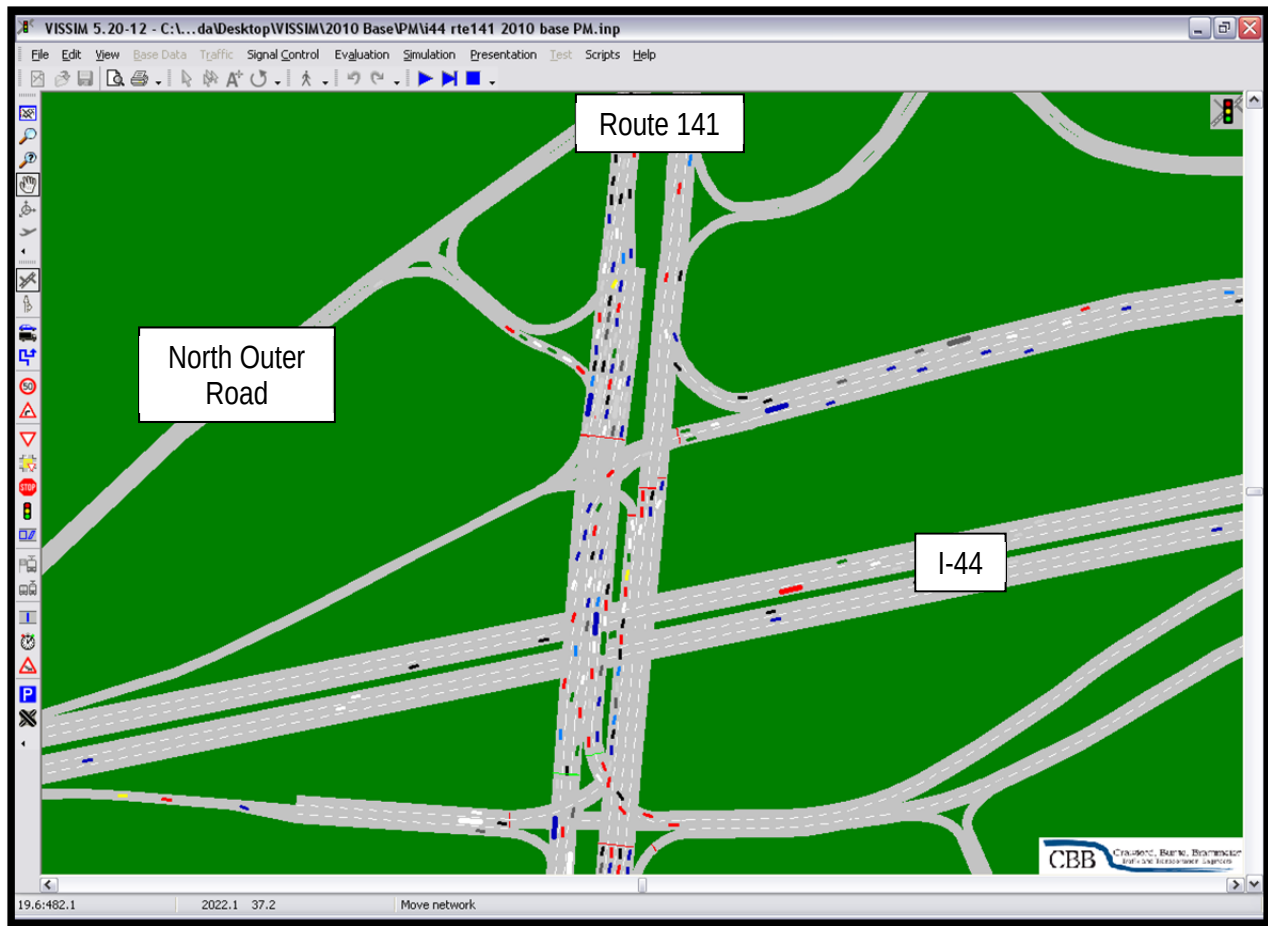
Figure 14: Eastbound I-44 Off-ramp Queue – AM Peak Hour (Looking West)



In the evening peak hour, the westbound ramp terminal intersection operates over capacity resulting from heavy westbound off-ramp traffic and southbound through traffic along Route 141. In addition, downstream constraint at Vance Road intersection causes congestion along northbound Route 141 that impacts the traffic operations at the interchange. Even though, the westbound right-turn movement at this signal is very heavy (1800 vph) in the evening peak hour, it does not queue back on to the interstate during a typical weekday. Queue backups onto the interstate at this location occur rarely as a result of incidents. However, heavy traffic volumes at westbound Route 141 off-ramp diverge on westbound I-44 occasionally cause turbulent traffic flow along westbound I-44 between Route 141 and Bowles Avenue.

Additionally, in the evening peak hour, congestion along southbound Route 141 limits available gaps for traffic from the North Outer Road to access eastbound I-44 (Figure 15). This creates issues for traffic from the commuter lot in the north-west quadrant of the interchange to weave across the through lanes to turn left onto eastbound I-44. Field observations reveal aggressive driving maneuvers that have high potential to cause safety issues. Similar driving behavior is observed for traffic from the North Outer Road turning right onto northbound Route 141. Overall, the interchange operates at failing conditions, LOS F, during both morning and evening peak hours.

Figure 15: Southbound Traffic Blocking North Outer Road – PM Peak Hour



In addition to the traffic issues, this interchange experiences frequent flooding problems. This causes major backups and congestion which can exacerbate the already near-capacity operations due the heavy traffic demand at the interchange. The flooding problems can be divided into two categories:

1. Major flooding which occurs when the Meramec River rises to an elevation of 420' equaling 11' above flood stage (with the river flow line at 387' and USGS flood stage at 409');
2. Flash flooding which occurs when a large localized storm occurs over a short timeframe.

The major flooding of the Meramec River affects the entire interchange area, as well as many of the surrounding properties, as shown in Figure 16. During these events, Route 141 and the on and off ramps from I-44 are closed for several days while the river is at the peak flood stage. According to the National Weather Service data, the Meramec River has reached a flood stage above 420' at least nine times in the past 30 years. Figure 17 shows a graphical depiction of Meramec River elevation and its effect on flooding at Route 141.

Figure 16: Major Flooding Event at I-44 / Route 141 Interchange (Looking North, 2008)

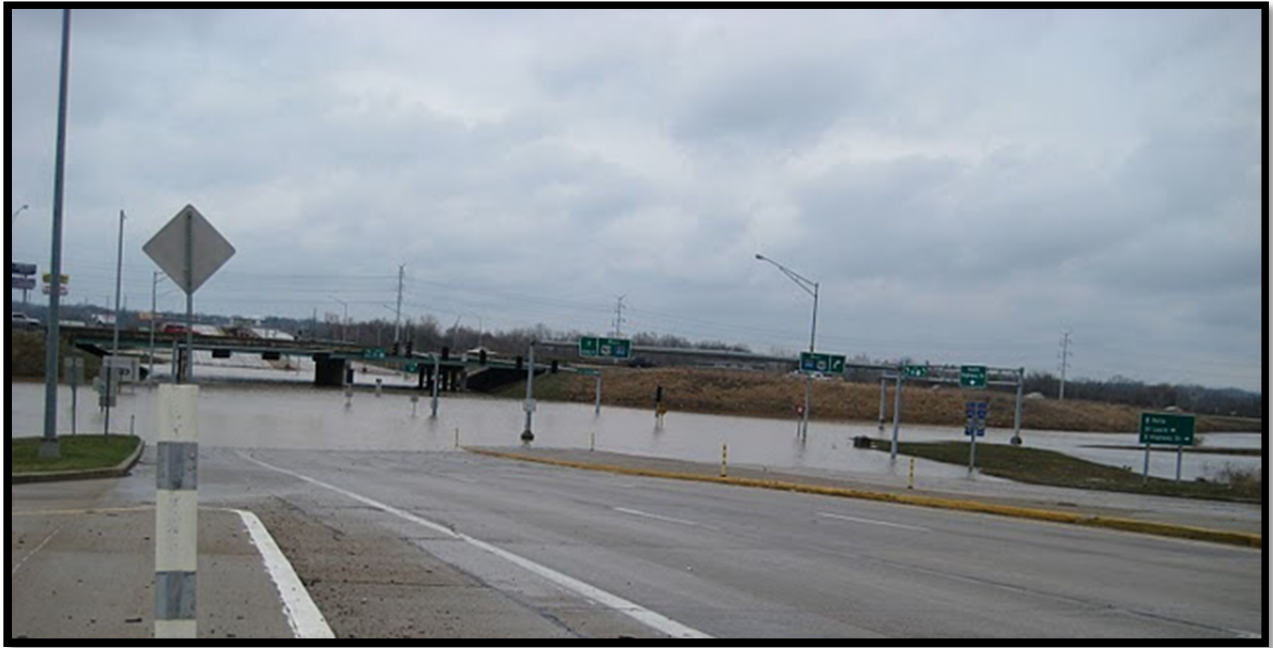
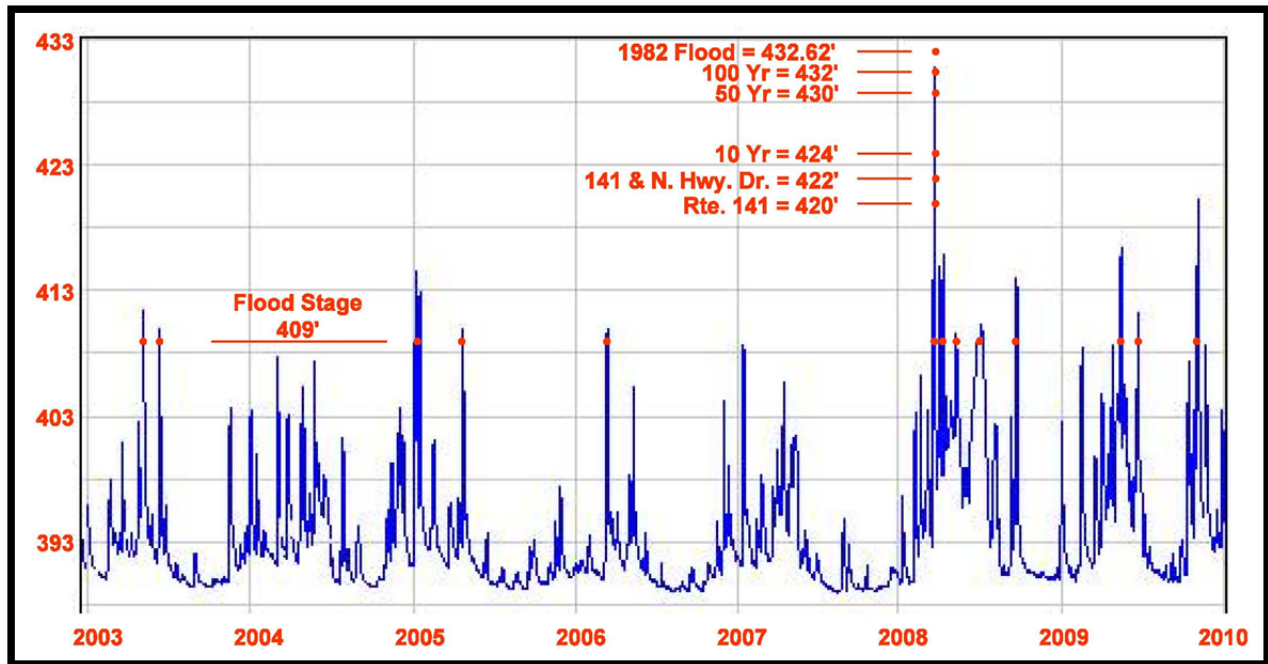


Figure 17: Meramec River Elevation Chart



The flash flooding occurs on a much more frequent basis, but the duration and extent of lane closure is usually far less severe than the major flooding impacts (Figures 18 & 19). Drainage for the southwest quadrant of the interchange is handled by a small concrete gutter which connects to a pipe under the I-44 off ramp. This gutter is too flat to handle the runoff from large storm events and the pipe under the off ramp is undersized. The pipe and gutter system cannot convey the storm water from these events. Storm water is forced to backup onto the right southbound lanes of Route 141. This occurs several times a year, but may only cause lanes closures for one to four hours at a time. During times of lane closures, all

southbound traffic is forced to use the two left turn lanes. When this happens, MoDOT maintenance personnel have portable pumps which they use to pump water from the island between the ramp and I-44 to the storm sewer system south of the ramp.

Flash flooding problems also occur in the northwest quadrant, although this occurs less frequently than in the southwest quadrant. Every couple of years during heavy localized storms the concrete channel leading to the east cannot handle the runoff from the northbound lanes of Route 141. Water then backs up onto the northbound traffic lanes and at that time multiple lanes of traffic on 141 are closed at one time.

Figure 18: Local Flooding Event at I-44 / Route 141 Interchange (Looking North, 2010)



Figure 19: Local Flooding Event at I-44 / Route 141 Interchange (Looking East, 2010)



Meramec Station Road and Centurion Drive Intersections

The signalized intersection at Meramec Station Road is located approximately 1,000 feet south of the eastbound ramp terminals. Both eastbound and westbound approaches of this intersection provide access to businesses. This intersection provides acceptable traffic operations during both morning and evening peak hours; however, traffic backups along northbound Route 141 in the morning peak hour impact the traffic operations at this intersection.

Similarly, the signalized intersection at Centurion Drive provides acceptable traffic operations. However, occasionally, traffic backups along northbound Route 141 in the morning peak hour impact the traffic operations at this intersection.

Safety Analysis

The crash statistics for the years 2004 through 2008 were received from MoDOT and the Missouri Highway Patrol along I-44 between Lindbergh Boulevard and Antire Road¹ and on Route 141 between Vance Road and Centurion Drive to determine any safety performance issues. During this time period, 2,011 crashes were reported on I-44 and 746 crashes reported on Route 141. Overall, rear end crashes were the most prominent on both routes, mostly due to congestion and heavy traffic areas.

I-44 Corridor

The crash data received for the years 2004 through 2008 reported 2,011 crashes on I-44 between Antire Road and Lindbergh Boulevard; 839 crashes for eastbound and 1,172 crashes for westbound. It should be recognized that data coding of crashes at interchanges occasionally results in interchange crashes assigned to the Interstate not the interchange. However, data available from MoDOT and the Missouri Highway Patrol was used for this analysis without further classification. The crash severity along I-44 is shown in Table 3. There were seven fatal crashes (Table 4) reported on this stretch of I-44, which is less than one percent of the total crashes. Two percent of the crashes involved disabling injury.

Table 3: Total crashes on I-44

	PDO	Minor Injury	Disabling Injury	Fatal
EB I-44	651	161	24	3
WB I-44	921	230	17	4
Total Both Directions	1,572	391	41	7

Table 4: Fatal crashes on I-44

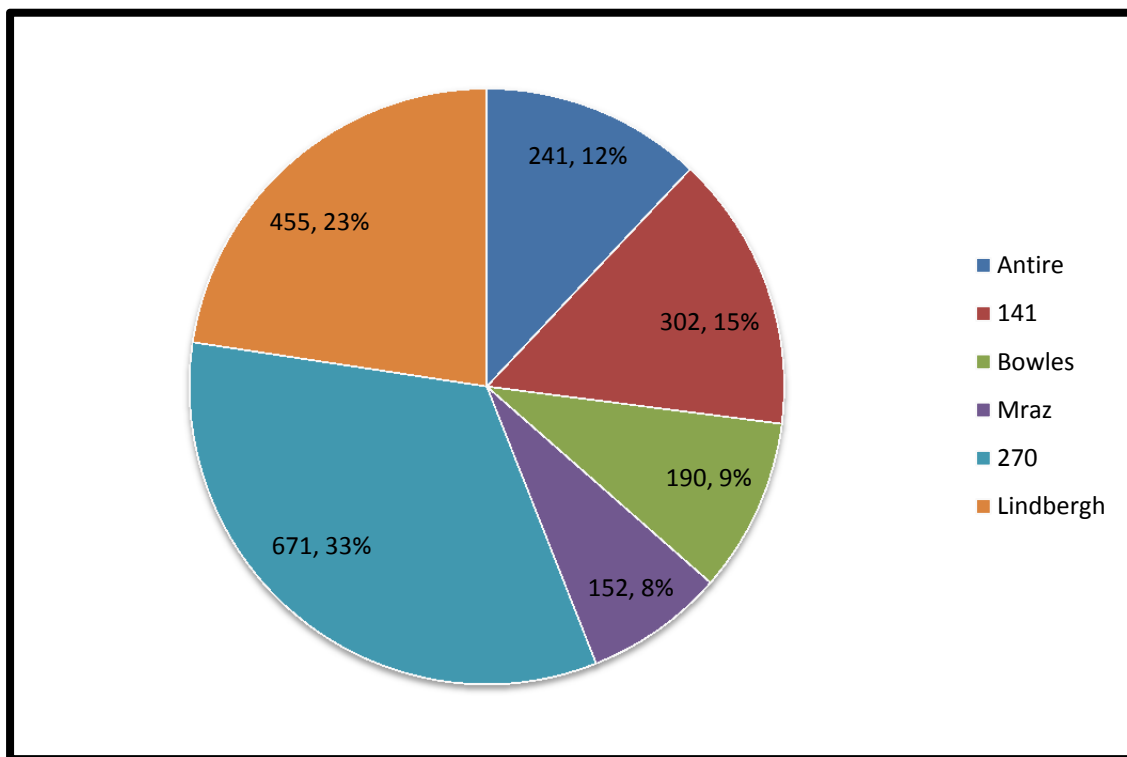
No	Location	Type of Accident	Road Surface Conditions	Light Conditions	Other
1	SB 270 off ramp to EB 44 (towards end of loop ramp)	Out of control	Dry	Dark no street lights	On curve and grade
2	WB I-44 ramp to I-270 in right lanes before diverge	Head on	Wet	Dark with street lights	On grade
3	EB I-44 west of Bowles overpass	Rear end	Dry	Daylight	On grade, Truck involved, Congestion ahead, alcohol
4	WB I-44 west of Bowles overpass	Out of control	Wet	Daylight	On curve
5	EB I-44 west of Rudder Road	Out of control	Wet	Daylight	Truck involved
6	WB I-44 at NOR diverge	Out of control	Wet	Daylight	Driving too fast
7	WB I-44 on Meramec River Bridge	Pedestrian	Dry	Dark no street lights	Truck involved, pedestrian walking in lanes of traffic

¹ Note that the Federal Highway Administration (FHWA) often requires upstream and down stream interchanges to be considered in operational analysis to study the impact on mainline operations. However, the Antire Road interchange is 3.5 miles west of MO 141 and carries relatively low volumes. Systems effects (e.g., freeway weaving) between Antire Road and MO 141 are negligible. As such Antire Road interchange was not included in traffic operations analysis. However, the segment along I-44 between Route 141 and Antire Road was included in Safety Analysis based on available crash data aggregation.

As shown in Table 3, there were seven fatal crashes reported along I-44 within the study limits. Three of the fatal crashes were eastbound I-44 and the other four were westbound I-44, as shown in Table 4. Four of the fatal crashes occurred when the road surface was wet. Two of the fatal crashes occurred when it was dark out with no street lights. Three of the crashes involved tractor trailers, although only one of these crashes could be blamed on a tractor trailer. There is one fatal crash listed involving a pedestrian. This crash occurred on the westbound Meramec River Bridge late at night. The pedestrian was seen walking and swerving in multiple lanes of traffic. Two vehicles hit the pedestrian. It was never determined if alcohol was involved. Four of the crashes were recorded on vertical grade and two were recorded on a horizontal curve.

Figure 20 shows the crashes by location along I-44. This figure shows that thirty-three percent of the total crashes on I-44 occurred in the vicinity of the I-270 interchange.

Figure 20: Total Crashes on I-44 by Location



Crashes were analyzed for both eastbound and westbound I-44 to get a better idea of any underlying issues along the corridor.

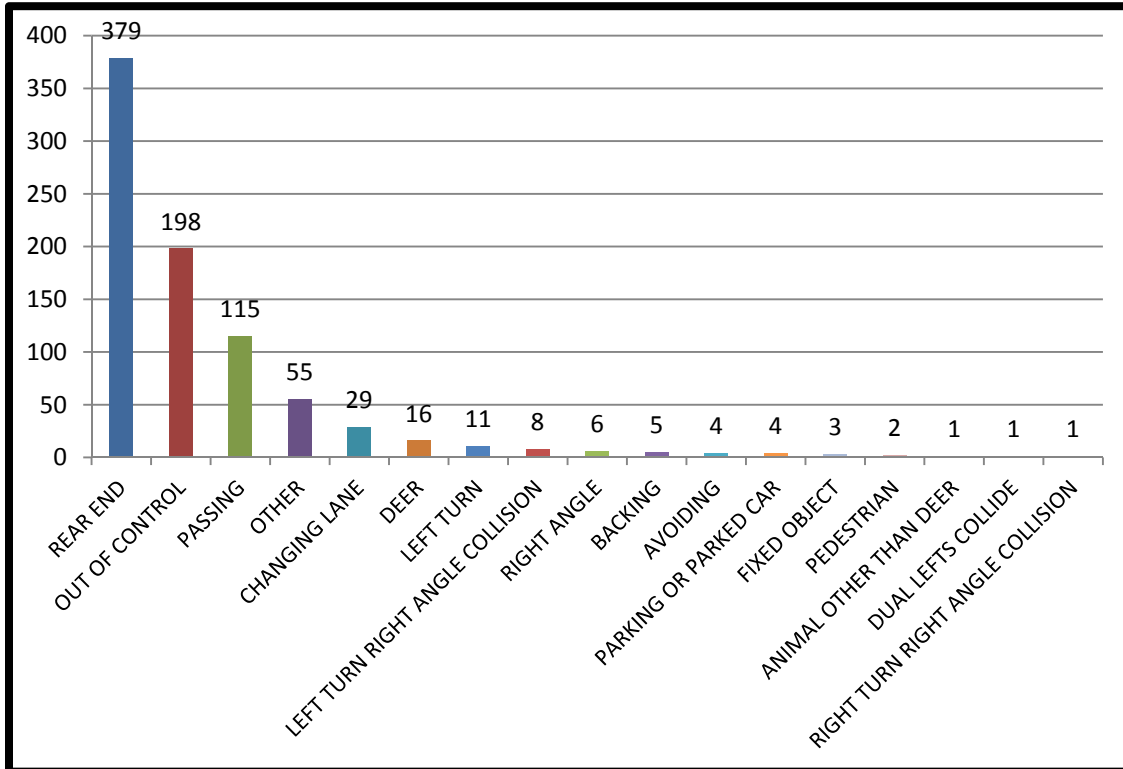
Eastbound I-44

As previously stated, there were 839 crashes reported eastbound I-44 from 2004 to 2008 between Antire Road and Lindbergh Boulevard. As shown in Figure 21, rear ends were the most common crash type at 45%. Two crashes involved pedestrians. One of these crashes was the fatal crash previously discussed and the other was a result of a pedestrian being struck on the interstate by a vehicle.

- 69% of crashes reported at interchanges
- 29% of total crashes at I-270

- 21% of total crashes at Lindbergh Boulevard
- 25% of rear end crashes occurred at I-270
- 23% of rear end crashes occurred at Lindbergh Boulevard
- 31% of crashes at Antire Road were dark with no street lights
- 34% of crashes at Antire Road were out of control
- 13 of the 24 disabling injuries were on a vertical grade
- 7 of the 24 disabling injuries were on a curve

Figure 21: EB I-44 Crashes by Type



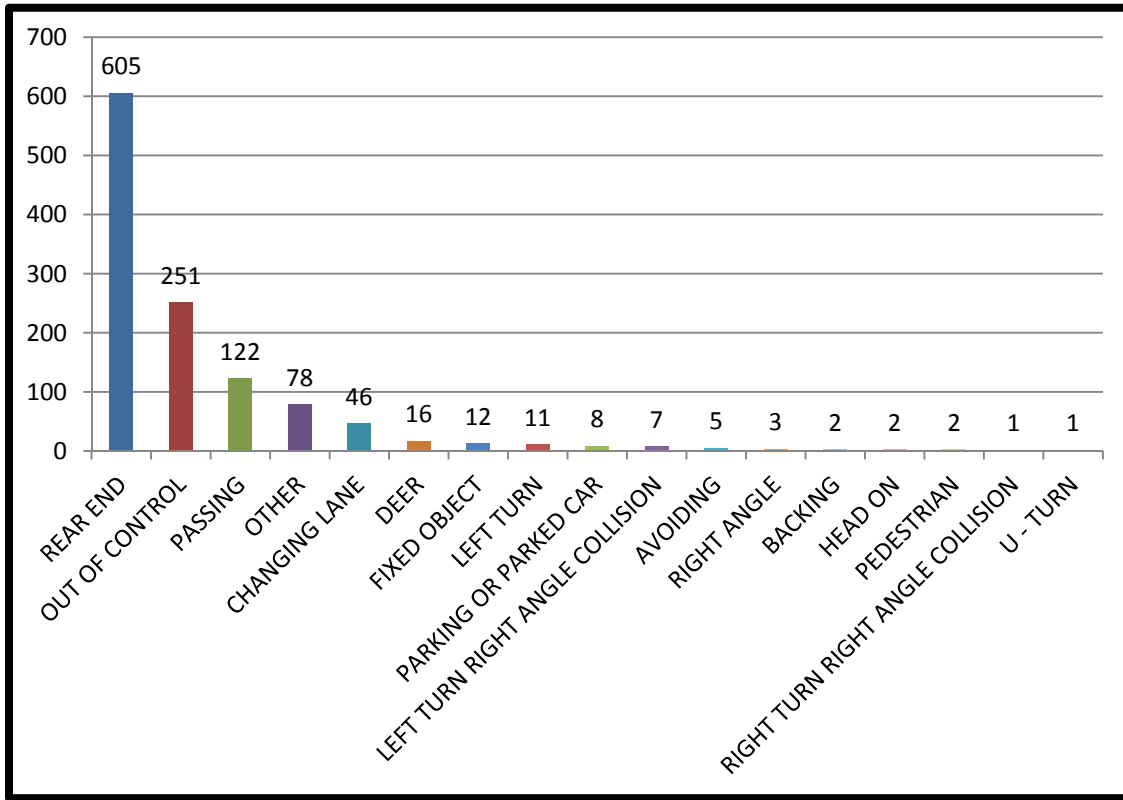
Westbound I-44

As previously stated, there were 1,172 crashes reported westbound I-44 from 2004 to 2008 between Antire Road and Lindbergh Boulevard. As shown in Figure 22, rear end crashes were the most common crash type at 52%.

- 66% of total crashes reported at interchanges
- 36% of total crashes at I-270
- 24% of total crashes at Lindbergh Boulevard
- 32% of rear end crashes occurred at Lindbergh Boulevard
- 30% of rear end crashes occurred at I-270
- 24% of crashes at Antire Road were dark with no street lights
- 7 of the 17 disabling injuries were on a vertical grade
- 5 of the 17 disabling injuries involved tractor trailers
- 4 of the 17 disabling injuries were on a curve

- 4 of the 17 disabling injuries occurred during congestion

Figure 22: WB Crashes by Type



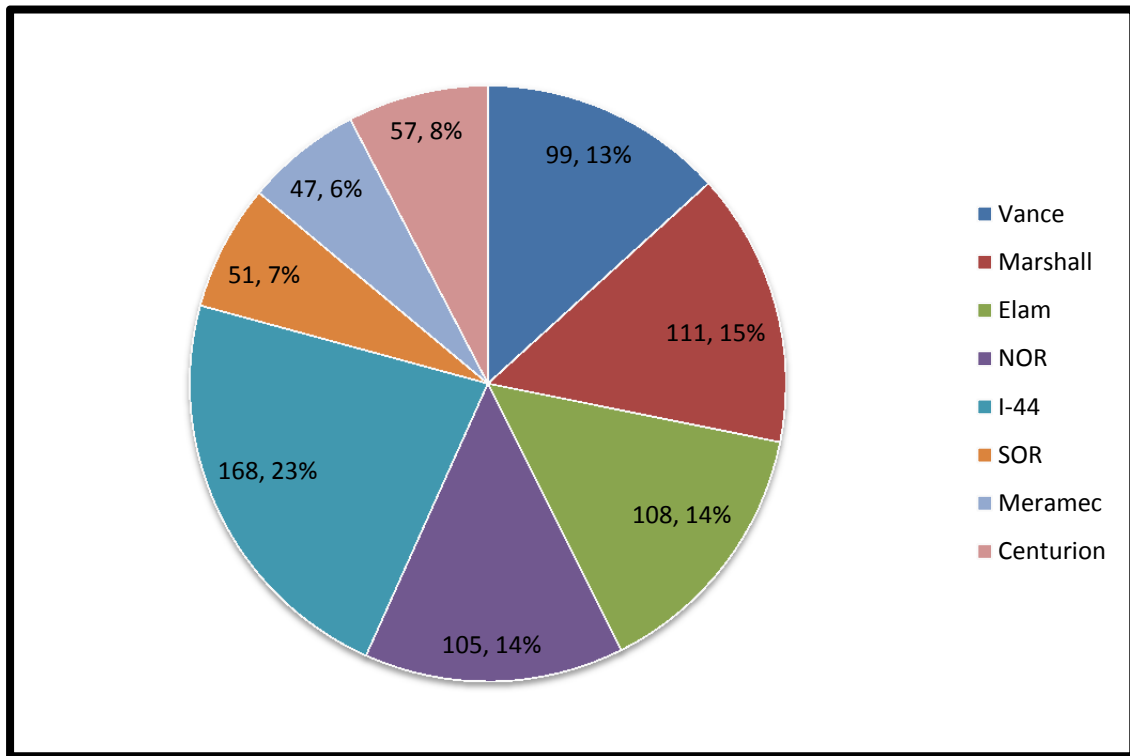
Route 141 Corridor

The crash data received for the years 2004 through 2008 reported 746 crashes on Route 141 between Vance Road and Centurion Drive; 349 crashes for southbound and 397 crashes for northbound. As can be seen in Table 5 one percent of the crashes involved disabling injury. Figure 23 shows that more than half of the crashes in the study area occurred between Elam Avenue and I-44.

Table 5: Total Crashes Route 141

	PDO	Minor Injury	Disabling Injury
SB Route 141	295	50	4
NB Route 141	328	64	5
<i>Total Both Directions</i>	623	114	9

Figure 23: Total Crashes on Route 141 by Location



Twenty-three percent of the crashes on Route 141 in the study area were recorded at the interchange with I-44, which includes both the eastbound and southbound ramp terminals.

Traffic Forecasts

Traffic forecasts for 2020 and 2035 horizon years were developed so as to test both “near-term” and “long-term” alternatives for their ability to handle forecasted increases in travel demand along I-44 and Route 141 corridors. To ensure that alternatives analysis is done with a reasonable set of traffic forecasts, base forecasts for “Committed Network” were developed. Committed Network includes No-build network plus any roadway improvement projects that are either under construction or programmed.

The following regional roadway improvement projects are included in Committed Network for generating traffic forecasts:

- Route 141 improvement project between I-64 and Olive Boulevard by MoDOT. This project includes new construction of Route 141 to the east of its current location with a six-lane roadway east of existing with two through lanes in each direction along Route 141 between Ladue Road and I-64. This project also includes Route 141 interchanges at Olive Boulevard and Ladue Road.
- Widening the eastbound off-ramp at I-44 / Route 141 interchange to provide additional storage on the off-ramp. This project also includes lengthening the eastbound off-ramp deceleration lane on I-44 to provide additional 1000 feet of deceleration length, for a total 1500 feet long deceleration lane.
- Page-Olive Connector project between Route 364 and Olive Boulevard by St. Louis County. This project includes extension of Maryland Heights Expressway from its current terminus at Route 364 to Olive Boulevard and tie-in with MoDOT’s Route 141 improvement project described above. When complete, these two projects provide a direct connection route between Route 370 and I-55.
- I-270 capacity enhancement project between I-44 and Dougherty Ferry Road being planned by MoDOT. This project includes restriping/widening of existing 8-lane section of I-270 between I-44 and Dougherty Ferry Road to a 10-lane facility. Previous studies done by CBB for MoDOT have documented the capacity constraint along I-270 and the inability of I-270 corridor to sustain additional growth in travel demand in the absence of capacity enhancements. As such, to ensure that I-44 corridor can be tested without the metering effect resulting from the I-270 corridor, it is essential to assume that the bottleneck on I-270 be eliminated. Accordingly, the “Committed Network” for this study includes I-270 capacity enhancement project.
- The New Mississippi River Bridge by MoDOT and IDOT. This project includes four-lane Mississippi River Bridge one mile north of the Martin Luther King Bridge, a roadway connection between the existing I-70 and the new bridge, with further connections to the local street system at Cass Avenue, and a roadway connection between the existing I-55/64/70 Tri-Level Interchange and the main span.
- Route 364 (Page Avenue) extension Phase 2 by MoDOT. This project includes extending Route 364 from its current terminus at Route 94 to Mid Rivers Mall Drive. When fully completed in 2011, Route 364 will be a access controlled facility from west of I-270 to east of Mid Rivers Mall Drive. ongoing portion of the work was completed and opened in September of 2010.

Traffic forecasts for the 2020 and 2035 horizon years were generated based on analysis of population and traffic growth trends in the region, outputs from the East-West Gateway Council of Governments Regional Travel Demand Model, and potential developments in the study area. Figure 24 shows St. Louis County’s population growth trends and Figures 25, 26 and 27 show traffic growth trends along I-44, I-270 and Route 141 corridors. As described earlier, capacity constraints and corridors outside the study area, like 8-lane section of I-270, completion of Route 141 north of the study area and constraints along I-44 east of the study area make projection of anticipated travel demand for the study area corridors complex. However, the

generated traffic forecasts for this study area ensure reasonableness of forecasts as well as consideration of higher growth rates to create conservative alternatives testing.

Figure 24: Population Growth in St. Louis County

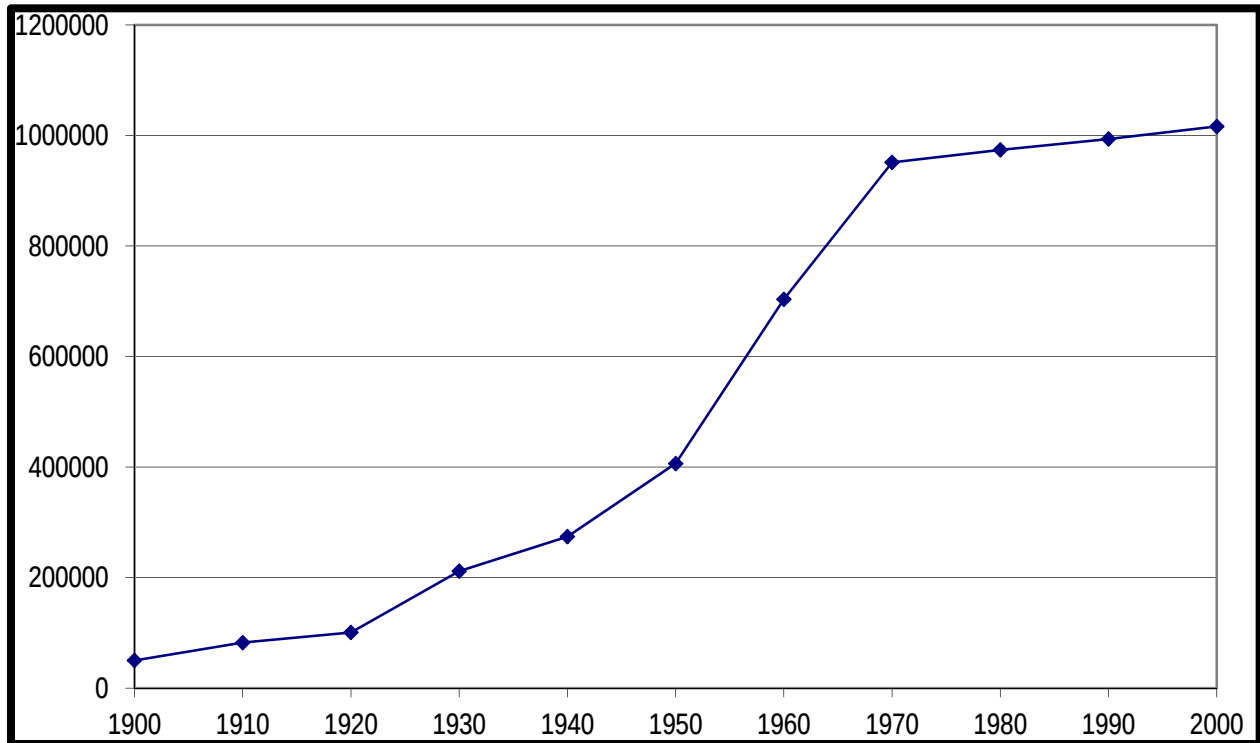


Figure 25: Traffic Growth Trends on I-270 north of I-44

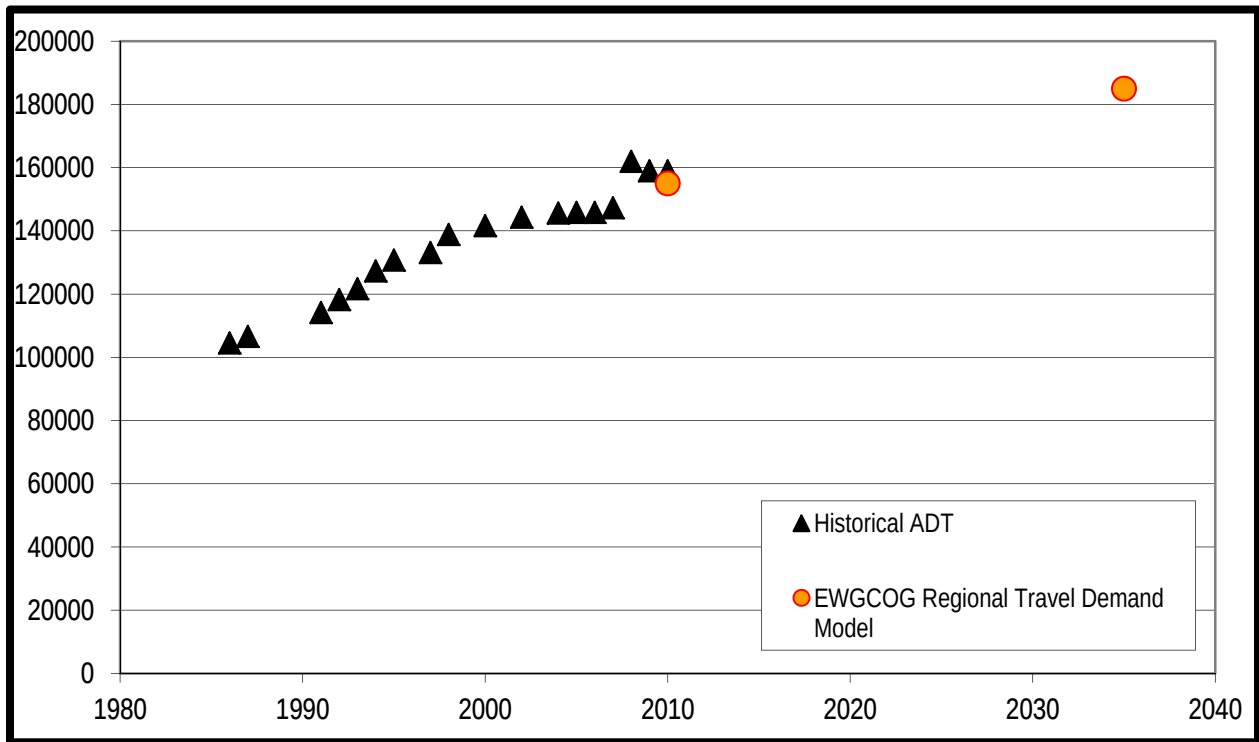


Figure 26: Traffic Growth Trends on I-44 west of I-270

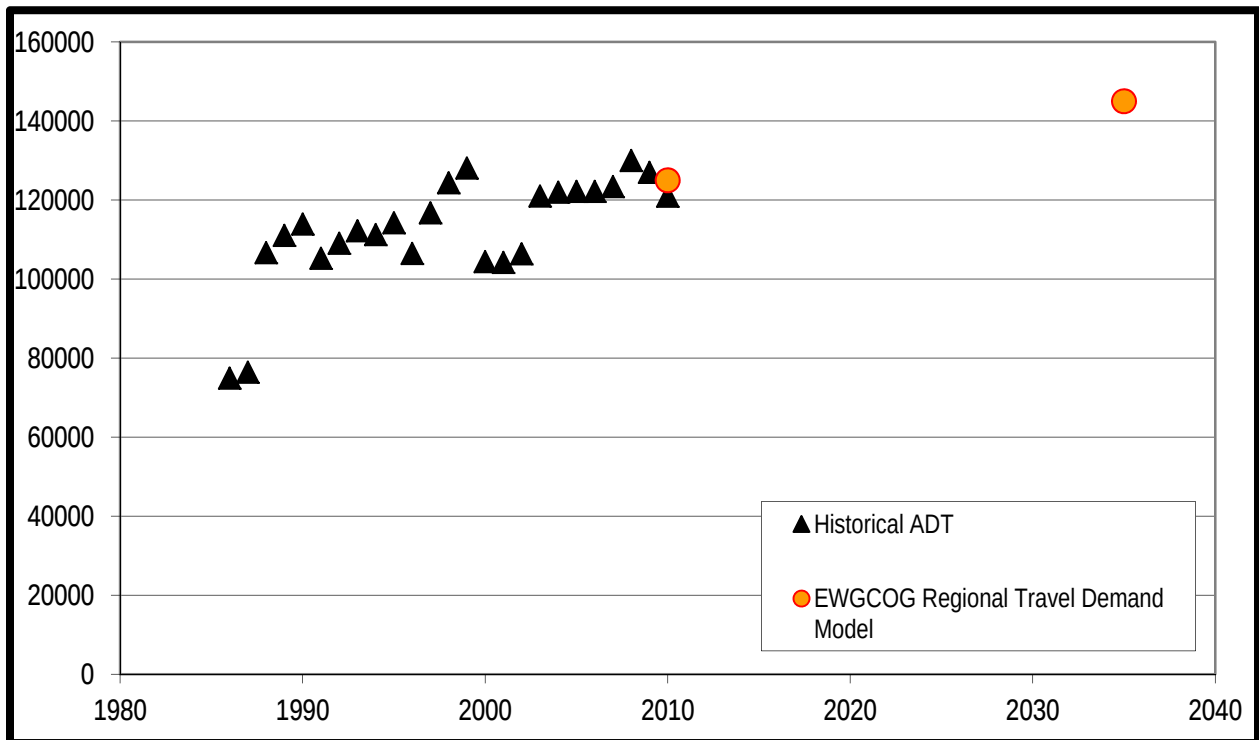
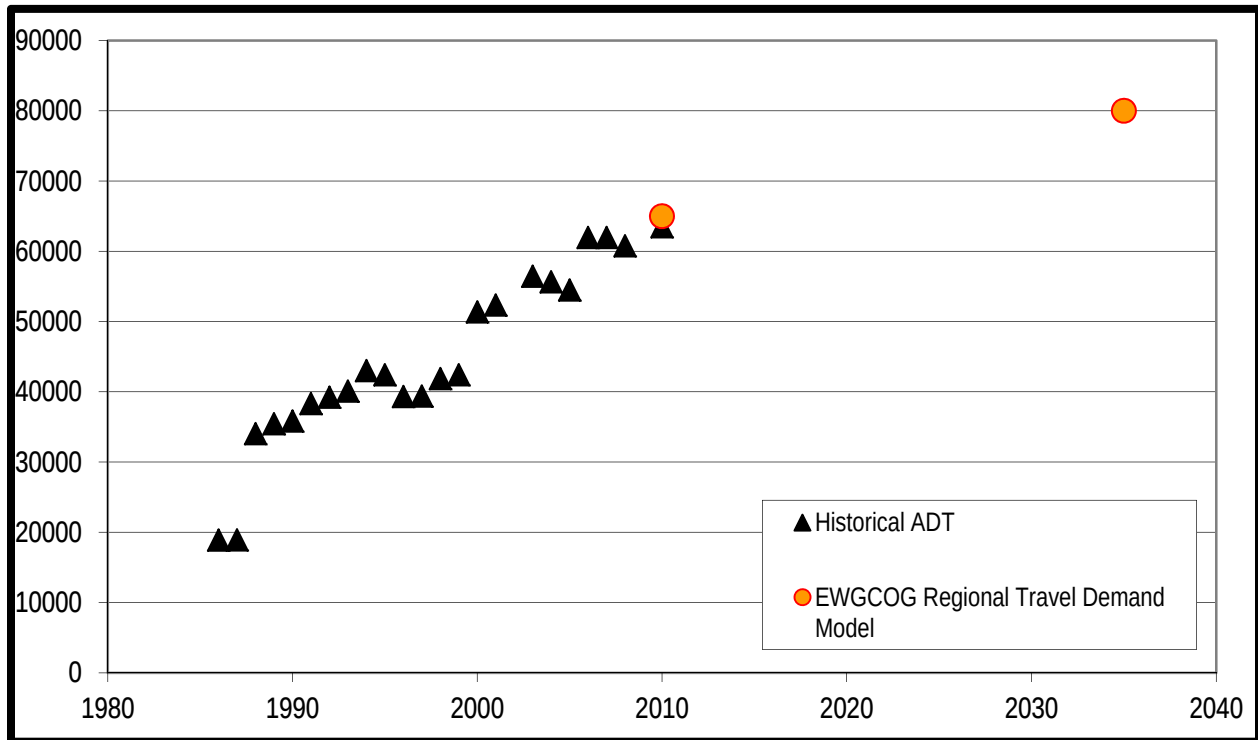


Figure 27: Traffic Growth Trends on Route 141 north of I-44



Based on our analysis of historic growth trends, regional travel demand model outputs and knowledge of system capacity constraints, the following are our estimates of projected 2035 increases in travel demand for the study area:

- 20% - 25% increase in traffic volumes on I-44 west of I-270
- 15% - 20% increase in traffic volumes on I-44 east of I-270
- 20% - 25% increase in traffic volumes on Route 141
- 15% - 20% increase in traffic volumes on I-270
- 10% - 15% increase in traffic volumes on all other roadways within the study area

2020 traffic forecasts were generated based on origin-destination matrix interpolation between 2010 and 2035 traffic volumes. Exhibits 3 and 4 in Appendix A show 2020 traffic forecasts and Exhibits 5 and 6 in Appendix A show 2035 traffic forecasts.

Committed Network Analysis

Existing Conditions traffic analysis models were updated with 2020 and 2035 traffic forecasts to create traffic analysis models for 2020 and 2035 committed network. These models were also updated to include the I-270 Capacity Enhancement Project (10-lane I-270) as described earlier. The intent is to ensure that projected traffic growth and increase in travel demand along study area corridors can be input into VISSIM models' roadway network. The 2020 and 2035 committed network conditions provide a baseline for alternatives analysis comparison.

2020 Traffic Operations Analysis

I-44 Corridor

Completion of the I-270 capacity enhancement project (widening to 10-lane by restriping between I-44 and Manchester Rd.) improves traffic operations along eastbound I-44, especially during the morning peak hour, by eliminating the downstream bottleneck on northbound I-270. The following represent significant constraints along I-44 corridor:

- The travel demand for the westbound off-ramp to Route 141 in the evening peak hour is 1930 vph and causes turbulence in traffic flow in this diverge segment, with occasional queuing on westbound I-44. This diverge segment operates at LOS F in the evening peak hour.
- The westbound C-D Road system along I-44 along with the one-lane westbound to southbound flyover ramp cause breakdown in traffic flow with queues extending on westbound I-44 up to Lindbergh Boulevard. This C-D Road system operated at LOS F in the evening peak hour.

I-270 Corridor

As previously stated, the I-270 capacity enhancement project will improve the northbound I-270 operations. With the 2020 Committed Network volumes, only the MO 30 interchange is shown to worsen to a LOS E at the ramp signals during both the morning and afternoon peak hours.

Route 141 Corridor

Overall, traffic operations along Route 141 corridor are worsened for 2020 forecasted traffic volumes. The following represent significant constraints along Route 141 corridor:

- The signalized intersections with Vance Road/Forest Avenue and Marshall Road operate over available capacity. Vance Road/Forest Avenue intersection operates at LOS F during both morning and evening peak hours and Marshall Road intersection operates at LOS C/F during morning and evening peak hours.
- I-44 / Route 141 interchange continues to pose significant capacity constraint along this corridor. Congestion from this interchange impacts traffic operations along Route 141 as well as along I-44, especially in the morning peak hour. This interchange operates at LOS F during both morning and evening peak hours.

Appendix C shows a detailed summary of measures of effectiveness for 2020 committed network conditions.

2035 Traffic Operations Analysis

As in 2020 committed network, the completion of the I-270 capacity enhancement project (widening to 10 lanes) improves traffic operations along eastbound I-44, especially during the morning peak hour, by eliminating the downstream bottleneck on northbound I-270. The following represent significant constraints along I-44 corridor:

- The travel demand for the westbound off-ramp to Route 141 in the evening peak hour is 2100 vph and causes breakdown in traffic flow in this diverge segment, with significant queuing on westbound I-44 extending as far back as Mraz Lane (Figure 28). This diverge segment operates at LOS F in the evening peak hour. This condition is also exacerbated by the capacity constraint at Route 141 interchange. Additionally, I-44 segments between Mraz Lane and Route 141 operate close to capacity with LOS E
- The westbound CD Road system along I-44 along with the one-lane westbound to southbound flyover ramp cause severe breakdown in traffic flow with queues extending on westbound I-44 beyond Lindbergh Boulevard (Figure 29). This CD Road system operated at LOS F in the evening peak hour.

Figure 28: Westbound Route 141 Off-ramp Failing Conditions – 2035 PM Peak Hour

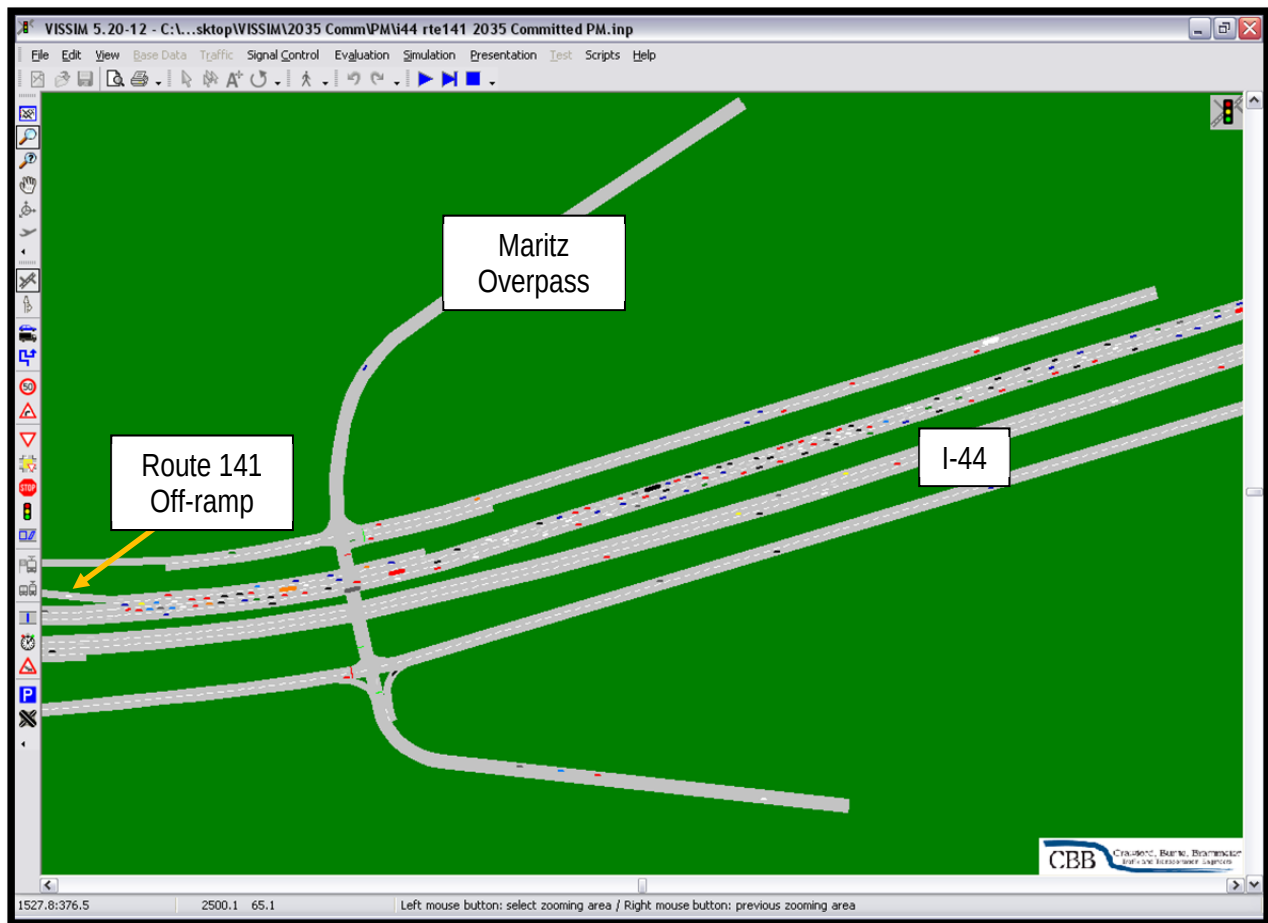
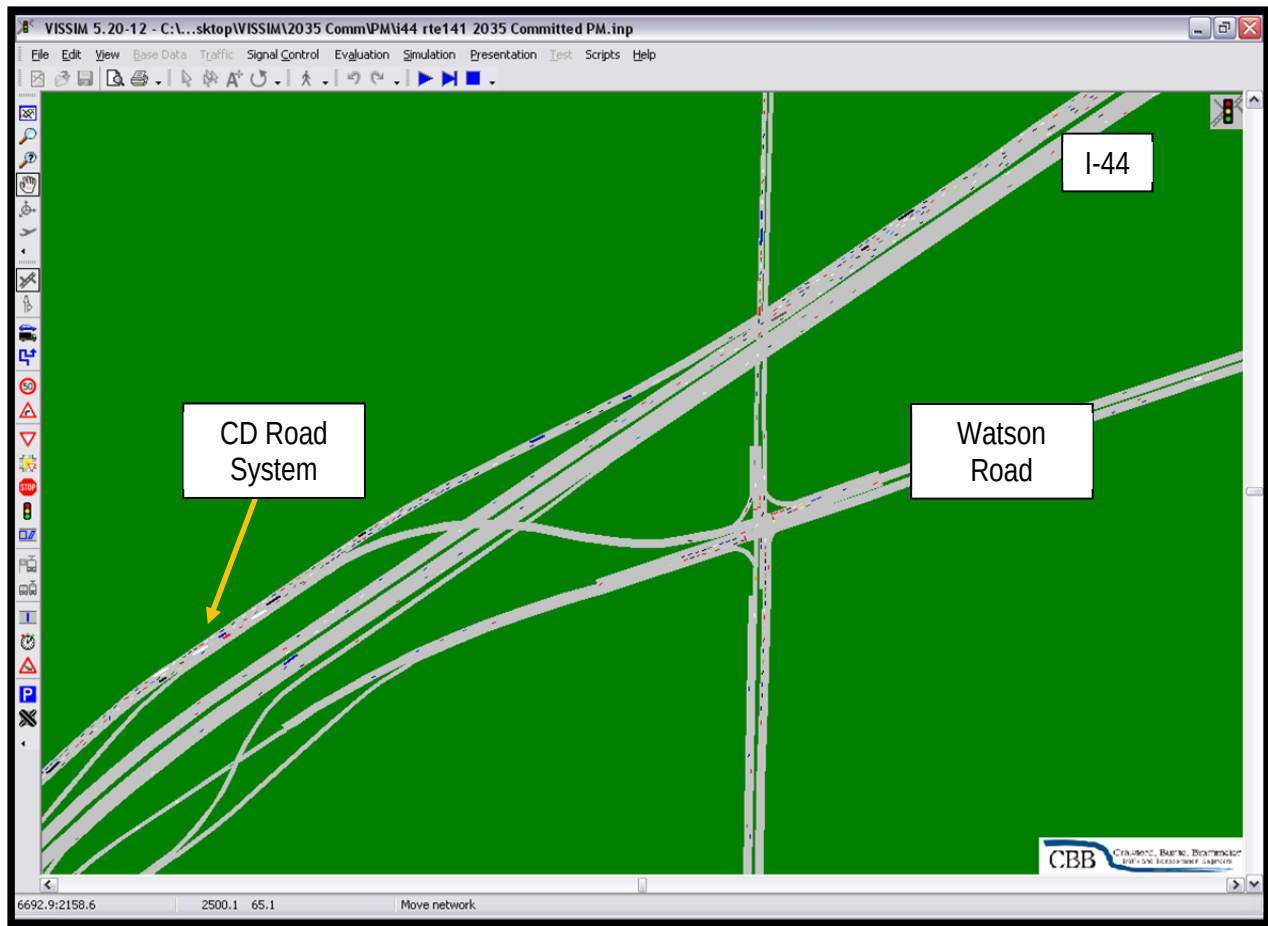


Figure 29: Westbound I-44 CD Road System Failing Conditions – 2035 PM Peak Hour



I-270 Corridor

With the 2035 Committed Network volumes, the MO 30 interchange is shown to exceed its capacity and operate at a LOS F at the ramp signals during both the morning and afternoon peak hours.

Route 141 Corridor

Overall, traffic operations along Route 141 corridor are worsened for 2035 forecasted traffic volumes compared to 2020 conditions. The following represent significant constraints along Route 141 corridor:

- The signalized intersections with Vance Road/Forest Avenue and Marshall Road operate over available capacity. Vance Road/Forest Avenue intersection operates at LOS F during both morning and evening peak hours and Marshall Road intersection operates at LOS E/F during morning and evening peak hours.
- I-44 / Route 141 interchange continues to pose significant capacity constraint along this corridor. Congestion from this interchange impacts traffic operations along Route 141 as well as along I-44, especially in the morning peak hour. The very limited ability of this interchange to cater to the high travel demand cause grid-lock congestion levels along Route 141 and I-44. This interchange operates at LOS F during both morning and evening peak hours.

Summary of Existing / Committed Network Conditions

The following is a summary of existing conditions and committed network analysis:

- The Meramec River Bridge along I-44 on the eastern end of this segment has significant geometric constraints that create uncomfortable and turbulent traffic conditions in the vicinity of the Bridge.
- Traffic operations along I-270 corridor north of the I-44 / I-270 interchange have significant influence on the operations at the interchange itself. Many recent studies for I-270 corridor have documented that the eight-lane section of I-270 from north of I-44 to Dougherty Ferry Road acts as a significant bottleneck for traffic flow both during the morning and evening peak hours. The proposed I-270 Capacity Enhancement Project (10-lane I-270) improves traffic operations along eastbound I-44, especially during the morning peak hour, by eliminating the downstream bottleneck on northbound I-270.
- The C-D Road system along westbound I-44 between Lindbergh Boulevard on-ramp merge and I-270 has geometric constraints with complex lane configurations. This along with heavy traffic volumes in the evening peak hour cause traffic flow breakdowns in the weaving segment. Additionally, the travel demand on the one-lane westbound to southbound flyover ramp is at or over the theoretical capacity of a one-lane ramp. As a result, the traffic operations in the C-D Road weaving segment are worsened by the inadequate capacity of this movement. This constraint is worsened with 2020 and 2035 forecasted conditions.
- I-44 / Lindbergh Boulevard interchange is a standard diamond interchange and the demand at this interchange exceeds available capacity provided by the standard diamond interchange.
- The 2035 forecasted travel demand for the westbound off-ramp to Route 141 in the evening peak hour is 2100 vph and causes breakdown in traffic flow in this diverge segment, with significant queuing on westbound I-44.
- Route 141 corridor within the study area has geometric and hydraulic deficiencies that exacerbate traffic capacity constraints along the corridor.
- Limited available northbound left-turn storage bay length at Route 141 / Vance Road intersection because of the Union Pacific Railroad Bridge results in reducing available northbound through capacity and impacts traffic operations along Route 141.
- The I-44 / Route 141 interchange lacks capacity to serve existing heavy traffic volumes and impacts traffic operations along Route 141 and I-44. This capacity constraint is worsened for 2020 and 2035 traffic forecasts.
- The proximity of North Outer Road intersections along Route 141 to the interchange with I-44 impacts traffic operations at the interchange and also presents a potential safety issue.
- The I-270 interchange with MO 30/Gravois Road is shown to exceed its capacity by 2035, operating at LOS F for the morning and afternoon peak hours.
- The I-270 interchanges at Dougherty Ferry Road and Big Bend Road continue to provide acceptable traffic operations by 2035.

Alternatives Development – Preliminary Concepts

The areas of concern discussed in the previous section were the focus of the alternatives development process. The study team (MoDOT, CBB, EFKMoen) held a stakeholder workshop to brainstorm preliminary concepts aimed at addressing geometric, traffic and hydraulic issues identified through existing and committed network conditions analysis. Stakeholders included EWGCOG, St Louis County Division of Highways and Traffic, St Louis County Police, St Louis County Parks, Metro, Great Rivers Greenway, Trailnet, the City of Fenton and the City of Valley Park.

The following is an overview of the preliminary concepts:

I-44/MO 141 Interchange (South of Meramec River Bridges to Centurion)

The study team looked at two concepts to address flooding events at the interchange.

- Overlaying Route 141 through the interchange in area of minor flooding to raise the pavement by 6 inches and providing bigger storm water pipes addresses the local flooding events.
- Constructing Route 141 over I-44 will address the major flooding events associated with Meramec River flooding.

Both these concepts are included for alternatives analysis

The right-in/right-out intersections for the North Outer Road can be removed by providing a direct connection between Elam Avenue and the North Outer Road via a railroad overpass, as shown in Figure 30. Based on discussions from the study team and the stakeholders, this is a viable concept and will be included for alternatives analysis. An additional connection to the South Highway Drive via Meramec Station Road intersection (Figure 31) is considered. This concept would need additional improvements at the signal and will be included in alternatives analysis if there is a need based on traffic operations.

Figure 30: Direct Connection between Elam Avenue and North Outer Road

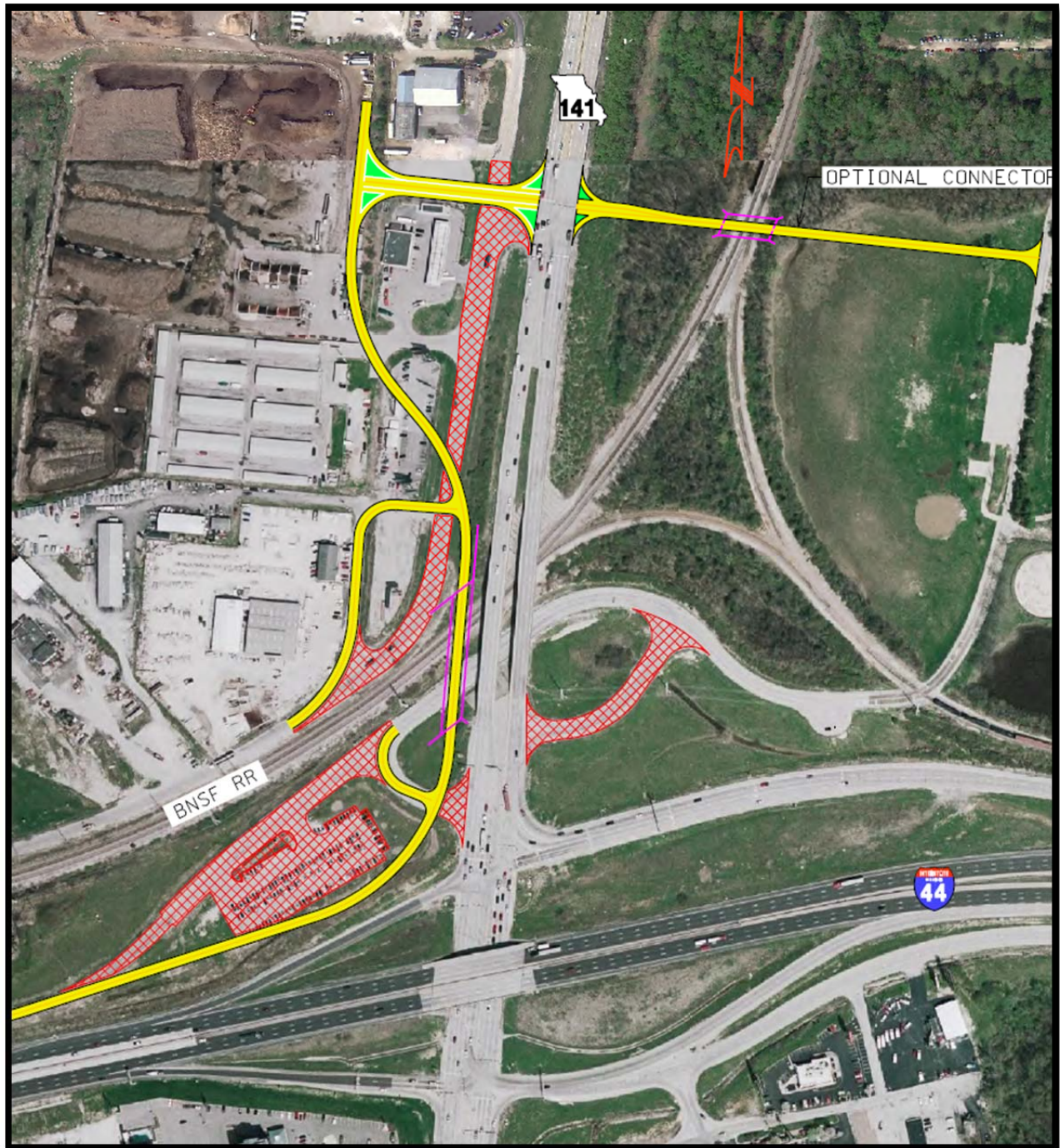
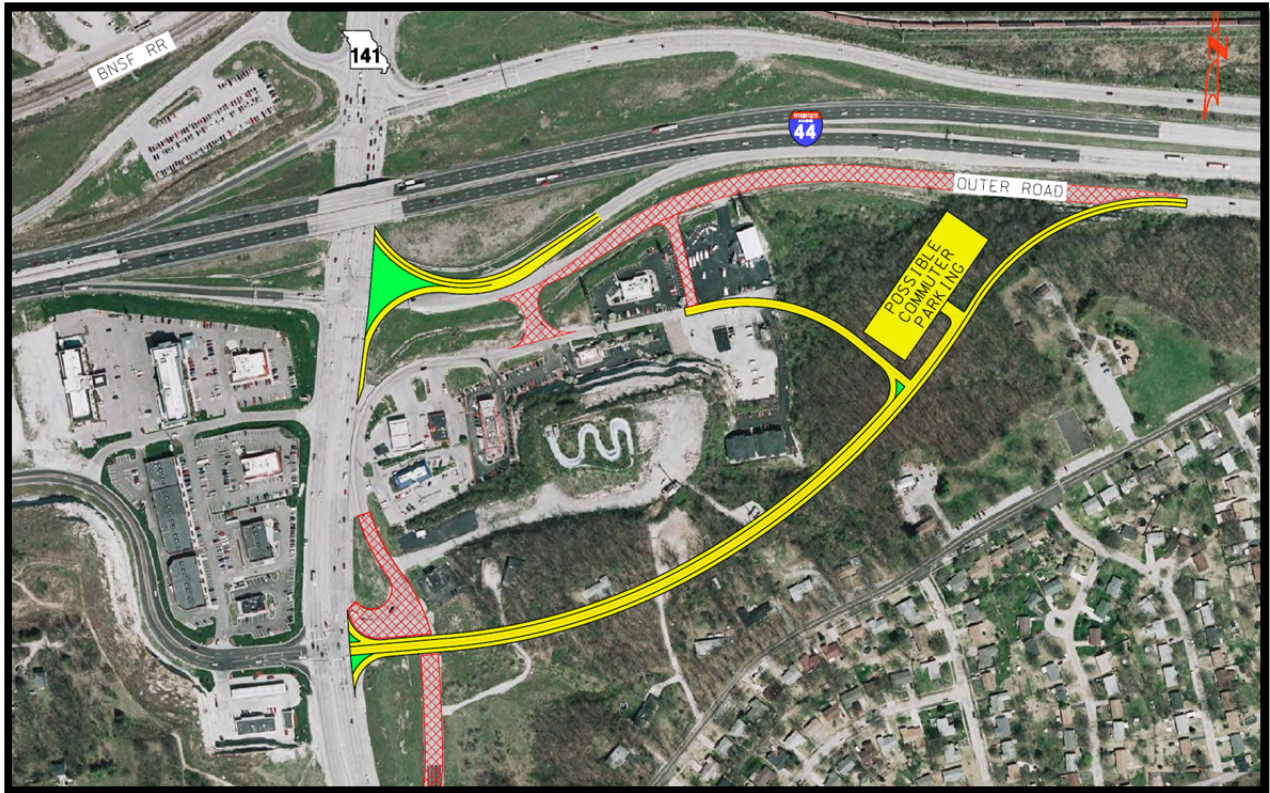


Figure 31: Relocated South Outer Road



Three interchange improvement concepts were considered: Diverging Diamond Interchange (DDI) as shown in Figure 32, Single Point Urban Interchange (SPUI) as shown in Figure 33 and adding a left-turn lane to the off-ramps for the existing interchange, creating triple left turns, as shown in Figure 34. Even though the SPUI and the triple left turn concepts improve operations compared to no-build, neither concept provides adequate capacity for 2020 forecasted traffic volumes. As such, it was agreed upon that these two concepts do not need any further analysis. Preliminary analysis shows that the DDI provides acceptable traffic operations for 2020 forecasts. However, the ability of the DDI to handle 2035 traffic forecasts needs detailed evaluation. Additionally, the DDI can be constructed with the existing structure. As such, the DDI can be considered a short-term solution for alternatives analysis.

Figure 32: DDI at I-44 and Route 141

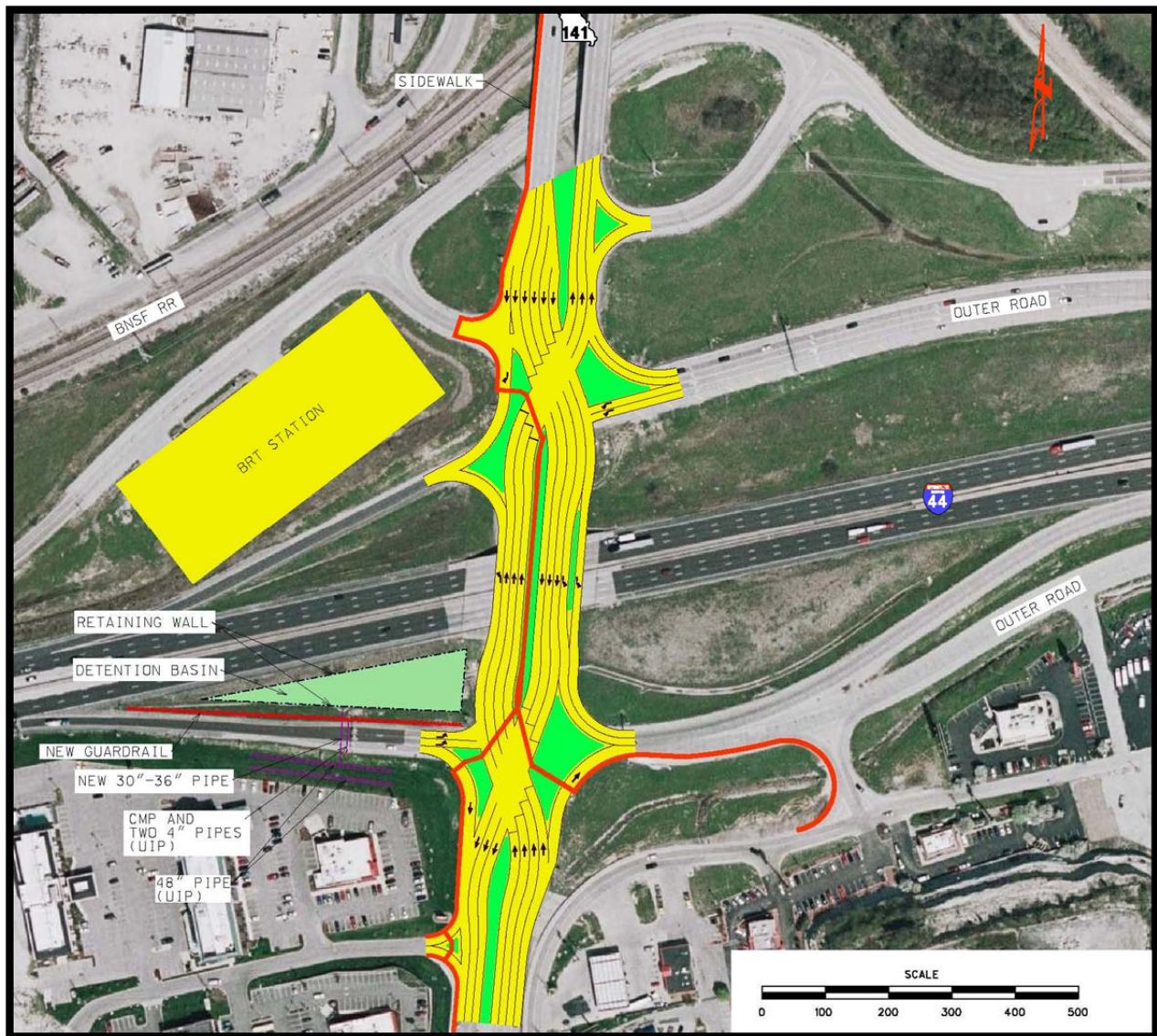


Figure 33: SPUI at I-44 and Route 141

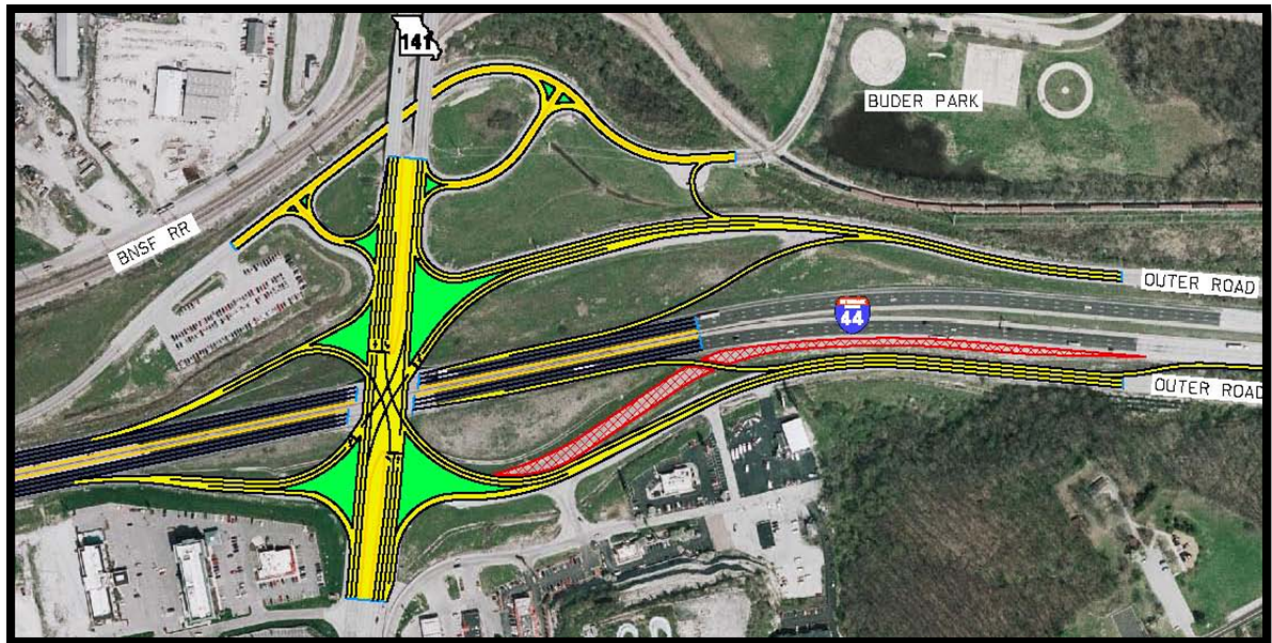
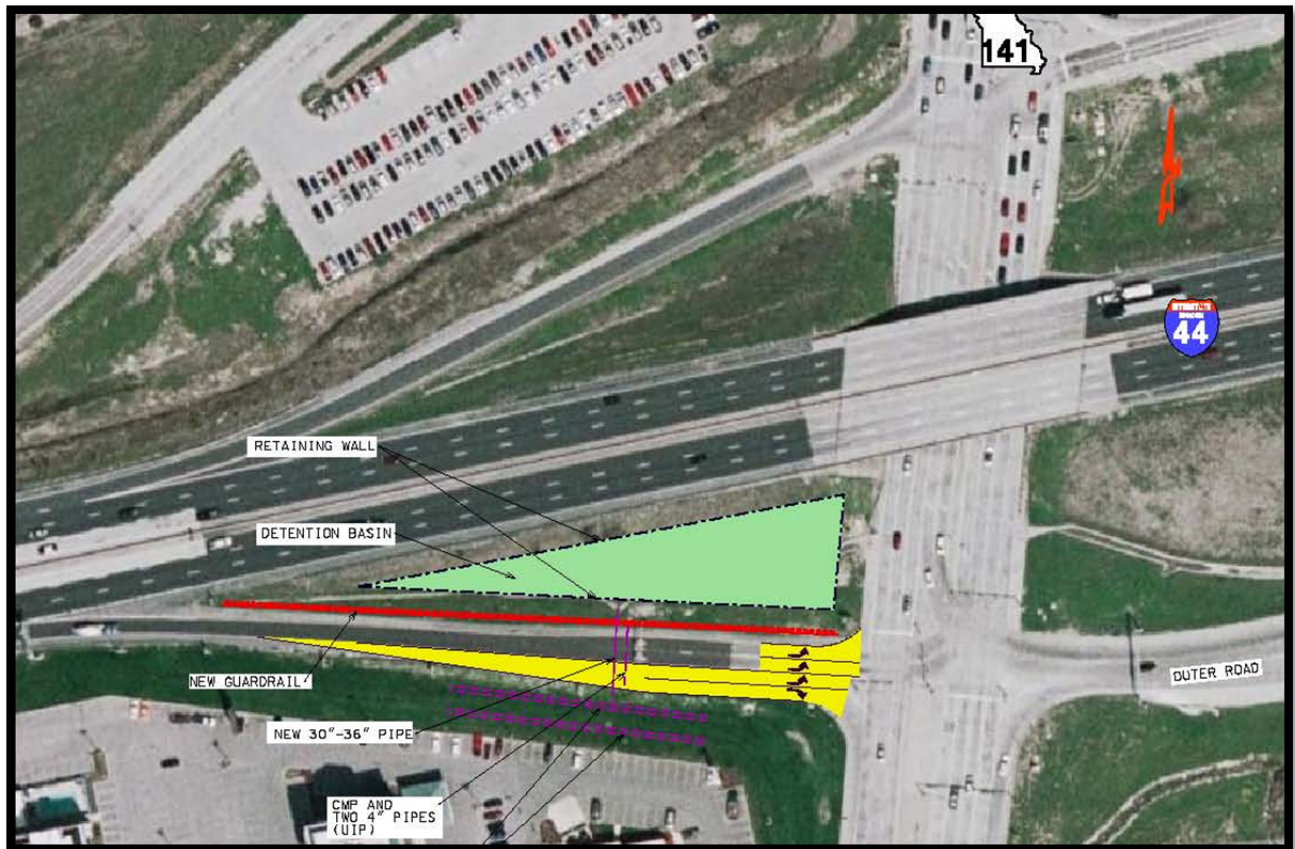


Figure 34: Eastbound Triple Left-Turn to Northbound Route 141



Two directional on-ramps - southbound to eastbound flyover ramp and northbound to westbound loop ramp (Figure 35) were considered. Preliminary analysis shows that both ramps provide acceptable 2035 operations. Both ramps, including sub-concepts for the southbound to eastbound flyover ramp (Figures 36 and 37) are included for further alternative analysis.

Figure 35: Northbound to Westbound Loop Ramp

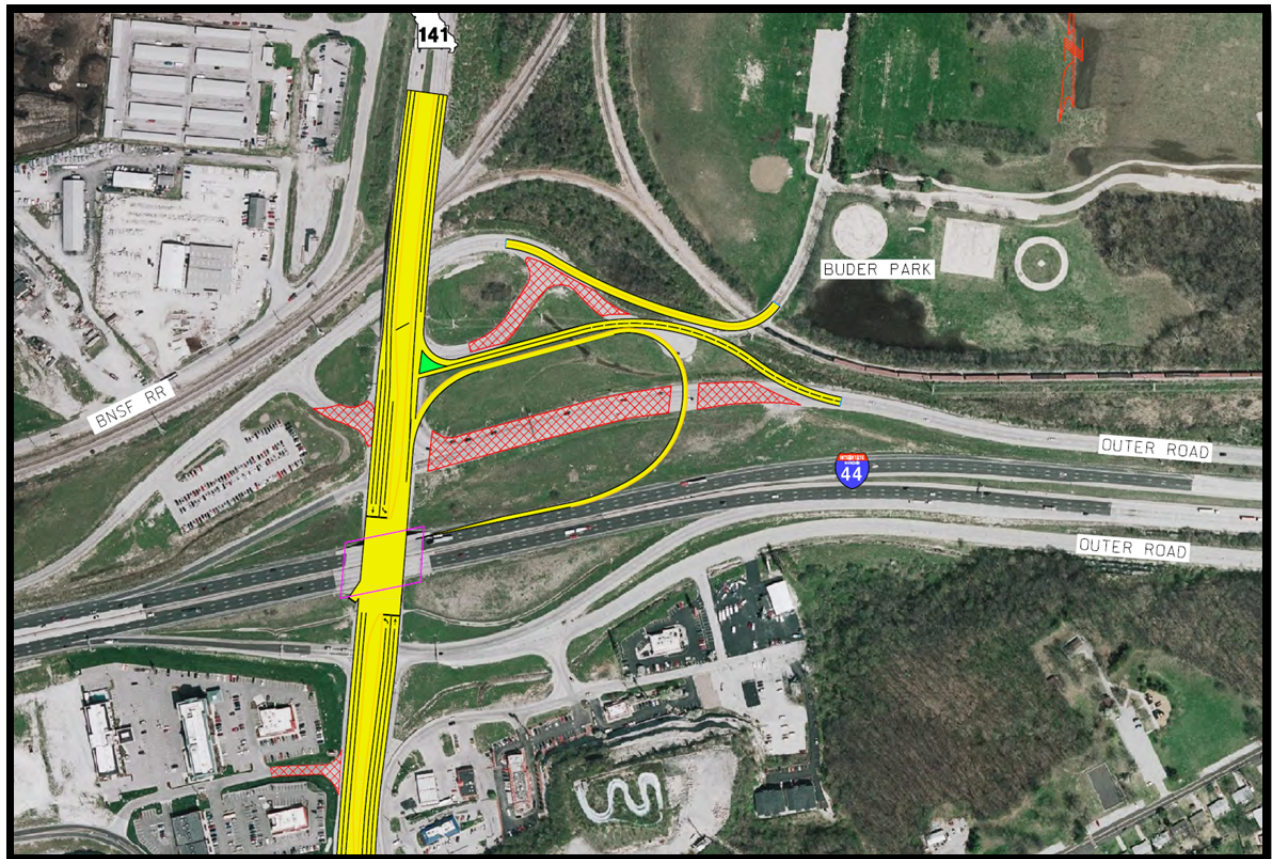


Figure 36: Right-exit Southbound to Eastbound Flyover

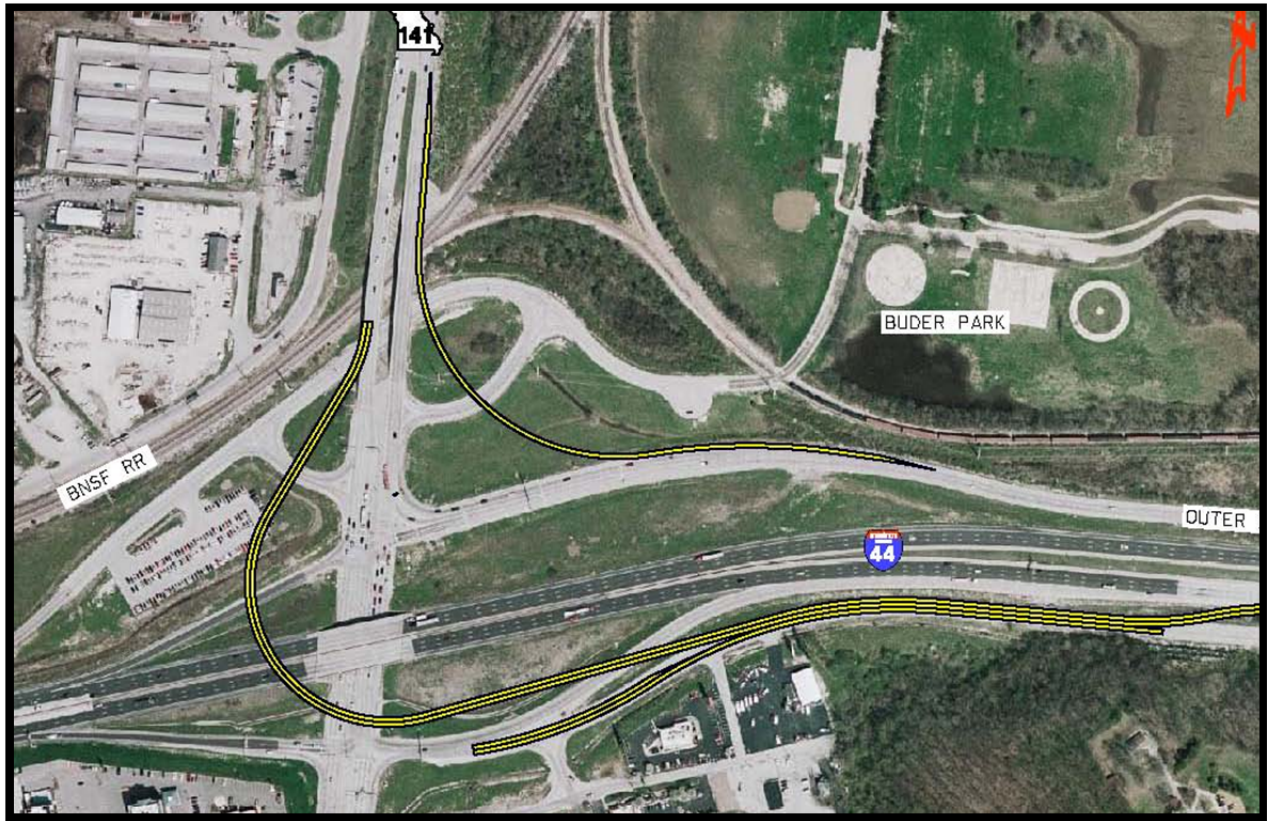
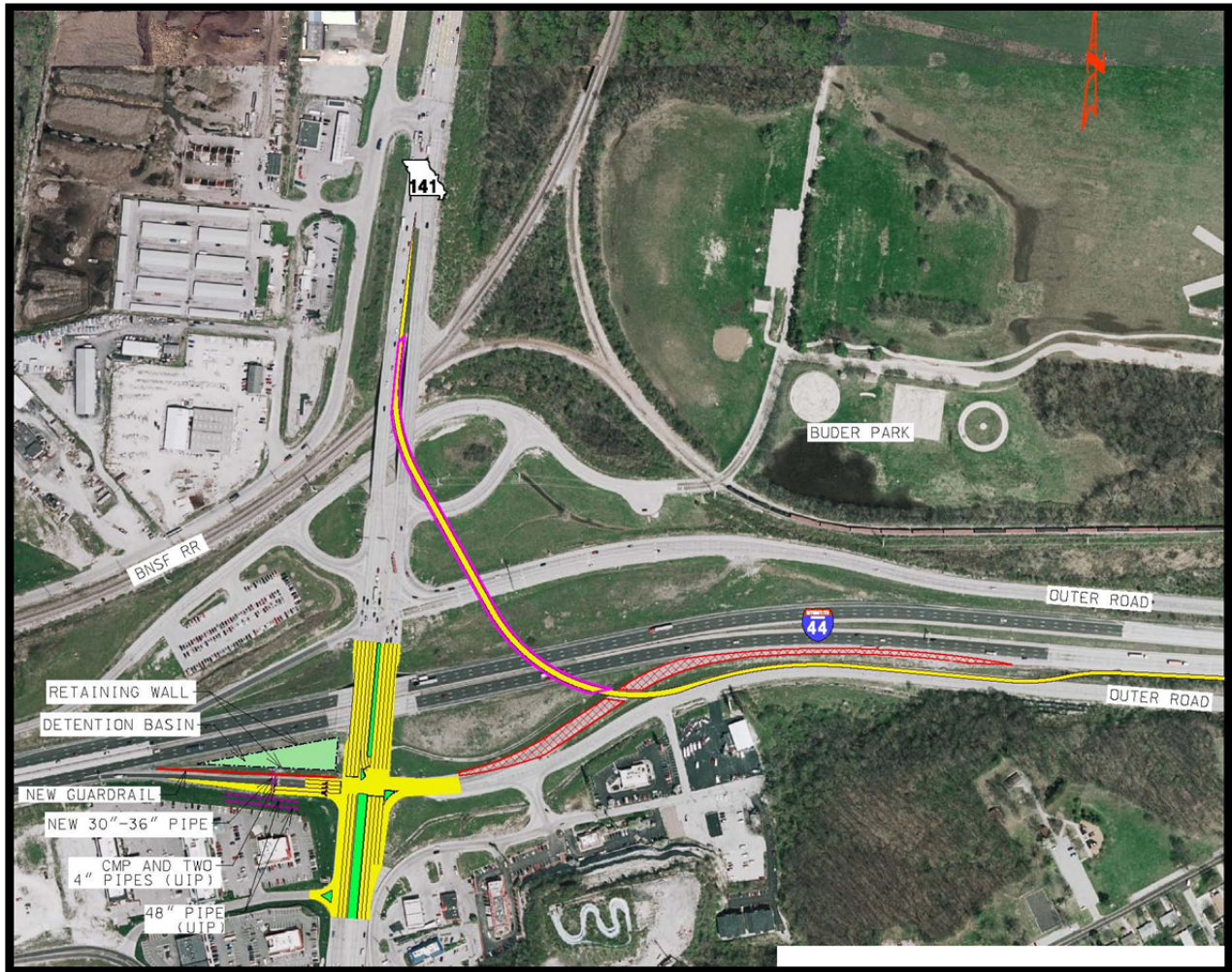


Figure 37: Left-exit Southbound to Eastbound Flyover



Route 141 Vance and Marshall Intersections

Four concepts were considered to enhance the capacity available at the signalized intersections

- Split flow using additional bents under the railroad bridge, shown in Figure 38
- Jug-handle for northbound Route 141 to Vance Road, shown in Figure 39
- Right-in/right-out at Vance Road intersection using access via Helfrich Road signal and improved Main Street / Plainview Avenue, shown in Figure 40, and
- Right-in/right-out at Vance Road intersection via a new overpass north of Vance Road, shown in Figure 41.

Figure 38: Route 141 at Vance Road 'Split Flow'

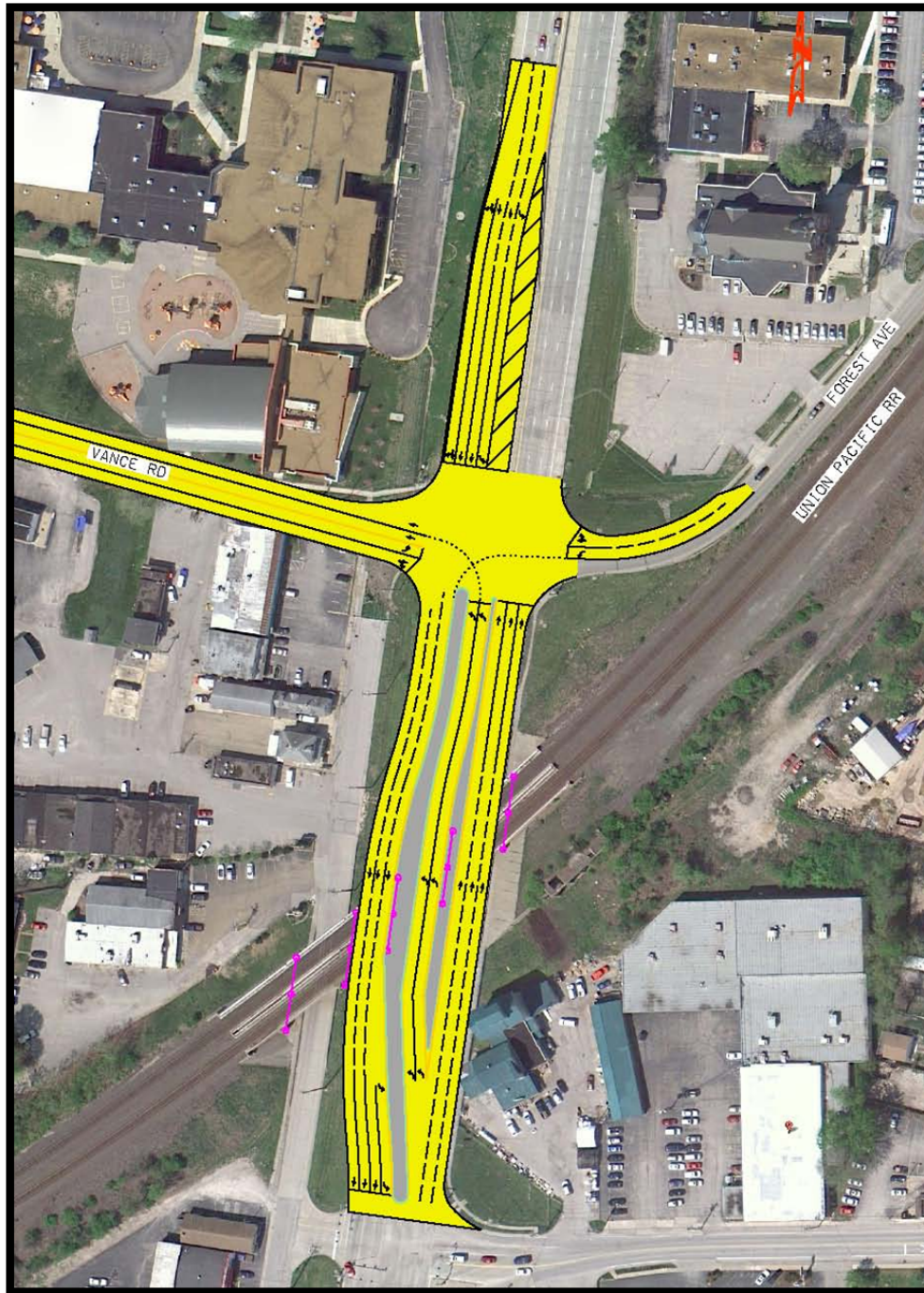


Figure 39: Jug Handle at Route 141 and Vance Road

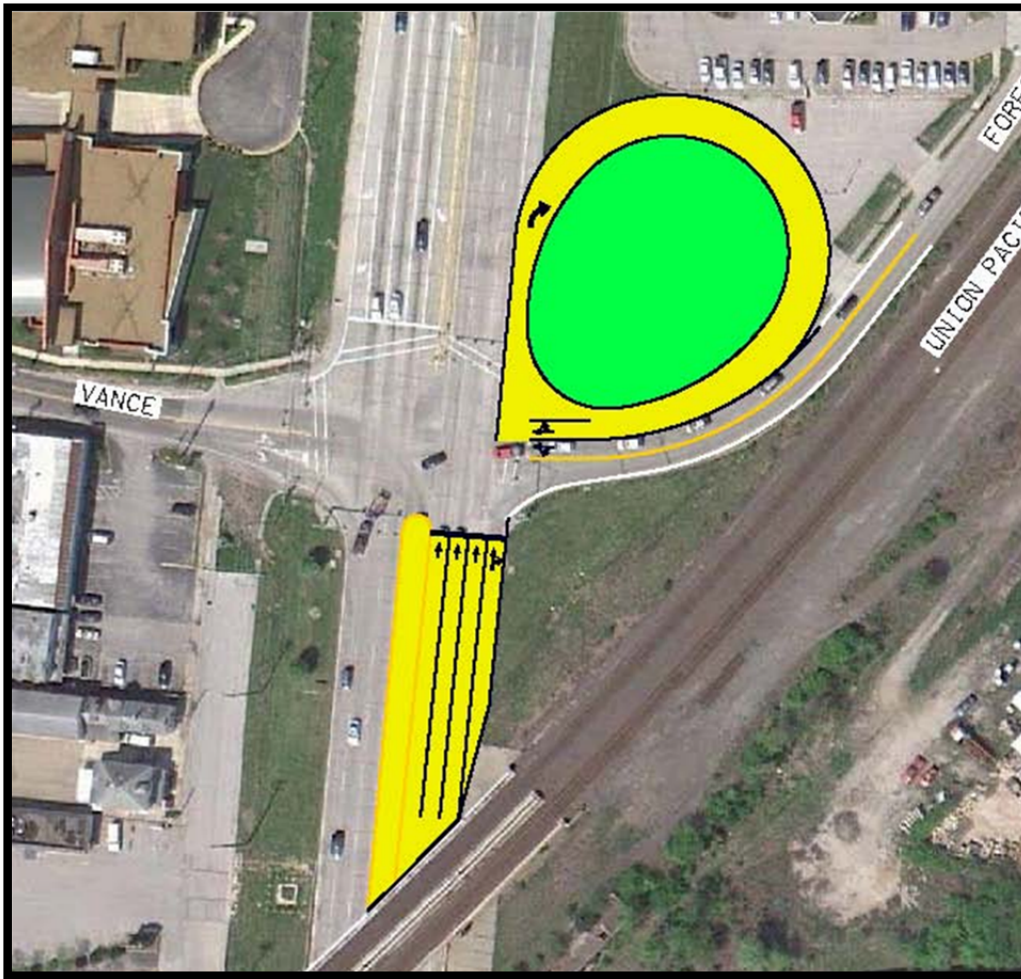


Figure 40: Right-in Right-out at Vance Road with access via Helfrich Road



Figure 41: Right-in Right-out at Vance Road with overpass over Route 141



The group concluded that providing access via Helfrich Road has many impacts including long adverse travel and impacts to residences, school and businesses. As such this concept will not be included for alternatives analysis. The remaining three concepts will be included for alternatives analysis. The impact for widening Vance Road under the split flow and jug-handle concepts will be considered.

I-44 between I-270 and Route 141

2035 no-build traffic analysis shows a need for four westbound lanes along I-44 between the Meramec River and Route 141. Additionally, relocating southbound I-270 to westbound I-44 ramp, as shown in Figure 42, improves weaving between I-270 ramps merge and Soccer Park Road. These two improvement concepts will be included for alternatives analysis.

The study team recommends that both bridges on I-44 over the Meramec River be eventually replaced in lieu of retrofit because of age and high retrofit costs. The group agreed with the recommendation. However, because of the uncertainty associated with funding availability, additional geometric analysis is not needed at this time. As such, addition of a lane to the eastbound bridge will be included only for traffic operations analysis.

Figure 42: Relocated Southbound I-270 to Westbound I-44 Ramp



I-44/I-270/Lindbergh Interchange Complex

The westbound to southbound flyover ramp will ultimately need two lanes to provide enough capacity for this movement (Figure 43). This also includes adding an additional lane on southbound I-270 between I-44 and Route 30. The group agreed to include this concept for alternatives analysis.

In addition to the above proposed improvement, additional improvements to the westbound CD road can be constructed by leaving the Watson Road on-ramp open or by either partially or fully closing the ramp. The group concluded that a partial or full closure of the Watson Road on-ramp has significant impacts to Watson Road and Lindbergh Boulevard. Moreover, any improvements to Lindbergh Boulevard interchanges at I-44 and Watson Road will likely require a detailed corridor study along Lindbergh Boulevard. Additionally, interchange upgrades along Lindbergh Boulevard are not a priority for MoDOT at

this time. As such, the group concluded that CD Road improvements with the Watson Road on-ramp open will be included for alternatives analysis and no additional analysis is needed for Lindbergh Boulevard interchanges as part of this study. Figures 43 and 44 show two sub-options for westbound CD Road improvements.

Figure 43: Westbound I-44 C-D Road Reconfiguration with 2-lane Flyover Ramp



Figure 44: Westbound I-44 Braided Ramps between Lindbergh Boulevard and C-D Road



Dual-lane Loop Ramp for southbound to eastbound movement enhances capacity for the southbound to eastbound movement and improves traffic operations along southbound I-270 by improving lane utilization. The group concluded that this concept was evaluated in detail in previous studies and was implemented as part of mitigation measures for I-64 closure in 2008 and 2009. So, no further analysis is needed at this time.

BRT Station along I-44 Mainline

Metro and EWGCOG plan a corridor feasibility study to determine potential freeway and arterial corridors for high-speed, high-capacity transit service, like Bus Rapid Transit (BRT). I-44 is one of the five regional corridors that would be considered for BRT service. As such, the study team explored two preliminary potential locations for incorporating a BRT station – at Route 141 interchange or at Mraz Lane interchange. Preliminary conceptual/qualitative analysis shows advantages for Mraz lane location over Route 141 location. Existing land use and space availability at Mraz Lane is more conducive for a BRT station compared to Route 141. Moreover, existing outer roads and u-turn ramps at Mraz lane provide for direct and quick access to and from I-44.

The group concluded that Metro's planning process will include detailed evaluation of BRT station locations. As part of this study, the study team will provide traffic operations related information available from this study to Metro that can be useful during Metro's planning process. The next section of the report (Alternatives Analysis) shows the study team's findings for BRT options.

Pedestrian and Bicycle: Incorporate Connections along Route 141

The study team explored concepts to provide pedestrian and bike connectivity along Route 141 corridor in the study area. Three segments along the corridor are critical for providing safe pedestrian/bike connections – Meramec River crossing, BNSF railroad crossing and I-44 interchange crossing. Pedestrian/bike connection across the Meramec River can be provided by constructing a new pedestrian/bike bridge, widening one of the existing bridges or constructing a new bridge for vehicular traffic and utilizing existing bridge for pedestrian/bike flow. Based on construction costs for the three concepts and constructability, the group concluded that a new pedestrian/bike bridge, shown in Figure 45, will be included for alternatives analysis.

Figure 45: Pedestrian / Bike Path along Route 141



Pedestrian/bike connections for crossing the railroad bridge and I-44 interchange are tied into the interchange improvement concepts. As such, detailed analysis of providing pedestrian/bike connections for these two segments will be included with interchange alternative analysis.

Alternatives Analysis

As described in the earlier section, preliminary concepts were screened based on traffic operations, geometric and hydraulic issues. Preliminary concepts brought forward for final alternatives analysis were grouped into four scenarios for detailed evaluation. It should be noted that the scenarios were created to streamline modeling of the final alternatives and are not combinations of concepts to be constructed together. This section describes the detailed analysis of alternatives selected for further analysis from the previous section. Table 6 shows the four scenarios developed.

Table 6: Scenario Matrix

Focus Area / Scenario	Scenario 1	Scenario 2	Scenario 3	Scenario 4	
I-44/MO 141 Interchange	Overlay & Pipes		Route 141 over I-44		
	DDI Retrofit		Diamond with NB to WB loop ramp	Diamond with NB to WB loop ramp	
	-	SB to EB flyover w/ Rte 141 existing profile	SB to EB flyover left-exit	SB to EB flyover under I-44 and Route 141	
		-	Elam Avenue Railroad Overpass & Remove NOR intersections on Route 141		
			South Outer Road relocation (if needed)		
Vance and Marshall Intersections	Jug Handle	Split Flow	Overpass		
I-44 between I-270 and Route 141	4-In WB I-44				
	-		5-In EB Meramec River Bridge ²		
			Relocate SB to WB ramp		
I-44/I-270/Lindbergh Interchange Complex	2-In WB to SB flyover ramp				
	-	4-In WB CD Road	4-In WB CD Road w/ Braided Ramps		
Pedestrian and Bicycle	Meramec River Ped/Bike Bridge				
	Interchange Ped/Bike Concepts				
BRT Station along I-44 Mainline	Metro's Planning Process				

The Scenario sets were designed so that each improvement fits within time frames: short, mid, and long term improvements, but that could be tested in the context of other improvements. Scenario 1 was designed for short-term improvements. This includes minor flooding improvements at I-44 and Route 141 and safety and capacity issues at Route 141 and Vance Road. Scenario 2 is meant to look at mid-term improvements, including a southbound to eastbound flyover ramp at I-44 and Route 141 and improving the weaving on the westbound CD Road parallel to I-44. Scenarios 3 and 4 are both meant to be long term improvement options. Both of these options incorporate Route 141 being elevated over I-44 to address major flooding issues. Additionally, removing the connection with the North Outer Road, removing the signal at Vance Road, widening of the Meramec River Bridges on I-44, and relocating the southbound to westbound ramp at the I-270 to I-44 movement to address the merge downstream are all included.

² 5-In EB Meramec River Bridge is included for traffic operations analysis purposes only; no conceptual layouts will be generated.

Appendix D shows detailed conceptual layouts and associated costs³ for the alternatives.

I-44/MO 141 Interchange (South of Meramec River Bridges to Centurion)

Diverging Diamond Interchange (DDI)

As described in the previous section, preliminary analysis showed that a DDI may be a feasible concept at this interchange. It was anticipated that the existing interchange can be retrofitted to a DDI; thus not requiring reconstruction of the bridge structure. However, with the DDI design, northbound and southbound traffic flows will switch sides of the roadway. Currently there are five southbound lanes to accommodate the heavy left-turns to eastbound I-44 and three through lanes. There are only four northbound lanes under the bridge. With the DDI, the southbound lanes will be on the east side of Route 141 and there are only four lanes available. Initial field observations suggest that the additional southbound lane needed to accommodate traffic demand could be fit behind a barrier. This situation of splitting the traffic flow is not ideal, but is the only way a DDI retrofit could work in this location.

The second option is to construct a southbound to eastbound flyover ramp as a phased addition to the DDI retrofit.

Traffic operations analysis using VISSIM show that the DDI does not provide acceptable traffic operations for both options described above. The heavy through volumes on Route 141 conflict and compete for green time with the heavy turning movements. VISSIM analysis shows that the DDI will operate at LOS F during both morning and evening peak hours for 2020 and 2035 traffic forecasts.

Southbound to Eastbound Flyover Ramp

The southbound to eastbound movement at the interchange is one of the highest turning movements along the Route 141 corridor. Building a flyover for this movement and removing it from the signals would free-up some green time for the conflicting movements and address safety concerns relating to congestion and rear end crashes that result from this heavy movement. Both a right-handed exit and a left-handed exit are constructible at this location, although there are different costs associated with each. Both flyover options can be built as phases to the ultimate design of constructing Route 141 over I-44.

From a traffic operations standpoint, both these sub-options provided acceptable traffic operations, LOS C for 2020 and LOS D for 2035 traffic forecasts. However, the right-exit flyover option brings additional geometric challenges and costs when combined with constructing Route 141 over I-44. Moreover, the traffic using this flyover ramp will have to shift to the outside of Route 141 with the right-exit option. The left-exit option allows the traffic to be in the same lanes as they are today. As such, our analysis shows that the left-exit option has some advantages over the right-exit option. However, detailed geometric evaluation based on actual field surveying is needed to determine the appropriate option, left-exit vs. right exit for the southbound to eastbound flyover ramp.

Northbound to Westbound Loop Ramp

As described earlier, a southbound to eastbound flyover ramp provides significant improvement at the interchange. Our analysis shows that addition of the northbound to westbound loop ramp provides further improvement to traffic operations by eliminating the northbound left-turn phase at the westbound ramps

³ Vertical and horizontal alignments shall need to be adjusted based on actual field shots. These shots and future revised alignments will affect the actual conceptual costs for each alternate shown.

terminal. However, to be able to construct this loop ramp, the westbound off-ramp to Route 141 needs to be relocated further north. This eliminates the connection between the North Outer Road and Route 141. As such, our analysis shows that this option is only feasible by providing a different connection between Elam Avenue and North Outer Road.

Direct Connection between Elam Avenue and North Outer Road

This alternative is intended to improve traffic operations and safety at Elam Avenue intersection with Route 141 as well as improve traffic operations along Route 141 by eliminating the closely spaced existing North Outer Road intersections at the interchange. The relocated outer road will span the existing railroad and can be constructed independently of most other improvements along Route 141. Additionally, this alternative will fit well with the northbound to westbound flyover ramp. It is anticipated that this direct connection will encourage redevelopment in this area. Traffic operations analysis shows that this alternative operates at LOS B for 2020 and LOS C for 2035 traffic forecasts

Route 141 Vance and Marshall Intersections

Split-flow Intersection

This alternative is intended to make better use of the space underneath the rail road bridge. There are three bents with space available and only two of these are being used at this time. There is a monitoring well system under the western bent, but preliminary analysis suggests that moving this to a different location is feasible. This would help to reroute the southbound traffic under the western bent and allow the northbound left-turns to use the center bent. The northbound left-turns would gain additional capacity with dual-lefts but also have an additional 270 feet of storage length than what is out there now.

The split-flow intersection provides satisfactory operations, LOS D for both the morning and evening peak hours, by the year 2020. However, Synchro analysis shows this intersection will operate at a LOS F for the morning peak hour and LOS E for the evening peak hour by 2035. VISSIM queues for the northbound approach are over 1,500 feet. Therefore, this improvement may be beneficial in the short and mid-term but may be near or at capacity by 2035.

Jug-handle Intersection

The jug-handle intersection is designed to eliminate the northbound left-turn movement. One of the benefits of a jug handle is the storage of vehicles it offers. Other benefits include simplified signal timing and less traffic conflicts. The jug handle option moves the northbound left-turn traffic to the westbound through movement, thus allowing more green-time for the conflicting southbound thru volume. However, in order to get the traffic from northbound Route 141 to Vance Road heading west, more time would need to be given to westbound Forest Avenue. However, the jug-handle requires right-of-way in the northeast quadrant of the intersection

The jug-handle does eliminate the safety concern for the northbound queuing on the left side of the road where vehicles currently stack waiting to get into the left-turn bay. However, VISSIM analysis shows that this problem just moves to the right-side of the road under this alternative, causing stacking well beyond Marshall Road by 2035.

Synchro and VISSIM outputs show that this design option will still operate at a LOS F for both the morning and afternoon 2020 and 2035 peak hours. The queues and delays at the intersection do not improve by much, if at all for any of the approaches. In summary, this alternative does not provide any benefits compared to no-build.

Right-in/right-out access at Vance Road with an overpass

This alternative removes the signal at Vance Road and Route 141 and only allows right-in/right-out traffic. An overpass north of Vance Road over Route 141 provides for all traffic movements. Our analysis shows that this alternative provides significant benefits to traffic operations with LOS A for the morning peak hour and LOS C for the evening peak hour for 2020 and 2035 traffic forecasts. However, it is anticipated that a more detailed study will need to be completed to document property impacts and detailed traffic operations for this alternative.

I-44 between I-270 and Route 141

Additional Westbound I-44 Lane

2035 no-build traffic analysis shows a need for four westbound lanes along I-44 between the Meramec River and Route 141. Our analysis shows that an additional westbound lane between Mraz Lane and Route 141 can be constructed within the limits of the existing structures. Our analysis shows that this alternative provides significant benefits to traffic operations with LOS D or better along the freeway segments. This alternative also allows the westbound I-44 off-ramp to Route 141 to be widened to 2-lanes.

5-Lane Meramec River Bridges

The study team recommends that both bridges on I-44 over the Meramec River be eventually replaced in lieu of retrofit because of age and high retrofit costs. The group agreed with the recommendation. However, because of the uncertainty associated with funding availability, additional geometric analysis is not needed at this time. As such, addition of a lane to the eastbound bridge will be included only for traffic operations analysis. Our analysis shows that widening the eastbound bridge to 5-lanes improves the LOS on the bridge and I-270 diverge to LOS D or better.

Relocate southbound to westbound ramp at I-44 / I-270 Interchange

This alternative relocates the southbound to westbound ramp at the I-44 / I-270 ramp to create two merge areas on I-44 (from northbound and southbound I-270), instead of the one merge area present now. Our analysis shows that this alternative improves the traffic operations at the merge to LOS D for 2035. Additionally, this alternative improves the traffic operations at the weaving segment along I-44 between I-270 and Soccer Park Road to LOS C.

I-44/I-270/Lindbergh Interchange Complex

Westbound C-D Road between Watson Road and I-270

The C-D Road system along westbound I-44 between Lindbergh Boulevard on-ramp merge and I-270 has geometric constraints with complex lane configurations. This along with heavy traffic volumes in the evening peak hour cause traffic flow breakdowns in the weaving segment. Additionally, the travel demand on the one-lane westbound to southbound flyover ramp is at or over the theoretical capacity of a one-lane ramp. As a result, the traffic operations in the C-D Road weaving segment are worsened by the inadequate capacity of this movement. This constraint is worsened with 2020 and 2035 forecasted conditions.

In addition to a 2-lane westbound to southbound flyover ramp, two options were evaluated for the C-D road system, as shown in the Alternatives Development section.

The first option includes adding a lane to the C-D road system between I-270 exit gore point on I-44 and I-270 northbound and southbound ramps. This alternative improves traffic operations along I-44 by providing a better diverge for I-270 traffic. Additionally, by physically separating using a barrier the traffic from Watson Road to westbound I-44 and traffic to I-270, this alternative provides improved traffic operations along the C-D road. Moreover, under this alternative, two lanes feed each of the I-270 northbound and southbound ramps from the C-D road; this improving lane utilization. VISSIM analysis shows that this alternative provides significantly improved traffic operations with LOS C for 2035 traffic forecasts.

A second option for this area includes addition of braided-ramps to eliminate the weaving between traffic entering from Lindbergh Boulevard and traffic exiting to I-270 along westbound I-44 in addition to the improvements identified for the previous option. It is recognized that this option is expensive and will only be need to be explored when the first option is no longer providing adequate traffic operations. It is also anticipated that this option will require reconstruction of Geyer Road overpass over I-44.

BRT Station along I-44 Mainline

Metro has identified I-44 as a future potential corridor for BRT, with Route 141 as a preliminarily designated stop on the route. Additionally, this study also included a BRT station at Mraz Lane overpass. Our analysis indicates that the Mraz Lane overpass location may provide some additional benefits by providing a faster exit and entry from the interstate. Preliminary analysis shows that Route 141 station may result in approximately 2 miles of adverse travel and 3 to 10 minutes of delay per stop. The Mraz Lane station has minimal adverse travel and delay.

Additionally, the existing overpass associated with one-way outer roads and slip ramps provide direct vehicular access to and from I-44 and facilitate the BRT line. Moreover, the Mraz Lane location enhances economic development of this area, provides direct access to multiple large employers and businesses, and captures reverse commuters working in Fenton.

In summary, preliminary traffic operations analysis shows that Mraz Lane location has potential benefits compared to Route 141 location. It should also be emphasized that the recommended alternatives for Route 141 do not preclude a future BRT station. However, detailed study by Metro would be needed to determine corridor and station locations.

Pedestrian and Bicycle: Incorporate Connections along Route 141

The stakeholder process made apparent the safety concerns and issues regarding the lack of bike and pedestrian accommodations along Route 141. Simpson Park, Buder Park, Upper Buder Park, Fenton City Park, Castlewood State Park, and Lone Elk State Park were all identified as major destinations in the vicinity of the study corridor. No link to connect the trails and parks north of the Meramec River and the trails and parks south of the Meramec River exists.

During analysis, it was determined that pedestrian and bike accommodations needed to be included along the length of the Route 141 corridor to offer connections between the different parks. A comprehensive effort was taken along the corridor to include a multi-use path. This included a separate bridge structure for the path across the Meramec River just west of Route 141.

One of the important findings during the study was that pedestrian accommodations needed to be along the western side of Route 141. There would be a major safety concern if pedestrians crossed paths with the heavy westbound to northbound right-turn at I-44 and Route 141. If pedestrian accommodations are kept on the west side of the road, it would eliminate this conflict. All pedestrian accommodations were incorporated into the preliminary conceptual designs.

Recommendations

The following is a list of recommended alternatives and the associated costs based on detailed traffic operations analysis and conceptual geometric and hydraulic analysis. Preliminary costs⁴ are also shown for the recommended alternatives.

I-44/MO 141 Interchange (South of Meramec River Bridges to Centurion)

- Widen eastbound off-ramp to provide additional storage length and triple eastbound left-turns. This is a short-term solution to enhance available capacity. Cost: \$0.5M - \$0.7M construction.
- Build detention basin and resurface Route 141 to address local flooding events. Cost: \$1M - \$1.5M construction.
- Construct southbound to eastbound flyover ramp. The ramp can be constructed either as a left-exit or as a right-exit. Left-exit ramp provides cost and driver expectation benefits. However, detailed geometric evaluation is needed to determine the appropriate option. This is a mid-term solution. Cost: \$9M - \$10M construction for left-exit and \$11M - \$12M construction for right-exit.
- Construct a direct connection between North Outer Road and Elam Avenue and a northbound to westbound loop ramp. This, along with the southbound to eastbound flyover ramp is a long-term solution for the I-44 / Route 141 interchange. Cost: \$3M - \$4M construction and \$9M - \$11M right-of-way for Elam Avenue direct connection. For the northbound to westbound loop ramp, the estimated cost is \$1.5M - \$2M construction.
- Reconstruct Route 141 over I-44 to address major flooding issues associated with the Meramec River Flooding. Cost: \$30M - \$35M construction.

Route 141 Vance and Marshall Intersections

- A split-flow intersection at Route 141 and Vance Road provides mid-term solution that addresses existing capacity constraints but does not address 2035 travel demand. Cost: \$1M - \$1.5M construction and \$1M - \$1.5M right-of-way.
- Construction of an overpass north of existing signal and a right-in / right-out access at Vance Road provides long-term operational benefits. Cost: \$2M - \$3M construction and \$3M - \$4M right-of-way.

I-44 between I-270 and Route 141

- Widen westbound I-44 to provide four through lanes between I-270 and Route 141, as a mid-term solution. Cost: \$3M - \$5M construction.
- Relocate southbound to westbound off-ramp at I-44/I-270 interchange, as a mid-term solution. Cost: \$2M - \$5M construction.
- Reconstruct Meramec River Bridges along I-44 to include five travel lanes and shoulders, as a long-term solution. Cost: \$25M - \$30M construction for each bridge.

⁴ Vertical and horizontal alignments shall need to be adjusted based on actual field shots. These shots and future revised alignments will affect the actual conceptual costs for each alternate shown.

I-44/I-270/Lindbergh Interchange Complex

- Widen westbound to southbound flyover ramp to 2-lanes at I-44/I-270 interchange. Additionally, widen and reconfigure the westbound C-D road along I-44 between Lindbergh Boulevard and I-270. This improvement is recommended as a long-term solution. Cost: \$15M - \$20M construction.
- Provided braided ramps to eliminate the weaving between traffic entering from Lindbergh Boulevard and traffic exiting to I-270 along westbound I-44. This is recommended as an ultimate fix. Cost: \$20M - \$25M construction and \$1M - \$1.5M right-of-way.

BRT Station along I-44 Mainline

- Route 141 and Mraz Lane provide opportunities for BRT station location. Within the scope of this study, Mraz Lane location provides ease of access to and from I-44. However, detailed study by Metro would be needed to determine corridor and station locations.

Pedestrian and Bicycle Facilities

- Construct a mixed-use path for bike and pedestrian use on the west side of Route 141. This includes a new structure that provides Meramec River crossing. Cost: \$1M - \$1.5M construction.
- Provide pedestrian and bike accommodations at the I-44 / Route 141 interchange. Cost: \$1M - \$1.5M construction for the bridge over railroad overpass.

Appendix A – Traffic Volume Exhibits

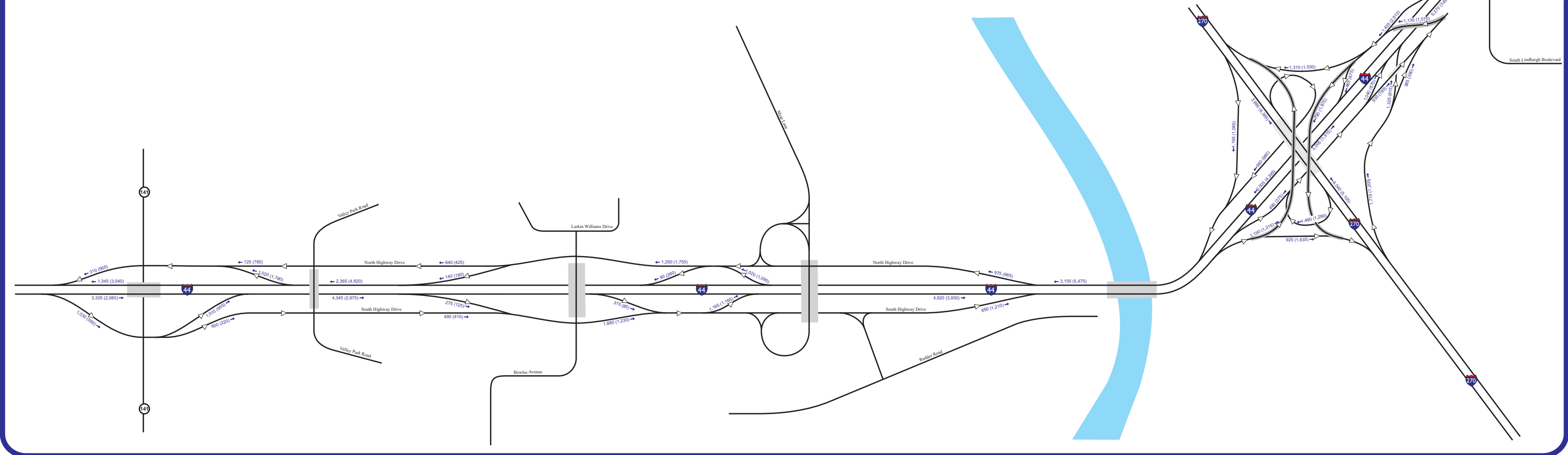


Exhibit 1: 2010 Traffic Volumes - I-44 Corridor

I-44 Corridor Study
 St. Louis County, Missouri
 Job# 043-10
 10/05/10



= Existing Traffic Signal
XX = AM Peak Hour Traffic (X:XX - X:XX AM)
(XX) = PM Peak Hour Traffic (X:XX - X:XX PM)

Legend

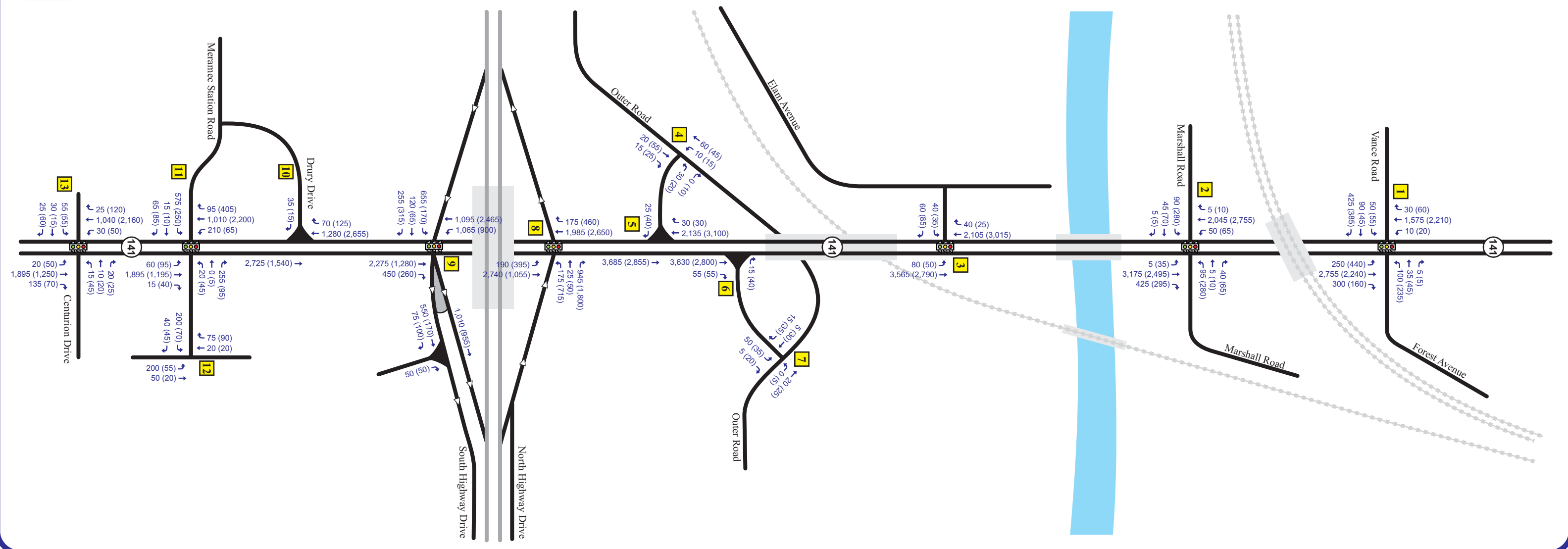


Exhibit 2: 2010 Traffic Volumes - Route 141 Corridor

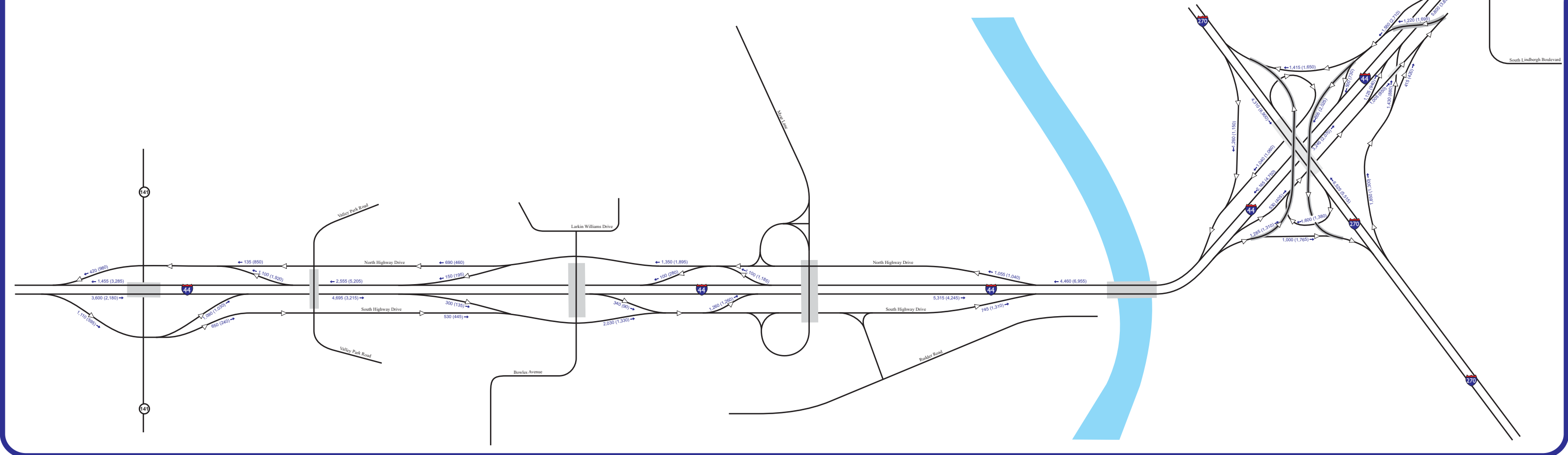


Exhibit 3: 2020 Forecasted Traffic Volumes (Committed/No-Build Network) - I-44 Corridor

I-44 Corridor Study
 St. Louis County, Missouri
 Job# 043-10
 10/05/10

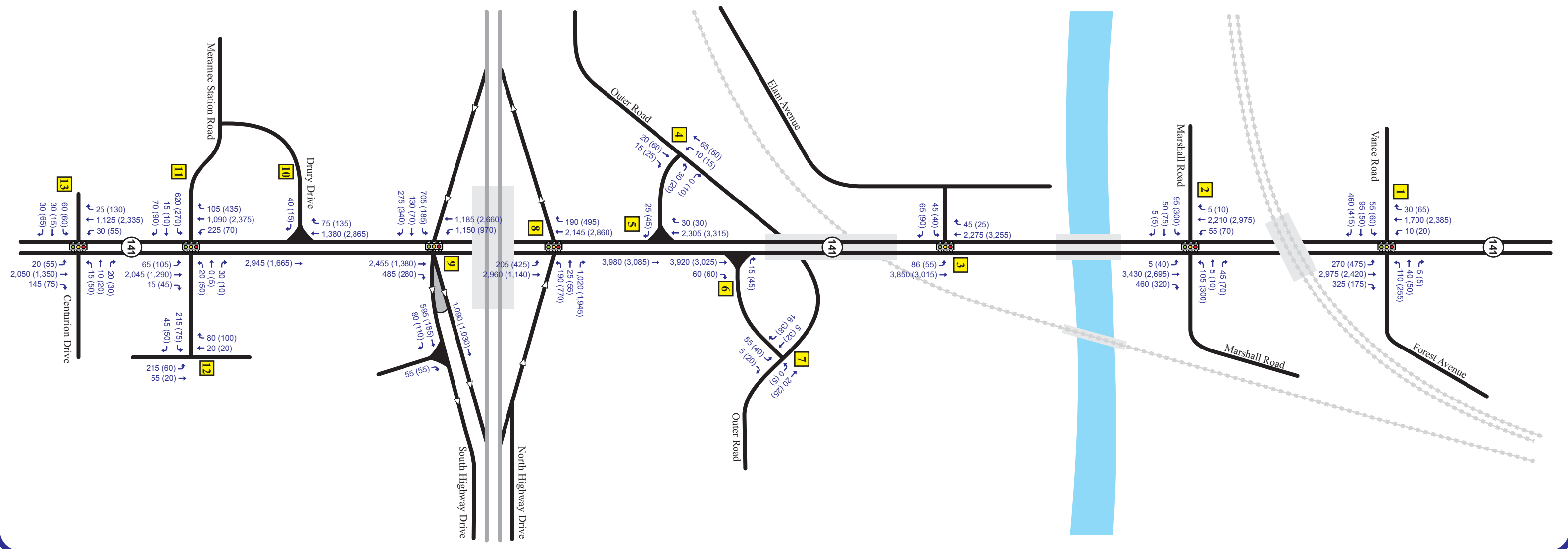


Exhibit 4: 2020 Forecasted Traffic Volumes (Committed/No-Build Network) - Route 141 Corridor

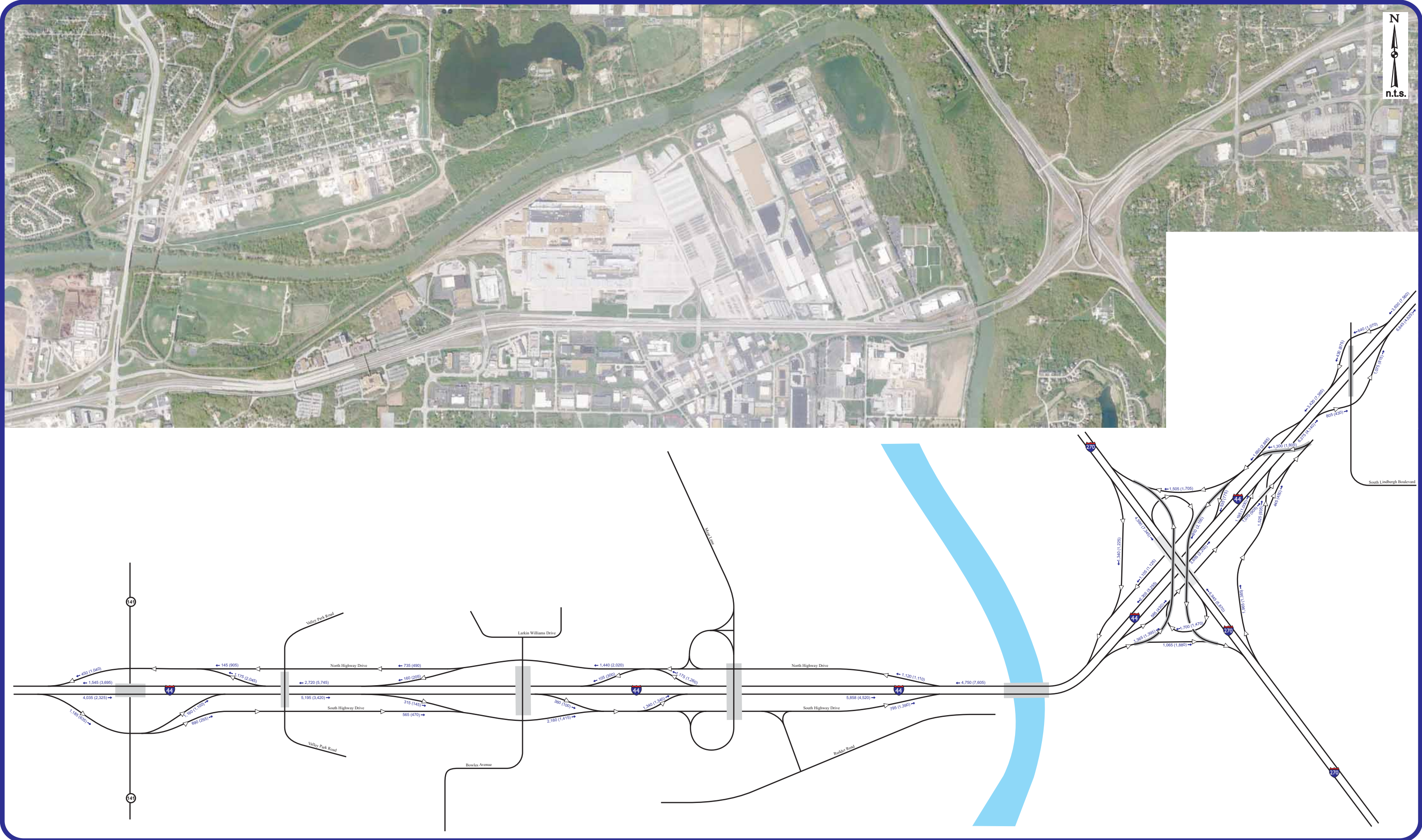
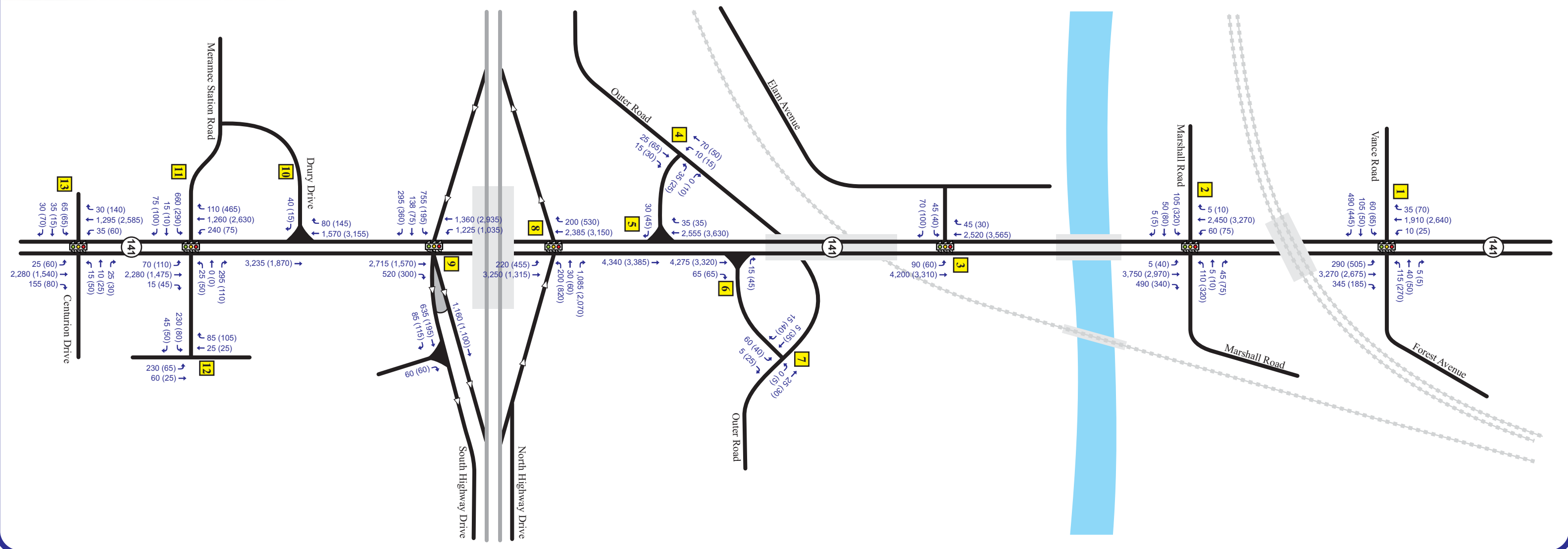


Exhibit 5: 2035 Forecasted Traffic Volumes (Committed/No-Build Network) - I-44 Corridor



Appendix B – Design Criteria Memorandum

Conceptual Study Design Criteria Route I-44, St. Louis County

Design Stage: ☒ Conceptual

☒ English

Design ADT: ≈2008 Route 141 ADT 60,000

≈2008 Route I-44 ADT 122,000

Type of Data	Standard
1. Design Speed/Posted Speed Route I-44 Route 141/Diamond Ramps Ramps Ramp (Flyover) Ramp (Loop)	60 mph 50 mph 40 mph 35 mph 25 mph Inner Loop
2. Lane Width/ Route 44/141 Ramps (Flyover and Diamond) Ramps (Loop)	12' 14' 18'>= 400 ft Rad. 22'<400 ft Rad.
3. Shoulder Width Route I-44 Route 141 Ramps (Flyover, Loop, and Diamond)	10' – 12' w/6 lanes (12'>DDHV Truck 250) Inside Shoulder 4' 10' w/6 lanes Outside Shoulder 10' Outside 8' Inside 4'
4. Guardrail/Barrier	Required length of need per Roadside Design Guide
5. Horizontal Alignment Min. Radius	60 mph >= 1500' Rte 44 50 mph >= 800' Rte 141 50 mph >=954' Ramp egress/ingress from Route I-44 40 mph >=450' other ramps 35 mph >=314 flyover ramps 25 mph >=150' Loop Ramp

6. Vertical Alignment Sag K	60 mph ≥136 50 mph K 96 Ramp 40 mph K 64 Ramp 35 mph K 49 Ramp 25 mph K 26
Crest SSD	60 mph SSD 570 ft 50 mph SSD 425 ft 40 mph SSD 305 ft 35 mph SSD 250 ft 25 mph SSD 155 ft
Min, Length	300 ft Min length all curves
7. Grade %	≤ 5% Route 141 and Ramps
8. Cross Slope	2% All Roads
9. Superelevation	≤4% Rte 44 ≤8% Ramps/141
10. Horizontal Clearance (Clear Zone)	Foreslopes Use Roadside Design Guide Tables 3.1
11. Right of Way Type Width	Rte 44 Controlled Access Route 141 Limited Access
12. Drainage (pavement drainage)	10 Year frequency 50 Year frequency Cross Road Pipes
13. Specialty Items Signalized Intersections/Safety Features	MoDOT EPG
Access Management	Intersection ½ Mile Ramp Terminals 700 ft. First Right from Ramp 750ft - 1320ft
14. Other Inslope Fill	4:1 to 6:1
Backslope	Soil Survey

Appendix C – Measures of Effectiveness (MOE) Summary

Table C1: 2010 Existing Conditions – Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	F	80.5	92%	F	84.2	103%
	Marshall Road	C	21.5	82%	D	43.8	85%
	Elam Road	A	9.2	83%	A	6.7	73%
	WB I-44 Ramps	D	52.8	98%	F	225.9	93%
	EB I-44 Ramps	D	59.5	98%	D	38.0	93%
	Meramec Station Road	D	45.7	76%	B	15.1	75%
	Centurion Drive	B	11.1	58%	A	6.7	61%
Maritz Road	N. Outer Road	A	6.6	32%	B	13.5	41%
	S. Outer Road	B	19.4	44%	A	9.7	47%
Bowles Road	N. Outer Road	C	20.1	71%	C	26.2	79%
	S. Outer Road	D	39.3	71%	C	34.3	79%
Rudder Road	S. Outer Road	B	10.2	53%	A	8.7	69%
Watson Road	Geyer Road	C	27.8	61%	D	39.6	76%
Lindbergh Blvd	WB I-44 Ramps	E	60.5	86%	D	52.5	86%
	EB I-44 Ramps	F	194.0	86%	B	17.0	86%

*sec/veh - seconds per vehicle

Table C2 2010 Existing Conditions – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	27.0	60.0	B	16.3	60.0
Route 141 Off-Ramp	EB	Diverge	D	28.5	50.4	B	18.3	51.3
Route 141 On-Ramp	EB	Merge	B	16.9	55.0	B	10.2	56.0
East of Route 141	EB	Freeway	C	20.2	60.0	B	13.8	60.0
Bowles Ave. Off-Ramp	EB	Diverge	C	26.8	51.8	B	19.3	52.1
Mraz Ln Off-Ramp	EB	Diverge	C	22.1	51.7	B	15.2	52.1
East of Bowles Ave.	EB	Freeway	C	23.3	60.0	B	17.1	60.0
Bowles Ave. On-Ramp	EB	Merge	D	29.0	52.0	C	23.8	54.0
East of Mraz Ln	EB	Freeway	D	30.7	59.5	C	24.3	60.0
Rudder Rd On-Ramp	EB	Merge	C	21.1	54.0	C	20.2	54.0
Between Rudder Rd and I-270	EB	Freeway	D	26.0	60.0	C	23.9	60.0
Watson Rd Off-Ramp	EB	Diverge	C	24.0	51.4	D	31.8	51.6
Southbound I-270 On-Ramp	EB	Merge	C	26.3	53.0	B	19.3	54.0
Northbound I-270 On-Ramp	EB	Merge	C	27.2	53.0	B	18.7	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	20.0	60.0	B	13.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	22.6	51.0	B	15.3	51.6
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	23.3	54.0	B	17.5	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	20.8	60.0	B	14.6	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	11.7	60.0	C	23.8	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	15.9	51.3	D	31.5	50.6
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	12.8	51.9	D	28.8	48.3
Watson Rd On-Ramp	WB	Merge	B	13.8	55.0	C	26.7	53.0
West of Watson Rd	WB	Freeway	B	12.4	60.0	D	27.2	60.0
Between I-270 and Soccer Park Off-Ramp	WB	Weave	B	18.9	48.8	D	30.3	47.4
West of Soccer Park Off-Ramp	WB	Freeway	B	14.6	60.0	C	20.9	60.0
Bowles Ave Off-Ramp	WB	Diverge	C	22.2	50.5	D	29.0	50.5
Mraz Ln On-Ramp	WB	Merge	B	12.6	55.0	C	25.6	53.0
Under Bowles Ave	WB	Freeway	B	13.8	60.0	D	28.8	59.9
Bowles Ave On-Ramp	WB	Merge	B	14.6	55.0	C	27.4	53.0
West of Bowles Ave	WB	Freeway	B	14.6	60.0	D	30.0	59.7
Route 141 Off-Ramp	WB	Diverge	B	16.9	50.5	D	31.0	49.1
Route 141 On-Ramp	WB	Merge	B	11.9	55.0	C	25.5	53.0
West of Route 141	WB	Freeway	A	10.3	60.0	C	24.4	60.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C3: 2010 Existing Conditions – VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	C	23.3	62.5	B	13.4	63.9
I-44	EB	Route 141 Off-Ramp	Diverge	F	41.1	27.5	B	11.2	57.0
I-44	EB	Route 141 On-Ramp	Merge	B	13.5	62.3	A	9.5	61.9
I-44	EB	East of Route 141	Freeway	B	17.0	61.9	B	11.7	62.9
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	22.5	62.5	B	15.5	63.4
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	17.9	56.0	B	11.2	63.1
I-44	EB	East of Bowles Ave.	Freeway	D	26.9	48.0	B	14.4	63.5
I-44	EB	Bowles Ave. On-Ramp	Merge	F	42.0	28.3	B	17.2	56.8
I-44	EB	East of Mraz Ln	Freeway	F	56.7	26.0	C	22.2	58.7
I-44	EB	Rudder Rd On-Ramp	Merge	F	61.2	16.1	B	17.4	59.1
I-44	EB	Between Rudder Rd and I-270	Freeway	F	76.6	15.3	C	26.0	49.5
I-44	EB	I-270 Off-Ramp	Diverge	F	76.6	15.3	C	26.0	49.5
I-44	EB	Watson Rd Off-Ramp	Diverge	B	11.6	62.9	A	9.0	63.9
I-44	EB	Southbound I-270 On-Ramp	Merge	B	14.1	63.6	B	10.7	64.0
I-44	EB	Northbound I-270 On-Ramp	Merge	B	15.9	61.8	B	11.3	63.7
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	B	15.9	61.8	B	11.3	63.7
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	15.9	61.8	B	11.3	63.7
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	B	17.1	60.2	B	12.4	62.1
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	21.2	61.1	B	15.4	62.9
C-D Road	EB	Between Bowles Ave and Mraz Ln	Weave	B	24.8	30.7	A	11.4	38.2
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	12.4	63.6	D	29.6	54.5
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	A	10.0	62.9	D	31.2	43.0
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	A	9.2	63.9	F	48.8	28.4
I-44	WB	Watson Rd On-Ramp	Merge	A	7.8	63.5	B	17.6	60.7
I-44	WB	West of Watson Rd	Freeway	A	10.4	63.0	C	23.3	61.0
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	15.8	51.6	C	25.6	48.8
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	12.5	62.8	C	22.0	60.9
I-44	WB	Bowles Ave Off-Ramp	Diverge	B	12.3	63.5	C	21.9	61.1
I-44	WB	Mraz Ln On-Ramp	Merge	A	8.7	63.5	B	19.5	58.7
I-44	WB	Under Bowles Ave	Freeway	B	11.7	63.1	D	26.1	58.6
I-44	WB	Bowles Ave On-Ramp	Merge	A	9.4	62.6	C	21.4	55.7
I-44	WB	West of Bowles Ave	Freeway	B	12.4	63.2	D	26.3	60.3
I-44	WB	Route 141 Off-Ramp	Diverge	A	9.2	63.5	B	19.4	61.2
I-44	WB	Route 141 On-Ramp	Merge	A	7.3	58.2	C	20.6	47.1
I-44	WB	West of Route 141	Freeway	A	8.8	64.2	C	20.7	62.6
C-D Road	WB	Between Bowles Ave and Mraz Ln	Weave	A	10.2	43.8	B	15.8	42.8

Table C4: 2020 No-Build/Committed - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	F	127.0	97%	F	109.9	109%
	Marshall Road	C	33.5	87%	F	85.5	90%
	Elam Road	B	12.4	89%	A	8.8	78%
	WB I-44 Ramps	E	66.4	104%	F	282.0	99%
	EB I-44 Ramps	F	86.0	104%	D	46.6	99%
	Meramec Station Road	D	53.6	80%	B	17.6	80%
	Centurion Drive	B	11.3	62%	A	6.9	64%
Maritz Road	N. Outer Road	A	6.8	33%	B	13.9	58%
	S. Outer Road	A	19.4	46%	A	10.0	48%
Bowles Road	N. Outer Road	C	22.4	76%	C	32.0	86%
	S. Outer Road	E	55.4	76%	D	50.1	86%
Rudder Road	S. Outer Road	B	11.1	57%	A	8.9	74%
Watson Road	Geyer Road	C	30.0	64%	D	45.7	81%
Lindbergh Blvd	WB I-44 Ramps	F	88.4	92%	E	63.6	91%
	EB I-44 Ramps	F	250.9	92%	B	17.9	91%

*sec/veh - seconds per vehicle

Table C5 2020 No-Build/Committed – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	29.3	59.8	B	17.2	60.0
Route 141 Off-Ramp	EB	Diverge	D	30.3	50.3	B	19.3	51.2
Route 141 On-Ramp	EB	Merge	B	18.9	55.0	B	11.3	56.0
East of Route 141	EB	Freeway	C	21.8	60.0	B	14.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	28.5	51.8	C	20.6	51.1
Mraz Ln Off-Ramp	EB	Diverge	C	23.8	51.7	B	16.5	52.1
East of Bowles Ave.	EB	Freeway	C	25.1	60.0	C	18.5	60.0
Bowles Ave. On-Ramp	EB	Merge	D	31.4	51.0	C	25.8	53.0
East of Mraz Ln	EB	Freeway	D	33.9	58.3	D	26.3	60.0
Rudder Rd On-Ramp	EB	Merge	C	23.5	52.0	C	22.8	53.0
Between Rudder Rd and I-270	EB	Freeway	D	28.2	60.0	C	25.8	60.0
Watson Rd Off-Ramp	EB	Diverge	C	25.5	51.3	D	33.6	51.6
Southbound I-270 On-Ramp	EB	Merge	D	28.2	53.0	C	20.7	54.0
Northbound I-270 On-Ramp	EB	Merge	D	29.2	53.0	B	20.0	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	21.5	60.0	B	14.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	24.4	50.9	B	16.6	51.6
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	24.5	54.0	B	18.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	22.5	60.0	B	15.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	12.7	60.0	C	25.7	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	17.2	51.2	D	34.1	50.5
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	14.0	51.2	D	31.5	47.5
Watson Rd On-Ramp	WB	Merge	B	14.7	55.0	D	28.7	53.0
West of Watson Rd	WB	Freeway	B	13.4	60.0	D	29.5	59.8
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	20.7	48.0	D	33.3	46.6
West of Soccer Park Off-Ramp	WB	Freeway	B	15.8	60.0	D	27.5	60.0
Bowles Ave Off-Ramp	WB	Diverge	C	23.8	50.3	E	35.3	50.2
Mraz Ln On-Ramp	WB	Merge	B	13.5	55.0	C	27.6	53.0
Under Bowles Ave	WB	Freeway	B	14.9	60.0	D	31.4	59.3
Bowles Ave On-Ramp	WB	Merge	B	15.6	55.0	D	29.4	53.0
West of Bowles Ave	WB	Freeway	B	15.8	60.0	D	32.9	58.7
Route 141 Off-Ramp	WB	Diverge	B	18.2	50.3	F	33.5	48.8
Route 141 On-Ramp	WB	Merge	B	13.4	55.0	C	27.3	55.0
West of Route 141	WB	Freeway	B	11.6	60.0	D	26.4	60.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C6 2020 No-Build/Committed – VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	D	27.8	56.5	B	14.5	63.7
I-44	EB	Route 141 Off-Ramp	Diverge	F	82.5	14.3	B	12.2	56.8
I-44	EB	Route 141 On-Ramp	Merge	B	14.4	62.1	B	10.2	61.8
I-44	EB	East of Route 141	Freeway	C	18.3	61.3	B	12.5	62.7
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	24.1	62.1	B	16.6	63.3
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	17.3	60.7	B	11.9	63.2
I-44	EB	East of Bowles Ave.	Freeway	C	20.6	62.6	B	15.4	63.4
I-44	EB	Bowles Ave. On-Ramp	Merge	C	24.1	53.2	B	19.0	55.2
I-44	EB	East of Mraz Ln	Freeway	D	29.5	57.9	C	24.4	57.2
I-44	EB	Rudder Rd On-Ramp	Merge	B	19.4	60.5	B	19.1	57.5
I-44	EB	Between Rudder Rd and I-270	Freeway	D	28.3	51.7	D	27.9	49.2
I-44	EB	I-270 Off-Ramp	Diverge	D	28.3	51.7	C	27.9	49.2
I-44	EB	Watson Rd Off-Ramp	Diverge	B	14.3	63.4	A	9.6	63.8
I-44	EB	Southbound I-270 On-Ramp	Merge	B	16.6	63.4	B	11.6	64.0
I-44	EB	Northbound I-270 On-Ramp	Merge	B	18.7	60.5	B	12.2	63.6
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	18.7	60.5	B	12.2	63.6
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	18.7	60.5	B	12.2	63.6
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	B	19.2	59.7	B	13.4	61.8
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	23.8	60.6	B	16.6	62.7
C-D Road	EB	Between Bowles Ave and Mraz Ln	Weave	B	20.3	38.5	B	12.6	37.1
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	13.4	63.4	F	56.5	29.3
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	10.9	62.6	F	66.4	17.8
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	A	9.9	63.8	F	93.9	11.8
I-44	WB	Watson Rd On-Ramp	Merge	A	8.3	63.3	B	17.3	59.8
I-44	WB	West of Watson Rd	Freeway	B	11.2	62.8	C	22.7	60.9
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	17.3	50.7	D	27.8	45.4
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	13.4	62.5	C	22.5	60.1
I-44	WB	Bowles Ave Off-Ramp	Diverge	B	13.3	63.1	C	22.4	60.3
I-44	WB	Mraz Ln On-Ramp	Merge	A	9.3	63.3	C	20.8	56.3
I-44	WB	Under Bowles Ave	Freeway	B	12.5	62.9	D	28.6	54.5
I-44	WB	Bowles Ave On-Ramp	Merge	B	10.1	62.3	C	24.8	49.6
I-44	WB	West of Bowles Ave	Freeway	B	13.3	62.9	D	31.3	52.5
I-44	WB	Route 141 Off-Ramp	Diverge	A	9.9	63.4	D	33.2	42.6
I-44	WB	Route 141 On-Ramp	Merge	A	7.8	58.0	C	21.8	45.7
I-44	WB	West of Route 141	Freeway	A	9.4	64.0	C	21.3	62.5
C-D Road	WB	Between Bowles Ave and Mraz Ln	Weave	A	11.1	43.624	B	16.6	42.6

Table C7: 2030 No-Build/Committed - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	F	179.3	104%	F	157.6	117%
	Marshall Road	E	58.9	94%	F	140.5	97%
	Elam Road	C	33.8	96%	C	23.6	84%
	WB I-44 Ramps	F	97.9	112%	F	349.4	107%
	EB I-44 Ramps	F	124.3	112%	E	67.3	107%
	Meramec Station Road	E	65.8	86%	C	26.8	85%
	Centurion Drive	B	12.5	67%	A	8.2	69%
Maritz Road	N. Outer Road	A	7.4	34%	B	14.3	59%
	S. Outer Road	B	19.5	48%	B	10.2	50%
Bowles Road	N. Outer Road	C	22.3	81%	C	34.0	91%
	S. Outer Road	E	73.3	81%	E	65.6	91%
Rudder Road	S. Outer Road	B	11.8	60%	A	9.3	77%
Watson Road	Geyer Road	C	31.6	67%	D	52.7	85%
Lindbergh Blvd	WB I-44 Ramps	F	114.2	97%	E	73.9	97%
	EB I-44 Ramps	F	295.1	97%	B	18.8	97%

*sec/veh - seconds per vehicle

Table C8 2035 No-Build/Committed – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	33.1	58.7	C	18.3	60.0
Route 141 Off-Ramp	EB	Diverge	D	32.7	50.2	C	20.4	51.2
Route 141 On-Ramp	EB	Merge	C	21.6	54.0	B	15.7	55.0
East of Route 141	EB	Freeway	C	24.1	60.0	B	15.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	30.8	51.7	C	21.8	52.0
Mraz Ln Off-Ramp	EB	Diverge	C	26.1	51.6	B	17.6	52.1
East of Bowles Ave.	EB	Freeway	D	28.0	60.0	C	20.3	60.0
Bowles Ave. On-Ramp	EB	Merge	D	34.5	49.0	C	27.4	53.0
East of Mraz Ln	EB	Freeway	E	39.8	54.6	D	28.0	60.0
Rudder Rd On-Ramp	EB	Merge	F	27.4	49.0	C	24.9	51.0
Between Rudder Rd and I-270	EB	Freeway	D	31.2	59.4	D	27.5	60.0
Watson Rd Off-Ramp	EB	Diverge	C	27.8	51.3	E	35.2	51.5
Southbound I-270 On-Ramp	EB	Merge	D	30.9	52.0	C	21.8	54.0
Northbound I-270 On-Ramp	EB	Merge	D	31.7	52.0	C	21.1	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	23.7	60.0	B	15.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	25.4	50.8	B	17.6	51.5
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	26.5	53.0	B	19.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	24.7	60.0	B	16.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	13.5	60.0	D	28.1	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	18.4	51.1	E	37.1	50.4
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	15.0	50.8	D	34.8	47.1
Watson Rd On-Ramp	WB	Merge	B	15.5	55.0	D	31.4	52.0
West of Watson Rd	WB	Freeway	B	14.3	60.0	D	33.3	58.5
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	22.3	47.4	E	36.8	46.1
West of Soccer Park Off-Ramp	WB	Freeway	B	16.9	60.0	D	30.3	59.6
Bowles Ave Off-Ramp	WB	Diverge	C	25.1	50.2	F	38.8	50.0
Mraz Ln On-Ramp	WB	Merge	B	14.3	55.0	D	30.4	52.0
Under Bowles Ave	WB	Freeway	B	15.8	60.0	E	36.0	57.1
Bowles Ave On-Ramp	WB	Merge	B	16.5	54.0	D	32.2	51.0
West of Bowles Ave	WB	Freeway	B	16.8	60.0	E	38.3	55.6
Route 141 Off-Ramp	WB	Diverge	B	19.3	50.2	F	36.0	48.6
Route 141 On-Ramp	WB	Merge	B	14.1	55.0	D	30.0	52.0
West of Route 141	WB	Freeway	B	12.4	60.0	D	29.4	59.8

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C9 2035 No-Build/Committed – VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	E	45.0	39.0	B	15.4	63.6
I-44	EB	Route 141 Off-Ramp	Diverge	F	100.2	12.3	B	13.0	56.7
I-44	EB	Route 141 On-Ramp	Merge	B	15.5	61.6	B	10.6	61.9
I-44	EB	East of Route 141	Freeway	C	19.8	60.3	B	13.1	62.6
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	26.1	61.1	B	17.4	63.2
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	19.5	57.8	B	12.9	61.8
I-44	EB	East of Bowles Ave.	Freeway	C	22.5	61.5	C	18.7	59.3
I-44	EB	Bowles Ave. On-Ramp	Merge	E	36.9	38.3	C	26.2	49.9
I-44	EB	East of Mraz Ln	Freeway	D	33.1	55.2	D	34.3	48.9
I-44	EB	Rudder Rd On-Ramp	Merge	C	21.2	59.3	D	30.7	44.0
I-44	EB	Between Rudder Rd and I-270	Freeway	D	30.9	50.9	E	44.6	36.3
I-44	EB	I-270 Off-Ramp	Diverge	D	30.9	50.9	F	44.6	36.3
I-44	EB	Watson Rd Off-Ramp	Diverge	B	15.7	63.2	B	10.1	63.4
I-44	EB	Southbound I-270 On-Ramp	Merge	B	18.1	63.2	B	12.1	63.8
I-44	EB	Northbound I-270 On-Ramp	Merge	C	20.8	58.8	B	12.7	63.3
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	20.8	58.8	B	12.7	63.3
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	C	20.8	58.8	B	12.7	63.3
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	C	21.3	57.9	B	14.0	61.6
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	D	26.2	59.1	B	17.4	62.4
C-D Road	EB	Between Bowles Ave and Mraz Ln	Weave	B	22.7	36.6	B	18.0	33.8
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	14.3	63.2	F	84.6	18.4
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	11.6	62.2	F	79.8	13.9
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	B	10.5	63.8	F	103.1	10.5
I-44	WB	Watson Rd On-Ramp	Merge	A	8.9	63.2	B	17.4	59.8
I-44	WB	West of Watson Rd	Freeway	B	12.0	62.8	C	23.1	60.1
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	18.7	50.0	D	34.4	41.5
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	14.4	62.3	C	23.5	59.4
I-44	WB	Bowles Ave Off-Ramp	Diverge	B	14.2	63.0	C	23.2	60.1
I-44	WB	Mraz Ln On-Ramp	Merge	A	10.0	63.2	D	30.5	43.5
I-44	WB	Under Bowles Ave	Freeway	B	13.4	62.7	F	47.6	36.1
I-44	WB	Bowles Ave On-Ramp	Merge	B	10.9	61.9	F	43.1	30.5
I-44	WB	West of Bowles Ave	Freeway	B	14.3	62.7	F	55.1	31.2
I-44	WB	Route 141 Off-Ramp	Diverge	B	10.7	63.1	F	75.5	16.8
I-44	WB	Route 141 On-Ramp	Merge	A	8.4	57.7	C	25.6	40.5
I-44	WB	West of Route 141	Freeway	A	10.1	64.0	C	22.2	62.2
C-D Road	WB	Between Bowles Ave and Mraz Ln	Weave	A	11.7	43.6	B	17.3	42.5

Table C10 2020 Scenario 1 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	F	129.3	102%	F	146.4	114%
	Marshall Road	F	85.8	87%	E	79.3	91%
	Elam Road	B	15.7	89%	A	8.7	78%
	WB I-44 Ramps						
	EB I-44 Ramps						
	Meramec Station Road	E	73.5	103%	B	19.7	80%
	Centurion Drive	B	11.3	62%	A	6.9	64%
Maritz Road	N. Outer Road	A	6.8	33%	B	13.9	58%
	S. Outer Road	A	19.4	46%	A	10.0	48%
Bowles Road	N. Outer Road	C	22.4	76%	C	32.0	86%
	S. Outer Road	E	55.4	76%	D	50.1	86%
Rudder Road	S. Outer Road	B	11.1	57%	A	8.9	74%
Watson Road	Geyer Road	C	30.0	64%	D	45.7	81%
Lindbergh Blvd	WB I-44 Ramps	F	88.4	92%	E	63.6	91%
	EB I-44 Ramps	F	250.9	92%	B	17.9	91%

*sec/veh - seconds per vehicle

Table C11 2020 Scenario 2 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	D	36.3	95%	D	53.3	98%
	Marshall Road	D	42.7	87%	E	76.8	91%
	Elam Road	B	17.0	89%	A	8.5	78%
	WB I-44 Ramps						
	EB I-44 Ramps						
	Meramec Station Road	E	73.5	103%	B	19.7	80%
	Centurion Drive	B	11.3	62%	A	6.9	64%
Maritz Road	N. Outer Road	A	6.8	33%	B	13.9	58%
	S. Outer Road	A	19.4	46%	A	10.0	48%
Bowles Road	N. Outer Road	C	22.4	76%	C	32.0	86%
	S. Outer Road	E	55.4	76%	D	50.1	86%
Rudder Road	S. Outer Road	B	11.1	57%	A	8.9	74%
Watson Road	Geyer Road	C	30.0	64%	D	45.7	81%
Lindbergh Blvd	WB I-44 Ramps	F	88.4	92%	E	63.6	91%
	EB I-44 Ramps	F	250.9	92%	B	17.9	91%

*sec/veh - seconds per vehicle

Table C12 2020 Scenario 3 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	U	U	75%	U	U	94%
	Marshall Road	C	31.9	87%	F	84.2	91%
	Elam Road	B	16.1	39%	C	21.9	90%
	WB I-44 Ramps	E	69.1	102%	F	130.0	99%
	EB I-44 Ramps	B	15.2	102%	B	19.9	99%
	Meramec Station Road	E	57.1	80%	B	19.0	80%
	Centurion Drive	A	8.7	62%	A	6.8	64%
Maritz Road	N. Outer Road	A	6.8	33%	B	13.9	58%
	S. Outer Road	A	19.4	46%	A	10.0	48%
Bowles Road	N. Outer Road	C	22.4	76%	C	32.0	86%
	S. Outer Road	E	55.4	76%	D	50.1	86%
Rudder Road	S. Outer Road	B	11.1	57%	A	8.9	74%
Watson Road	Geyer Road	C	30.0	64%	D	45.7	81%
Lindbergh Blvd	WB I-44 Ramps	F	88.4	92%	E	63.6	91%
	EB I-44 Ramps	F	250.9	92%	B	17.9	91%

*sec/veh - seconds per vehicle

Table C13 2020 Scenario 4 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	U	U	75%	U	U	94%
	Marshall Road	C	31.1	87%	F	83.1	91%
	Elam Road	C	20.8	89%	C	26.1	90%
	WB I-44 Ramps	A	6.7	71%	B	10.4	69%
	EB I-44 Ramps	C	22.6	82%	C	20.1	81%
	Meramec Station Road	E	56.6	80%	C	22.5	80%
	Centurion Drive	A	9.5	62%	A	8.3	64%
Maritz Road	N. Outer Road	A	6.8	33%	B	13.9	58%
	S. Outer Road	A	19.4	46%	A	10.0	48%
Bowles Road	N. Outer Road	C	22.4	76%	C	32.0	86%
	S. Outer Road	E	55.4	76%	D	50.1	86%
Rudder Road	S. Outer Road	B	11.1	57%	A	8.9	74%
Watson Road	Geyer Road	C	30.0	64%	D	45.7	81%
Lindbergh Blvd	WB I-44 Ramps	F	88.4	92%	E	63.6	91%
	EB I-44 Ramps	F	250.9	92%	B	17.9	91%

*sec/veh - seconds per vehicle

Table C14 2020 Scenario 1 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	29.3	59.8	B	17.2	60.0
Route 141 Off-Ramp	EB	Diverge	D	30.3	50.3	B	19.3	51.2
Route 141 On-Ramp	EB	Merge	B	18.9	55.0	B	11.3	56.0
East of Route 141	EB	Freeway	C	21.8	60.0	B	14.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	28.5	51.8	C	20.6	51.1
Mraz Ln Off-Ramp	EB	Diverge	C	23.8	51.7	B	16.5	52.1
East of Bowles Ave.	EB	Freeway	C	25.1	60.0	C	18.5	60.0
Bowles Ave. On-Ramp	EB	Merge	D	31.4	51.0	C	25.8	53.0
East of Mraz Ln	EB	Freeway	D	33.9	58.3	D	26.3	60.0
Rudder Rd On-Ramp	EB	Merge	C	23.5	52.0	C	22.8	53.0
Between Rudder Rd and I-270	EB	Freeway	D	28.2	60.0	C	25.8	60.0
Watson Rd Off-Ramp	EB	Diverge	C	25.5	51.3	D	33.6	51.6
Southbound I-270 On-Ramp	EB	Merge	D	28.2	53.0	C	20.7	54.0
Northbound I-270 On-Ramp	EB	Merge	D	29.2	53.0	B	20.0	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	21.5	60.0	B	14.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	24.4	50.9	B	16.6	51.6
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	24.5	54.0	B	18.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	22.5	60.0	B	15.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	12.7	60.0	C	25.7	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	17.2	51.2	D	34.1	50.5
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	14.1	50.8	D	32.7	45.8
Watson Rd On-Ramp	WB	Merge	B	14.7	55.0	D	28.7	53.0
West of Watson Rd	WB	Freeway	B	13.4	60.0	D	29.5	59.8
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	20.7	48.0	D	33.3	46.6
West of Soccer Park Off-Ramp	WB	Freeway	B	15.8	60.0	D	27.5	60.0
Bowles Rd Off-Ramp	WB	Diverge	C	23.8	50.3	E	35.3	50.2
Mraz Ln On-Ramp	WB	Merge	A	9.3	56.0	C	23.8	54.0
Under Bowles Rd	WB	Freeway	B	11.1	60.0	C	23.3	60.0
Bowles Rd On-Ramp	WB	Merge	B	10.2	56.0	C	24.6	53.0
West of Bowles Rd	WB	Freeway	B	11.9	60.0	C	24.2	60.0
Route 141 Off-Ramp	WB	Diverge	B	10.1	50.3	F	25.4	48.8
Route 141 On-Ramp	WB	Merge	B	14.8	54.0	D	28.6	53.0
West of Route 141	WB	Freeway	B	11.6	60.0	D	26.4	60.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C15 2020 Scenario 2 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	29.3	59.8	B	17.2	60.0
Route 141 Off-Ramp	EB	Diverge	D	30.3	50.3	B	19.3	51.2
Route 141 On-Ramp	EB	Merge	B	18.9	55.0	B	11.3	56.0
East of Route 141	EB	Freeway	C	21.8	60.0	B	14.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	28.5	51.8	C	20.6	51.1
Mraz Ln Off-Ramp	EB	Diverge	C	23.8	51.7	B	16.5	52.1
East of Bowles Ave.	EB	Freeway	C	25.1	60.0	C	18.5	60.0
Bowles Ave. On-Ramp	EB	Merge	D	31.4	51.0	C	25.8	53.0
East of Mraz Ln	EB	Freeway	D	33.9	58.3	D	26.3	60.0
Rudder Rd On-Ramp	EB	Merge	C	23.5	52.0	C	22.8	53.0
Between Rudder Rd and I-270	EB	Freeway	D	28.2	60.0	C	25.8	60.0
Watson Rd Off-Ramp	EB	Diverge	C	25.5	51.3	D	33.6	51.6
Southbound I-270 On-Ramp	EB	Merge	D	28.2	53.0	C	20.7	54.0
Northbound I-270 On-Ramp	EB	Merge	D	29.2	53.0	B	20.0	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	21.5	60.0	B	14.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	24.4	50.9	B	16.6	51.6
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	24.5	54.0	B	18.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	22.5	60.0	B	15.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	12.7	60.0	C	25.7	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	17.2	51.2	D	34.1	50.5
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	13.9	51.6	D	30.3	47.3
Watson Rd On-Ramp	WB	Merge	B	14.7	55.0	D	28.7	53.0
West of Watson Rd	WB	Freeway	B	13.4	60.0	D	29.5	59.8
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	20.7	48.0	D	33.3	46.6
West of Soccer Park Off-Ramp	WB	Freeway	B	15.8	60.0	D	27.5	60.0
Bowles Rd Off-Ramp	WB	Diverge	C	23.8	50.3	E	35.3	50.2
Mraz Ln On-Ramp	WB	Merge	A	9.3	56.0	C	23.8	54.0
Under Bowles Rd	WB	Freeway	B	11.1	60.0	C	23.3	60.0
Bowles Rd On-Ramp	WB	Merge	B	10.2	56.0	C	24.6	53.0
West of Bowles Rd	WB	Freeway	B	11.9	60.0	C	24.2	60.0
Route 141 Off-Ramp	WB	Diverge	B	10.1	50.3	F	25.4	48.8
Route 141 On-Ramp	WB	Merge	B	14.8	54.0	D	28.6	53.0
West of Route 141	WB	Freeway	B	11.6	60.0	D	26.4	60.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C16 2020 Scenario 3 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	29.3	59.8	B	17.2	60.0
Route 141 Off-Ramp	EB	Diverge	D	30.3	50.3	B	19.3	51.2
Route 141 On-Ramp	EB	Merge	B	18.9	55.0	B	11.3	56.0
East of Route 141	EB	Freeway	C	21.8	60.0	B	14.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	28.5	51.8	C	20.6	51.1
Mraz Ln Off-Ramp	EB	Diverge	C	23.8	51.7	B	16.5	52.1
East of Bowles Ave.	EB	Freeway	C	25.1	60.0	C	18.5	60.0
Bowles Ave. On-Ramp	EB	Merge	D	31.4	51.0	C	25.8	53.0
East of Mraz Ln	EB	Freeway	D	33.9	58.3	D	26.3	60.0
Rudder Rd On-Ramp	EB	Merge	A	9.7	55.0	A	9.0	55.0
Between Rudder Rd and I-270	EB	Freeway	C	22.5	60.0	C	20.6	60.0
Watson Rd Off-Ramp	EB	Diverge	C	25.5	51.3	D	33.6	51.6
Southbound I-270 On-Ramp	EB	Merge	D	28.2	53.0	C	20.7	54.0
Northbound I-270 On-Ramp	EB	Merge	D	29.2	53.0	B	20.0	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	21.5	60.0	B	14.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	24.4	50.9	B	16.6	51.6
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	24.5	54.0	B	18.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	22.5	60.0	B	15.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	12.7	60.0	C	25.7	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	17.2	51.2	D	34.1	50.5
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	13.9	51.6	D	30.3	47.3
Watson Rd On-Ramp	WB	Merge	B	14.7	55.0	D	28.7	53.0
West of Watson Rd	WB	Freeway	B	13.4	60.0	D	29.5	59.8
Northbound I-270 On-Ramp	WB	Merge	B	16.2	56.0	D	30.3	51.0
Between I-270 and Soccer Park Off-Ramp	WB	Weave	B	15.0	50.8	C	25.4	51.8
West of Soccer Park Off-Ramp	WB	Freeway	B	15.8	60.0	D	27.5	60.0
Bowles Rd Off-Ramp	WB	Diverge	C	23.8	50.3	E	35.3	50.2
Mraz Ln On-Ramp	WB	Merge	A	9.3	56.0	C	23.8	54.0
Under Bowles Rd	WB	Freeway	B	11.1	60.0	C	23.3	60.0
Bowles Rd On-Ramp	WB	Merge	B	10.2	56.0	C	24.6	53.0
West of Bowles Rd	WB	Freeway	B	11.9	60.0	C	24.2	60.0
Route 141 Off-Ramp	WB	Diverge	B	10.1	50.3	F	25.4	48.8
Route 141 On-Ramp	WB	Merge	B	14.8	54.0	D	28.6	53.0
West of Route 141	WB	Freeway	B	11.6	60.0	D	26.4	60.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C17 2020 Scenario 4 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	29.3	59.8	B	17.2	60.0
Route 141 Off-Ramp	EB	Diverge	D	30.3	50.3	B	19.3	51.2
Route 141 On-Ramp	EB	Merge	B	18.9	55.0	B	11.3	56.0
East of Route 141	EB	Freeway	C	21.8	60.0	B	14.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	28.5	51.8	C	20.6	51.1
Mraz Ln Off-Ramp	EB	Diverge	C	23.8	51.7	B	16.5	52.1
East of Bowles Ave.	EB	Freeway	C	25.1	60.0	C	18.5	60.0
Bowles Ave. On-Ramp	EB	Merge	D	31.4	51.0	C	25.8	53.0
East of Mraz Ln	EB	Freeway	D	33.9	58.3	D	26.3	60.0
Rudder Rd On-Ramp	EB	Merge	A	9.7	55.0	A	9.0	55.0
Between Rudder Rd and I-270	EB	Freeway	C	22.5	60.0	C	20.6	60.0
Watson Rd Off-Ramp	EB	Diverge	C	25.5	51.3	D	33.6	51.6
Southbound I-270 On-Ramp	EB	Merge	D	28.2	53.0	C	20.7	54.0
Northbound I-270 On-Ramp	EB	Merge	D	29.2	53.0	B	20.0	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	21.5	60.0	B	14.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	24.4	50.9	B	16.6	51.6
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	24.5	54.0	B	18.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	22.5	60.0	B	15.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	12.7	60.0	C	25.7	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	17.2	51.2	D	34.1	50.5
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	13.9	51.6	D	30.3	47.3
Watson Rd On-Ramp	WB	Merge	B	14.7	55.0	D	28.7	53.0
West of Watson Rd	WB	Freeway	B	13.4	60.0	D	29.5	59.8
Northbound I-270 On-Ramp	WB	Merge	B	16.2	56.0	D	30.3	51.0
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	20.7	48.0	D	33.3	46.6
West of Soccer Park Off-Ramp	WB	Freeway	B	15.8	60.0	D	27.5	60.0
Bowles Rd Off-Ramp	WB	Diverge	C	23.8	50.3	E	35.3	50.2
Mraz Ln On-Ramp	WB	Merge	A	9.3	56.0	C	23.8	54.0
Under Bowles Rd	WB	Freeway	B	11.1	60.0	C	23.3	60.0
Bowles Rd On-Ramp	WB	Merge	B	10.2	56.0	C	24.6	53.0
West of Bowles Rd	WB	Freeway	B	11.9	60.0	C	24.2	60.0
Route 141 Off-Ramp	WB	Diverge	A	-10.4	52.6	A	5.3	51.2
Northbound Route 141 On-Ramp	WB	Merge	B	12.3	54.0	C	23.5	54.0
Southbound Route 141 On-Ramp	WB	Merge	B	13.9	54.0	C	26.9	53.0
West of Route 141	WB	Freeway	B	11.6	60.0	D	26.4	60.0

* pc/mi/ln = passenger cars per mile per lane, ** mph = miles per hour

Table C18 2020 Scenario 1 - VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	C	25.1	62.4	B	14.5	63.8
I-44	EB	Route 141 Off-Ramp	Diverge	C	21.2	56.5	B	11.4	60.6
I-44	EB	Route 141 On-Ramp	Merge	B	14.1	62.5	B	10.1	63.0
I-44	EB	East of Route 141	Freeway	B	17.9	61.6	B	12.6	63.0
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	23.7	62.2	B	16.7	63.4
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	16.9	61.3	B	12.0	63.3
I-44	EB	East of Bowles Ave.	Freeway	C	20.2	62.8	B	15.5	63.4
I-44	EB	Bowles Ave. On-Ramp	Merge	C	22.6	55.9	B	18.7	56.2
I-44	EB	East of Mraz Ln	Freeway	D	28.6	59.0	C	24.8	56.7
I-44	EB	Rudder Rd On-Ramp	Merge	B	19.2	60.4	C	20.5	55.1
I-44	EB	Between Rudder Rd and I-270	Freeway	D	28.2	51.5	D	31.8	44.4
I-44	EB	I-270 Off-Ramp	Diverge	D	28.2	51.5	D	31.8	44.4
I-44	EB	Watson Rd Off-Ramp	Diverge	B	14.2	63.3	A	9.7	63.7
I-44	EB	Southbound I-270 On-Ramp	Merge	B	16.5	63.3	B	11.7	63.9
I-44	EB	Northbound I-270 On-Ramp	Merge	B	18.6	60.3	B	12.2	63.5
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	18.6	60.3	B	12.2	63.5
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	18.6	60.3	B	12.2	63.5
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	B	19.2	59.4	B	13.5	61.9
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	23.8	60.4	B	16.7	62.7
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	C	20.2	38.7	B	12.5	37.3
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	13.4	63.4	D	32.0	54.0
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	10.9	62.6	C	25.0	55.1
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	A	9.9	63.8	C	22.6	58.9
I-44	WB	Watson Rd On-Ramp	Merge	A	8.4	63.3	B	19.7	59.6
I-44	WB	West of Watson Rd	Freeway	B	11.2	62.9	C	25.8	60.6
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	17.1	51.4	D	30.5	45.2
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	13.5	62.2	C	24.8	59.1
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	11.0	61.0	B	19.8	59.0
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.3	64.0	B	17.2	59.6
I-44	WB	Under Bowles Rd	Freeway	B	16.5	41.5	C	23.2	56.0
I-44	WB	Bowles Rd On-Ramp	Merge	C	22.0	29.7	C	21.8	51.2
I-44	WB	West of Bowles Rd	Freeway	E	43.7	13.8	D	31.9	44.7
I-44	WB	Route 141 Off-Ramp	Diverge	E	53.3	10.4	E	43.8	32.2
I-44	WB	Route 141 On-Ramp	Merge	A	7.5	58.6	C	25.9	41.0
I-44	WB	West of Route 141	Freeway	A	9.1	64.1	C	22.9	61.0
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.1	43.4	B	17.3	42.6

Table C19 2020 Scenario 2 - VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	C	25.1	62.4	B	14.5	63.8
I-44	EB	Route 141 Off-Ramp	Diverge	C	20.1	58.7	B	11.4	60.6
I-44	EB	Bowles Ave. Off-Ramp	Diverge	E	43.7	42.3	C	25.3	46.7
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	15.2	61.4	A	9.3	63.5
I-44	EB	East of Bowles Ave.	Freeway	C	18.2	62.6	B	11.9	63.6
I-44	EB	Bowles Ave. On-Ramp	Merge	C	24.6	52.1	B	18.3	55.7
I-44	EB	East of Mraz Ln	Freeway	D	28.3	60.2	C	23.7	57.4
I-44	EB	Rudder Rd On-Ramp	Merge	B	19.3	60.4	B	19.6	55.3
I-44	EB	Between Rudder Rd and I-270	Freeway	D	30.2	48.5	D	30.1	45.4
I-44	EB	I-270 Off-Ramp	Diverge	D	30.2	48.5	D	30.1	45.4
I-44	EB	Watson Rd Off-Ramp	Diverge	B	14.4	63.0	A	9.5	63.7
I-44	EB	Southbound I-270 On-Ramp	Merge	B	16.6	63.3	B	11.5	63.9
I-44	EB	Northbound I-270 On-Ramp	Merge	B	18.8	60.0	B	12.1	63.4
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	18.8	60.0	B	12.1	63.4
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	18.8	60.0	B	12.1	63.4
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	B	19.4	59.0	B	13.4	61.7
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	23.9	60.2	B	16.6	62.6
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	E	37.8	27.1	F	55.1	15.6
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	13.3	63.8	D	28.2	61.1
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	10.7	63.5	C	22.2	62.2
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	A	9.9	63.7	C	22.1	60.1
I-44	WB	Watson Rd On-Ramp	Merge	A	8.3	63.4	C	21.5	55.2
I-44	WB	West of Watson Rd	Freeway	B	11.2	62.9	D	29.8	55.3
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	17.0	51.6	E	36.1	42.8
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	13.4	62.7	C	24.9	58.3
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	12.2	54.9	C	20.5	56.7
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.3	64.0	B	16.0	61.6
I-44	WB	Under Bowles Rd	Freeway	A	9.2	64.2	C	20.2	61.5
I-44	WB	Bowles Rd On-Ramp	Merge	A	7.9	63.8	B	17.2	60.2
I-44	WB	West of Bowles Rd	Freeway	A	9.9	63.4	C	22.9	56.5
I-44	WB	Route 141 Off-Ramp	Diverge	B	10.2	61.7	E	36.8	36.1
I-44	WB	Route 141 On-Ramp	Merge	A	7.7	57.9	D	28.4	37.4
I-44	WB	West of Route 141	Freeway	A	9.3	64.1	C	23.7	59.2
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.2	43.0	B	17.3	42.4

Table C20 2020 Scenario 3 - VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	C	25.2	62.4	B	14.5	63.8
I-44	EB	Route 141 Off-Ramp	Diverge	C	23.6	53.2	B	11.4	60.8
I-44	EB	Route 141 On-Ramp	Merge	D	34.6	28.5	A	8.5	63.9
I-44	EB	East of Route 141	Freeway	F	69.9	17.0	B	11.4	63.3
I-44	EB	Bowles Ave. Off-Ramp	Diverge	E	96.1	14.5	A	7.5	162.8
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	13.6	61.8	A	8.8	63.5
I-44	EB	East of Bowles Ave.	Freeway	B	16.4	61.9	B	11.3	63.6
I-44	EB	Bowles Ave. On-Ramp	Merge	D	31.8	37.4	B	17.8	55.4
I-44	EB	East of Mraz Ln	Freeway	D	27.5	56.9	C	24.2	54.4
I-44	EB	Rudder Rd On-Ramp	Merge	B	17.7	61.6	B	17.6	59.7
I-44	EB	Between Rudder Rd and I-270	Freeway	C	19.9	54.9	C	19.5	53.9
I-44	EB	I-270 Off-Ramp	Diverge	B	19.9	54.9	B	19.5	53.9
I-44	EB	Watson Rd Off-Ramp	Diverge	B	13.4	63.4	A	9.2	63.8
I-44	EB	Southbound I-270 On-Ramp	Merge	B	15.7	63.4	B	11.4	63.9
I-44	EB	Northbound I-270 On-Ramp	Merge	B	17.8	61.1	B	12.0	63.5
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	B	17.8	61.1	B	12.0	63.5
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	17.8	61.1	B	12.0	63.5
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	B	18.7	59.4	B	13.3	61.8
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	23.1	60.5	B	16.4	62.6
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	F	54.0	19.4	F	61.1	12.7
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	13.3	63.8	D	28.2	61.1
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	10.7	63.5	C	22.3	61.8
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	A	9.9	63.7	C	22.1	60.3
I-44	WB	Watson Rd On-Ramp	Merge	A	8.3	63.3	C	20.7	56.7
I-44	WB	West of Watson Rd	Freeway	B	11.1	63.2	D	27.0	57.5
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	16.1	54.7	C	26.3	52.4
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	13.4	62.5	C	24.8	59.1
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	11.0	60.9	C	22.2	53.8
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.3	64.0	C	20.7	54.7
I-44	WB	Under Bowles Rd	Freeway	A	9.2	64.2	D	27.0	51.9
I-44	WB	Bowles Rd On-Ramp	Merge	A	7.9	63.8	C	24.7	46.2
I-44	WB	West of Bowles Rd	Freeway	A	9.8	63.9	D	27.7	52.4
I-44	WB	Route 141 Off-Ramp	Diverge	A	9.8	63.7	D	31.8	53.9
I-44	WB	Route 141 On-Ramp	Merge	A	7.8	57.7	C	27.4	38.5
I-44	WB	West of Route 141	Freeway	A	9.4	64.0	C	23.4	59.9
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.1	43.383	B	17.3	42.5

Table C21 2020 Scenario 4 - VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	C	25.1	62.4	B	14.5	63.8
I-44	EB	Route 141 Off-Ramp	Diverge	C	20.2	58.3	B	11.4	60.7
I-44	EB	Route 141 On-Ramp	Merge	B	11.3	63.2	A	6.8	63.9
I-44	EB	East of Route 141	Freeway	B	14.1	63.3	A	8.5	63.9
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	26.0	59.9	B	16.9	62.2
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	16.3	61.7	B	12.1	62.4
I-44	EB	East of Bowles Ave.	Freeway	C	19.5	92.9	B	15.6	62.8
I-44	EB	Bowles Ave. On-Ramp	Merge	C	25.5	51.7	B	18.5	56.6
I-44	EB	East of Mraz Ln	Freeway	D	30.5	57.4	C	25.4	55.1
I-44	EB	Rudder Rd On-Ramp	Merge	B	19.7	61.0	B	18.9	58.3
I-44	EB	Between Rudder Rd and I-270	Freeway	D	27.5	54.6	D	27.4	50.2
I-44	EB	I-270 Off-Ramp	Diverge	C	27.5	54.6	C	27.4	50.2
I-44	EB	Watson Rd Off-Ramp	Diverge	B	14.7	63.3	A	9.7	63.4
I-44	EB	Southbound I-270 On-Ramp	Merge	B	17.0	63.4	B	11.7	63.7
I-44	EB	Northbound I-270 On-Ramp	Merge	B	19.4	59.4	B	12.3	63.2
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	19.4	59.4	B	12.3	63.2
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	19.4	59.4	B	12.3	63.2
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	B	19.7	59.2	B	13.5	61.5
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	24.4	60.1	B	16.8	62.5
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	C	25.2	35.3	B	12.5	37.4
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	13.3	63.8	D	28.2	61.1
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	10.7	63.5	C	22.3	61.8
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	A	9.9	63.7	C	24.5	57.0
I-44	WB	Watson Rd On-Ramp	Merge	A	8.3	63.4	C	20.4	57.3
I-44	WB	West of Watson Rd	Freeway	B	11.1	63.3	D	26.9	57.5
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	16.1	54.5	C	25.8	53.0
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	13.4	62.6	C	24.5	59.5
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	11.0	61.0	C	20.8	56.5
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.3	64.1	B	16.1	61.7
I-44	WB	Under Bowles Rd	Freeway	A	9.2	64.2	C	20.4	61.6
I-44	WB	Bowles Rd On-Ramp	Merge	A	7.9	63.8	B	17.2	60.5
I-44	WB	West of Bowles Rd	Freeway	A	9.8	63.9	C	21.7	60.0
I-44	WB	Route 141 Off-Ramp	Diverge	A	9.9	63.6	C	22.9	56.9
I-44	WB	Route 141 On-Ramp	Merge	A	7.6	60.5	C	22.8	46.4
I-44	WB	West of Route 141	Freeway	A	9.5	64.1	C	23.3	60.2
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.1	43.4	B	17.3	42.5

Table C22 2035 Scenario 1 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	F	133.8	99%	F	115.4	108%
	Marshall Road	F	133.8	94%	F	116.9	97%
	Elam Road	D	35.9	96%	C	23.5	84%
	WB I-44 Ramps						
	EB I-44 Ramps						
	Meramec Station Road	E	65.8	86%	C	26.8	85%
	Centurion Drive	B	12.5	67%	A	8.2	69%
Maritz Road	N. Outer Road	A	7.4	34%	B	14.3	59%
	S. Outer Road	B	19.5	48%	B	10.2	50%
Bowles Road	N. Outer Road	C	22.3	81%	C	34.0	91%
	S. Outer Road	E	73.3	81%	E	65.6	91%
Rudder Road	S. Outer Road	B	11.8	60%	A	9.3	77%
Watson Road	Geyer Road	C	31.6	67%	D	52.7	85%
Lindbergh Blvd	WB I-44 Ramps	F	114.2	97%	E	73.9	97%
	EB I-44 Ramps	F	295.1	97%	B	18.8	97%

*sec/veh - seconds per vehicle

Table C23 2035 Scenario 2 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	E	65.7	101%	E	78.6	106%
	Marshall Road	E	72.7	94%	F	123.3	97%
	Elam Road	D	37.8	96%	C	22.4	84%
	WB I-44 Ramps						
	EB I-44 Ramps						
	Meramec Station Road	D	53.6	80%	B	17.6	80%
	Centurion Drive	B	11.6	62%	A	6.9	64%
Maritz Road	N. Outer Road	A	7.4	34%	B	14.3	59%
	S. Outer Road	B	19.5	48%	B	10.2	50%
Bowles Road	N. Outer Road	C	22.3	81%	C	34.0	91%
	S. Outer Road	E	73.3	81%	E	65.6	91%
Rudder Road	S. Outer Road	B	11.8	60%	A	9.3	77%
Watson Road	Geyer Road	C	31.6	67%	D	52.7	85%
Lindbergh Blvd	WB I-44 Ramps	F	114.2	97%	E	73.9	97%
	EB I-44 Ramps	F	295.1	97%	B	18.8	97%

*sec/veh - seconds per vehicle

Table C24 2035 Scenario 3 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	U	U	81%	U	U	102%
	Marshall Road	E	55.7	94%	F	116.1	97%
	Elam Road	D	36.2	95%	D	52.3	97%
	WB I-44 Ramps	F	87.6	110%	F	187.9	107%
	EB I-44 Ramps	B	18.1	110%	D	35.2	107%
	Meramec Station Road	E	68	86%	C	27.0	85%
	Centurion Drive	A	9.5	67%	A	8.1	69%
Maritz Road	N. Outer Road	A	7.4	34%	B	14.3	59%
	S. Outer Road	B	19.5	48%	B	10.2	50%
Bowles Road	N. Outer Road	C	22.3	81%	C	34.0	91%
	S. Outer Road	E	73.3	81%	E	65.6	91%
Rudder Road	S. Outer Road	B	11.8	60%	A	9.3	77%
Watson Road	Geyer Road	C	31.6	67%	D	52.7	85%
Lindbergh Blvd	WB I-44 Ramps	F	114.2	97%	E	73.9	97%
	EB I-44 Ramps	F	295.1	97%	B	18.8	97%

*sec/veh - seconds per vehicle

Table C25 2035 Scenario 4 - Synchro

Corridor	Intersection	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec.veh)*	ICU	LOS	Delay (sec.veh)*	ICU
Route 141	Vance Road	U	U	88%	U	U	102%
	Marshall Road	E	55.5	94%	F	119.1	70%
	Elam Road	D	38.9	95%	D	52.1	97%
	WB I-44 Ramps	C	20.9	76%	B	11.5	72%
	EB I-44 Ramps	C	29.8	85%	C	23.0	88%
	Meramec Station Road	E	69.3	86%	C	29.9	85%
	Centurion Drive	B	10.2	67%	A	9.3	69%
Maritz Road	N. Outer Road	A	7.4	34%	B	14.3	59%
	S. Outer Road	B	19.5	48%	B	10.2	50%
Bowles Road	N. Outer Road	C	22.3	81%	C	34.0	91%
	S. Outer Road	E	73.3	81%	E	65.6	91%
Rudder Road	S. Outer Road	B	11.8	60%	A	9.3	77%
Watson Road	Geyer Road	C	31.6	67%	D	52.7	85%
Lindbergh Blvd	WB I-44 Ramps	F	114.2	97%	E	73.9	97%
	EB I-44 Ramps	F	295.1	97%	B	18.8	97%

*sec/veh - seconds per vehicle

Table C26 2035 Scenario 1 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	33.1	58.7	C	18.3	60.0
Route 141 Off-Ramp	EB	Diverge	D	32.7	50.2	C	20.4	51.2
Route 141 On-Ramp	EB	Merge	C	21.6	54.0	B	15.7	55.0
East of Route 141	EB	Freeway	C	24.1	60.0	B	15.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	30.8	51.7	C	21.8	52.0
Mraz Ln Off-Ramp	EB	Diverge	C	26.1	51.6	B	17.6	52.1
East of Bowles Ave.	EB	Freeway	D	28.0	60.0	C	20.3	60.0
Bowles Ave. On-Ramp	EB	Merge	D	34.5	49.0	C	27.4	53.0
East of Mraz Ln	EB	Freeway	E	39.8	54.6	D	28.0	60.0
Rudder Rd On-Ramp	EB	Merge	F	27.4	49.0	C	24.9	51.0
Between Rudder Rd and I-270	EB	Freeway	D	31.2	59.4	D	27.5	60.0
Watson Rd Off-Ramp	EB	Diverge	C	27.8	51.3	E	35.2	51.5
Southbound I-270 On-Ramp	EB	Merge	D	30.9	52.0	C	21.8	54.0
Northbound I-270 On-Ramp	EB	Merge	D	31.7	52.0	C	21.1	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	23.7	60.0	B	15.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	25.4	50.8	B	17.6	51.5
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	26.5	53.0	B	19.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	24.7	60.0	B	16.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	13.5	60.0	D	28.1	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	18.4	51.1	E	37.1	50.4
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	15.1	50.3	E	36.2	45.3
Watson Rd On-Ramp	WB	Merge	B	15.5	55.0	D	31.4	52.0
West of Watson Rd	WB	Freeway	B	14.3	60.0	D	33.3	58.5
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	22.3	47.4	E	36.8	46.1
West of Soccer Park Off-Ramp	WB	Freeway	B	16.9	60.0	D	30.3	59.6
Bowles Rd Off-Ramp	WB	Diverge	C	25.1	50.2	F	38.8	50.0
Mraz Ln On-Ramp	WB	Merge	B	10.1	56.0	C	26.7	52.0
Under Bowles Rd	WB	Freeway	B	11.9	60.0	C	25.7	60.0
Bowles Rd On-Ramp	WB	Merge	B	11.2	56.0	C	27.6	52.0
West of Bowles Rd	WB	Freeway	B	12.6	60.0	D	26.7	60.0
Route 141 Off-Ramp	WB	Diverge	B	11.2	50.2	F	27.9	48.6
Route 141 On-Ramp	WB	Merge	B	14.1	55.0	D	30.0	52.0
West of Route 141	WB	Freeway	B	12.4	60.0	D	29.4	59.8

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C27 2035 Scenario 2 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	33.1	58.7	C	18.3	60.0
Route 141 Off-Ramp	EB	Diverge	D	32.7	50.2	C	20.4	51.2
Route 141 On-Ramp	EB	Merge	C	21.6	54.0	B	15.7	55.0
East of Route 141	EB	Freeway	C	24.1	60.0	B	15.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	30.8	51.7	C	21.8	52.0
Mraz Ln Off-Ramp	EB	Diverge	C	26.1	51.6	B	17.6	52.1
East of Bowles Ave.	EB	Freeway	D	28.0	60.0	C	20.3	60.0
Bowles Ave. On-Ramp	EB	Merge	D	34.5	49.0	C	27.4	53.0
East of Mraz Ln	EB	Freeway	E	39.8	54.6	D	28.0	60.0
Rudder Rd On-Ramp	EB	Merge	F	27.4	49.0	C	24.9	51.0
Between Rudder Rd and I-270	EB	Freeway	D	31.2	59.4	D	27.5	60.0
Watson Rd Off-Ramp	EB	Diverge	C	27.8	51.3	E	35.2	51.5
Southbound I-270 On-Ramp	EB	Merge	D	30.9	52.0	C	21.8	54.0
Northbound I-270 On-Ramp	EB	Merge	D	31.7	52.0	C	21.1	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	23.7	60.0	B	15.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	25.4	50.8	B	17.6	51.5
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	26.5	53.0	B	19.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	24.7	60.0	B	16.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	13.5	60.0	D	28.1	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	18.4	51.1	E	37.1	50.4
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	14.9	51.0	E	36.1	45.4
Watson Rd On-Ramp	WB	Merge	B	15.5	55.0	D	31.4	52.0
West of Watson Rd	WB	Freeway	B	14.3	60.0	D	33.3	58.5
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	22.3	47.4	E	36.8	46.1
West of Soccer Park Off-Ramp	WB	Freeway	B	16.9	60.0	D	30.3	59.6
Bowles Rd Off-Ramp	WB	Diverge	C	25.1	50.2	F	38.8	50.0
Mraz Ln On-Ramp	WB	Merge	B	10.1	56.0	C	26.7	52.0
Under Bowles Rd	WB	Freeway	B	11.9	60.0	C	25.7	60.0
Bowles Rd On-Ramp	WB	Merge	B	11.2	56.0	C	27.6	52.0
West of Bowles Rd	WB	Freeway	B	12.6	60.0	D	26.7	60.0
Route 141 Off-Ramp	WB	Diverge	B	11.2	50.2	F	27.9	48.6
Route 141 On-Ramp	WB	Merge	B	14.1	55.0	D	30.0	52.0
West of Route 141	WB	Freeway	B	12.4	60.0	D	29.4	59.8

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C28 2035 Scenario 3 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	33.1	58.7	C	18.3	60.0
Route 141 Off-Ramp	EB	Diverge	D	32.7	50.2	C	20.4	51.2
Route 141 On-Ramp	EB	Merge	C	21.6	54.0	B	15.7	55.0
East of Route 141	EB	Freeway	C	24.1	60.0	B	15.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	30.8	51.7	C	21.8	52.0
Mraz Ln Off-Ramp	EB	Diverge	C	26.1	51.6	B	17.6	52.1
East of Bowles Ave.	EB	Freeway	D	28.0	60.0	C	20.3	60.0
Bowles Ave. On-Ramp	EB	Merge	D	34.5	49.0	C	27.4	53.0
East of Mraz Ln	EB	Freeway	E	39.8	54.6	D	28.0	60.0
Rudder Rd On-Ramp	EB	Merge	F	13.6	52.0	B	11.1	54.0
Between Rudder Rd and I-270	EB	Freeway	C	24.7	60.0	C	22.0	60.0
Watson Rd Off-Ramp	EB	Diverge	C	27.8	51.3	E	35.2	51.5
Southbound I-270 On-Ramp	EB	Merge	D	30.9	52.0	C	21.8	54.0
Northbound I-270 On-Ramp	EB	Merge	D	31.7	52.0	C	21.1	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	23.7	60.0	B	15.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	25.4	50.8	B	17.6	51.5
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	26.5	53.0	B	19.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	24.7	60.0	B	16.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	13.5	60.0	D	28.1	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	18.4	51.1	E	37.1	50.4
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	14.9	51.0	E	36.1	45.4
Watson Rd On-Ramp	WB	Merge	B	15.5	55.0	D	31.4	52.0
West of Watson Rd	WB	Freeway	B	14.3	60.0	D	33.3	58.5
Northbound I-270 On-Ramp	WB	Merge	B	17.5	55.0	F	33.6	47.0
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	20.6	50.4	D	32.8	51.6
West of Soccer Park Off-Ramp	WB	Freeway	B	16.9	60.0	D	30.3	59.6
Bowles Rd Off-Ramp	WB	Diverge	C	25.1	50.2	F	38.8	50.0
Mraz Ln On-Ramp	WB	Merge	B	10.1	56.0	C	26.7	52.0
Under Bowles Rd	WB	Freeway	B	11.9	60.0	C	25.7	60.0
Bowles Rd On-Ramp	WB	Merge	B	11.2	56.0	C	27.6	52.0
West of Bowles Rd	WB	Freeway	B	12.6	60.0	D	26.7	60.0
Route 141 Off-Ramp	WB	Diverge	B	11.2	50.2	F	27.9	48.6
Route 141 On-Ramp	WB	Merge	B	14.1	55.0	D	30.0	52.0
West of Route 141	WB	Freeway	B	12.4	60.0	D	29.4	59.8

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table C29 2035 Scenario 4 – HCS+

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)	Avg. Speed (mph)	LOS	Density (pc/mi/ln)	Avg. Speed (mph)
West of Route 141	EB	Freeway	D	33.1	58.7	C	18.3	60.0
Route 141 Off-Ramp	EB	Diverge	D	32.7	50.2	C	20.4	51.2
Route 141 On-Ramp	EB	Merge	C	21.6	54.0	B	15.7	55.0
East of Route 141	EB	Freeway	C	24.1	60.0	B	15.9	60.0
Bowles Ave. Off-Ramp	EB	Diverge	D	30.8	51.7	C	21.8	52.0
Mraz Ln Off-Ramp	EB	Diverge	C	26.1	51.6	B	17.6	52.1
East of Bowles Ave.	EB	Freeway	D	28.0	60.0	C	20.3	60.0
Bowles Ave. On-Ramp	EB	Merge	D	34.5	49.0	C	27.4	53.0
East of Mraz Ln	EB	Freeway	E	39.8	54.6	D	28.0	60.0
Rudder Rd On-Ramp	EB	Merge	F	13.6	52.0	B	11.1	54.0
Between Rudder Rd and I-270	EB	Freeway	C	24.7	60.0	C	22.0	60.0
Watson Rd Off-Ramp	EB	Diverge	C	27.8	51.3	E	35.2	51.5
Southbound I-270 On-Ramp	EB	Merge	D	30.9	52.0	C	21.8	54.0
Northbound I-270 On-Ramp	EB	Merge	D	31.7	52.0	C	21.1	54.0
Between I-270 and Lindbergh Blvd	EB	Freeway	C	23.7	60.0	B	15.4	60.0
Lindbergh Blvd/US 67 Off-Ramp	EB	Diverge	C	25.4	50.8	B	17.6	51.5
Lindbergh Blvd/US 67 On-Ramp	EB	Merge	C	26.5	53.0	B	19.7	54.0
East of Lindbergh Blvd/US 67	EB	Freeway	C	24.7	60.0	B	16.8	60.0
East of Lindbergh Blvd/US 67	WB	Freeway	B	13.5	60.0	D	28.1	60.0
Lindbergh Blvd/US 67 Off-Ramp	WB	Diverge	B	18.4	51.1	E	37.1	50.4
Between Lindbergh Blvd/US 67 and I-270	WB	Weave	B	14.9	51.0	E	36.1	45.4
Watson Rd On-Ramp	WB	Merge	B	15.5	55.0	D	31.4	52.0
West of Watson Rd	WB	Freeway	B	14.3	60.0	D	33.3	58.5
Northbound I-270 On-Ramp	WB	Merge	B	17.5	55.0	F	33.6	47.0
Between I-270 and Soccer Park Off-Ramp	WB	Weave	C	20.6	50.4	D	32.8	51.6
West of Soccer Park Off-Ramp	WB	Freeway	B	16.9	60.0	D	30.3	59.6
Bowles Rd Off-Ramp	WB	Diverge	C	25.1	50.2	F	38.8	50.0
Mraz Ln On-Ramp	WB	Merge	B	10.1	56.0	C	26.7	52.0
Under Bowles Rd	WB	Freeway	B	11.9	60.0	C	25.7	60.0
Bowles Rd On-Ramp	WB	Merge	B	11.2	56.0	C	27.6	52.0
West of Bowles Rd	WB	Freeway	B	12.6	60.0	D	26.7	60.0
Route 141 Off-Ramp	WB	Diverge	A	-9.3	50.2	A	8.3	48.6
Northbound Route 141 On-Ramp	WB	Merge	B	12.9	54.0	C	25.8	53.0
Southbound Route 141 On-Ramp	WB	Merge	B	14.6	54.0	D	29.4	53.0
West of Route 141	WB	Freeway	B	12.4	60.0	D	29.4	59.8

Table C30 2035 Scenario 1 – VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	D	28.1	62.0	B	15.4	63.7
I-44	EB	Route 141 Off-Ramp	Diverge	C	24.3	53.8	B	12.1	60.8
I-44	EB	Route 141 On-Ramp	Merge	B	15.4	62.4	B	10.6	62.8
I-44	EB	East of Route 141	Freeway	C	19.7	61.0	B	13.3	62.9
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	26.1	61.5	B	17.6	63.3
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	19.0	59.4	B	12.8	62.9
I-44	EB	East of Bowles Ave.	Freeway	C	22.4	61.9	C	21.5	55.5
I-44	EB	Bowles Ave. On-Ramp	Merge	D	33.7	41.8	D	32.8	46.4
I-44	EB	East of Mraz Ln	Freeway	D	32.8	55.8	E	41.6	44.2
I-44	EB	Rudder Rd On-Ramp	Merge	C	21.1	59.5	E	37.9	39.0
I-44	EB	Between Rudder Rd and I-270	Freeway	D	31.1	50.5	F	52.2	33.1
I-44	EB	I-270 Off-Ramp	Diverge	D	31.1	50.5	E	52.2	33.1
I-44	EB	Watson Rd Off-Ramp	Diverge	B	15.7	63.2	A	10.0	63.3
I-44	EB	Southbound I-270 On-Ramp	Merge	B	18.1	63.1	B	11.5	63.9
I-44	EB	Northbound I-270 On-Ramp	Merge	C	20.8	58.7	B	12.2	63.4
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	20.8	58.7	B	12.2	63.4
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	C	20.8	58.7	B	12.2	63.4
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	C	21.3	57.9	B	13.6	61.6
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	D	26.1	59.3	B	16.9	62.5
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	C	24.5	34.9	C	23.3	30.9
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	14.4	63.2	F	45.4	41.5
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	11.6	62.2	D	34.8	43.3
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	B	10.5	63.7	C	25.3	56.7
I-44	WB	Watson Rd On-Ramp	Merge	A	8.9	63.2	C	22.4	57.4
I-44	WB	West of Watson Rd	Freeway	B	12.0	62.8	D	29.3	58.4
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	18.4	50.8	E	35.7	41.0
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	14.5	61.9	D	29.7	54.9
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	11.8	60.5	C	27.0	51.6
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.9	64.0	D	31.9	48.4
I-44	WB	Under Bowles Rd	Freeway	A	10.4	61.3	E	40.6	43.7
I-44	WB	Bowles Rd On-Ramp	Merge	B	11.6	53.3	E	39.0	37.7
I-44	WB	West of Bowles Rd	Freeway	D	27.4	27.1	F	54.1	30.2
I-44	WB	Route 141 Off-Ramp	Diverge	E	38.0	18.2	E	68.9	20.9
I-44	WB	Route 141 On-Ramp	Merge	A	7.7	59.2	D	31.0	35.0
I-44	WB	West of Route 141	Freeway	A	9.5	63.9	C	23.7	60.4
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.8	43.3	B	18.3	41.4

Table C31 2035 Scenario 2 - VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	D	30.4	57.9	B	15.4	63.7
I-44	EB	Route 141 Off-Ramp	Diverge	E	42.8	61.0	B	12.1	60.7
I-44	EB	Bowles Ave. Off-Ramp	Diverge	C	26.9	59.5	B	18.0	62.0
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	19.2	59.1	B	12.9	62.1
I-44	EB	East of Bowles Ave.	Freeway	C	23.3	59.8	C	21.7	54.9
I-44	EB	Bowles Ave. On-Ramp	Merge	E	42.5	33.3	E	35.3	41.9
I-44	EB	East of Mraz Ln	Freeway	D	34.6	53.2	F	47.3	37.7
I-44	EB	Rudder Rd On-Ramp	Merge	C	21.9	57.7	E	45.3	31.9
I-44	EB	Between Rudder Rd and I-270	Freeway	C	25.2	50.1	F	47.7	27.7
I-44	EB	I-270 Off-Ramp	Diverge	C	25.2	50.1	E	47.7	27.7
I-44	EB	Watson Rd Off-Ramp	Diverge	B	15.9	62.8	A	9.8	62.9
I-44	EB	Southbound I-270 On-Ramp	Merge	B	18.3	62.8	B	11.7	63.6
I-44	EB	Northbound I-270 On-Ramp	Merge	C	21.1	58.2	B	12.4	63.3
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	21.1	58.2	B	12.4	63.3
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	C	21.1	58.2	B	12.4	63.3
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	C	21.6	57.3	B	13.8	61.5
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	D	26.4	59.0	B	17.1	62.4
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	D	29.2	32.3	C	24.4	30.9
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	14.2	63.7	D	32.1	58.8
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	11.4	53.3	C	24.6	61.2
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	B	10.5	63.7	C	24.8	58.6
I-44	WB	Watson Rd On-Ramp	Merge	A	9.1	62.2	E	35.0	43.6
I-44	WB	West of Watson Rd	Freeway	B	12.2	61.7	E	38.8	50.1
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	18.5	50.5	F	46.6	37.1
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	14.7	61.5	D	27.5	56.1
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	12.1	59.2	C	23.5	53.8
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.9	63.7	C	27.4	49.5
I-44	WB	Under Bowles Rd	Freeway	A	9.9	63.8	E	36.7	45.4
I-44	WB	Bowles Rd On-Ramp	Merge	A	8.5	63.5	D	33.9	42.0
I-44	WB	West of Bowles Rd	Freeway	B	14.9	55.3	F	53.2	30.8
I-44	WB	Route 141 Off-Ramp	Diverge	B	15.4	46.3	E	76.1	18.4
I-44	WB	Route 141 On-Ramp	Merge	A	8.2	58.5	D	31.9	34.4
I-44	WB	West of Route 141	Freeway	A	9.7	63.6	C	24.7	59.1
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.8	43.2	B	18.0	42.3

Table C32 2035 Scenario 3 - VISSIM

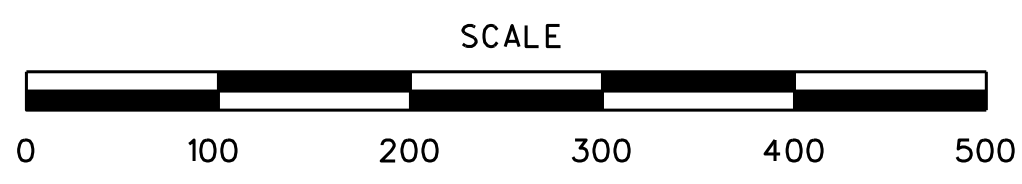
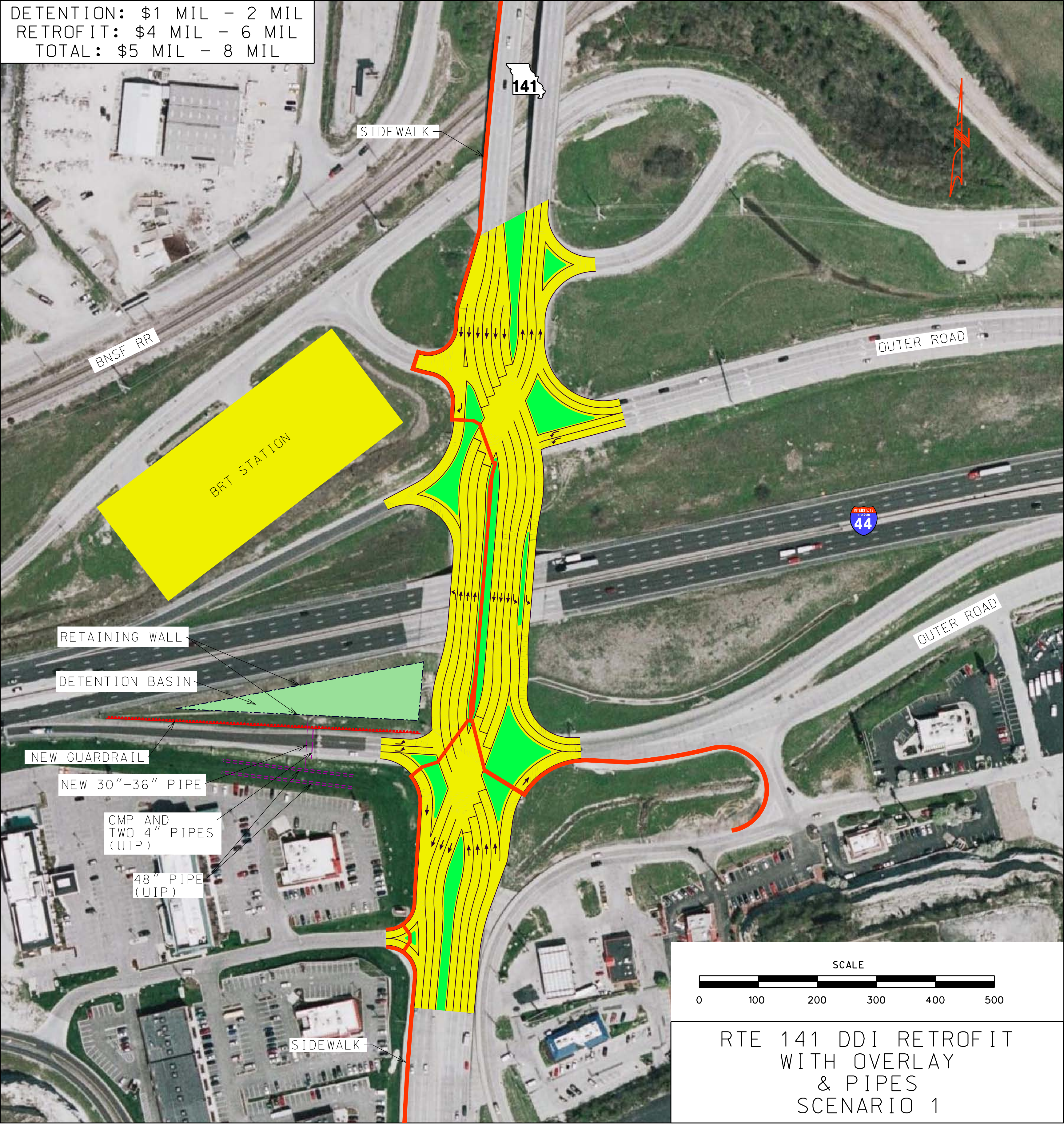
FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	D	33.9	53.7	B	15.4	63.7
I-44	EB	Route 141 Off-Ramp	Diverge	E	60.4	23.7	B	11.7	62.7
I-44	EB	Route 141 On-Ramp	Merge	E	57.4	13.4	A	7.2	63.8
I-44	EB	East of Route 141	Freeway	F	76.8	12.4	A	9.0	63.8
I-44	EB	Bowles Ave. Off-Ramp	Diverge	E	99.5	14.8	D	31.9	41.6
I-44	EB	Mraz Ln Off-Ramp	Diverge	B	15.4	60.3	A	9.7	63.3
I-44	EB	East of Bowles Ave.	Freeway	C	20.3	57.0	B	12.4	63.4
I-44	EB	Bowles Ave. On-Ramp	Merge	D	34.1	39.0	B	19.0	54.6
I-44	EB	East of Mraz Ln	Freeway	D	29.5	56.4	D	27.1	51.1
I-44	EB	Rudder Rd On-Ramp	Merge	B	19.0	60.8	B	18.9	58.6
I-44	EB	Between Rudder Rd and I-270	Freeway	D	26.4	54.7	D	26.5	52.4
I-44	EB	I-270 Off-Ramp	Diverge	C	26.4	54.7	C	26.5	52.4
I-44	EB	Watson Rd Off-Ramp	Diverge	B	14.4	63.1	A	9.8	63.7
I-44	EB	Southbound I-270 On-Ramp	Merge	B	17.0	63.2	B	11.6	63.8
I-44	EB	Northbound I-270 On-Ramp	Merge	B	19.5	59.8	B	12.3	63.4
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	19.5	59.8	B	12.3	63.4
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	19.5	59.8	B	12.3	63.4
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	C	20.1	58.8	B	13.6	61.6
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	C	24.9	59.7	B	16.9	62.5
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	F	57.6	18.5	F	102.6	7.4
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	14.2	63.7	D	32.2	58.5
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	11.4	63.3	C	24.7	60.9
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	B	10.5	63.7	C	24.7	58.7
I-44	WB	Watson Rd On-Ramp	Merge	A	9.1	62.0	C	27.4	50.1
I-44	WB	West of Watson Rd	Freeway	B	12.1	61.9	D	30.9	55.6
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	17.1	54.7	D	28.2	52.0
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	14.5	62.0	D	27.3	57.3
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	12.0	59.7	C	27.0	48.4
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.9	63.8	E	39.3	39.7
I-44	WB	Under Bowles Rd	Freeway	A	9.9	63.8	F	46.5	39.5
I-44	WB	Bowles Rd On-Ramp	Merge	A	8.5	63.3	E	45.8	37.0
I-44	WB	West of Bowles Rd	Freeway	A	10.6	63.3	F	53.9	34.8
I-44	WB	Route 141 Off-Ramp	Diverge	B	10.7	62.7	E	65.5	25.5
I-44	WB	Route 141 On-Ramp	Merge	A	8.2	57.3	D	28.7	37.6
I-44	WB	West of Route 141	Freeway	A	9.8	63.6	C	23.9	59.5
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.8	43.2	B	18.6	41.3

Table C33 2035 Scenario 4 - VISSIM

FREEWAY SEGMENT				AM PEAK HOUR			PM PEAK HOUR		
Route	Direction	Location	Type	LOS	DENSITY	SPEED	LOS	DENSITY	SPEED
I-44	EB	West of Route 141	Freeway	D	28.1	62.0	B	15.4	63.7
I-44	EB	Route 141 Off-Ramp	Diverge	C	22.9	56.7	B	12.2	60.3
I-44	EB	Route 141 On-Ramp	Merge	B	12.7	62.9	A	7.2	63.8
I-44	EB	East of Route 141	Freeway	B	15.9	63.0	A	9.0	63.9
I-44	EB	Bowles Ave. Off-Ramp	Diverge	D	29.3	58.5	B	18.2	62.0
I-44	EB	Mraz Ln Off-Ramp	Diverge	C	21.1	57.5	B	13.0	62.1
I-44	EB	East of Bowles Ave.	Freeway	D	30.7	49.8	B	16.9	61.9
I-44	EB	Bowles Ave. On-Ramp	Merge	E	61.2	24.1	D	29.2	43.0
I-44	EB	East of Mraz Ln	Freeway	E	37.0	51.4	D	35.0	44.1
I-44	EB	Rudder Rd On-Ramp	Merge	C	22.4	58.2	C	24.8	52.3
I-44	EB	Between Rudder Rd and I-270	Freeway	D	30.1	54.0	E	42.1	43.7
I-44	EB	I-270 Off-Ramp	Diverge	D	30.1	54.0	E	42.1	43.7
I-44	EB	Watson Rd Off-Ramp	Diverge	B	16.5	62.5	B	10.4	63.2
I-44	EB	Southbound I-270 On-Ramp	Merge	B	18.9	62.7	B	12.2	63.6
I-44	EB	Northbound I-270 On-Ramp	Merge	C	21.9	57.5	B	12.7	63.3
I-44	EB	Between I-270 and Lindbergh Blvd	Freeway	C	21.9	57.5	B	12.7	63.3
I-44	EB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	C	21.9	57.5	B	12.7	63.3
I-44	EB	Lindbergh Blvd/US 67 On-Ramp	Merge	C	22.2	57.0	B	14.1	61.5
I-44	EB	East of Lindbergh Blvd/US 67	Freeway	D	27.2	58.4	B	17.5	62.3
C-D Road	EB	Between Bowles Rd and Mraz Ln	Weave	A	7.4	35.1	B	16.2	34.5
I-44	WB	East of Lindbergh Blvd/US 67	Freeway	B	14.2	63.7	D	32.2	58.5
I-44	WB	Lindbergh Blvd/US 67 Off-Ramp	Diverge	B	11.4	63.3	C	24.7	61.0
I-44	WB	Between Lindbergh Blvd/US 67 and I-270	Weave	B	12.5	63.7	C	26.7	54.5
I-44	WB	Watson Rd On-Ramp	Merge	A	9.1	62.0	C	24.8	52.2
I-44	WB	West of Watson Rd	Freeway	B	12.1	62.0	D	30.3	56.7
I-44	WB	Between I-270 and Soccer Park Off-Ramp	Weave	B	17.2	54.7	D	28.5	51.8
I-44	WB	West of Soccer Park Off-Ramp	Freeway	B	14.5	61.9	D	26.8	58.7
I-44	WB	Bowles Rd Off-Ramp	Diverge	B	12.1	59.0	C	22.3	56.3
I-44	WB	Mraz Ln On-Ramp	Merge	A	7.9	63.8	B	17.9	60.8
I-44	WB	Under Bowles Rd	Freeway	A	9.9	63.8	C	22.3	60.8
I-44	WB	Bowles Rd On-Ramp	Merge	A	8.5	63.3	B	19.0	59.2
I-44	WB	West of Bowles Rd	Freeway	A	10.6	63.3	C	24.6	57.1
I-44	WB	Route 141 Off-Ramp	Diverge	B	10.7	62.7	D	33.9	41.4
I-44	WB	Route 141 On-Ramp	Merge	A	8.1	60.0	C	26.5	43.9
I-44	WB	West of Route 141	Freeway	A	10.2	63.6	D	26.2	58.9
C-D Road	WB	Between Bowles Rd and Mraz Ln	Weave	B	11.8	43.2	B	18.3	42.3

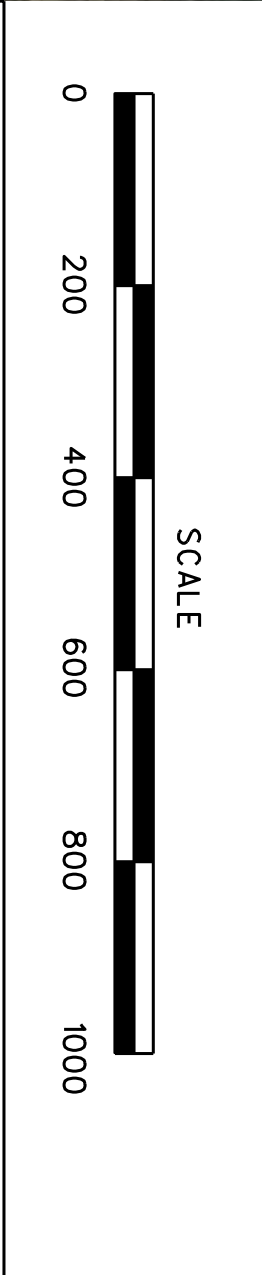
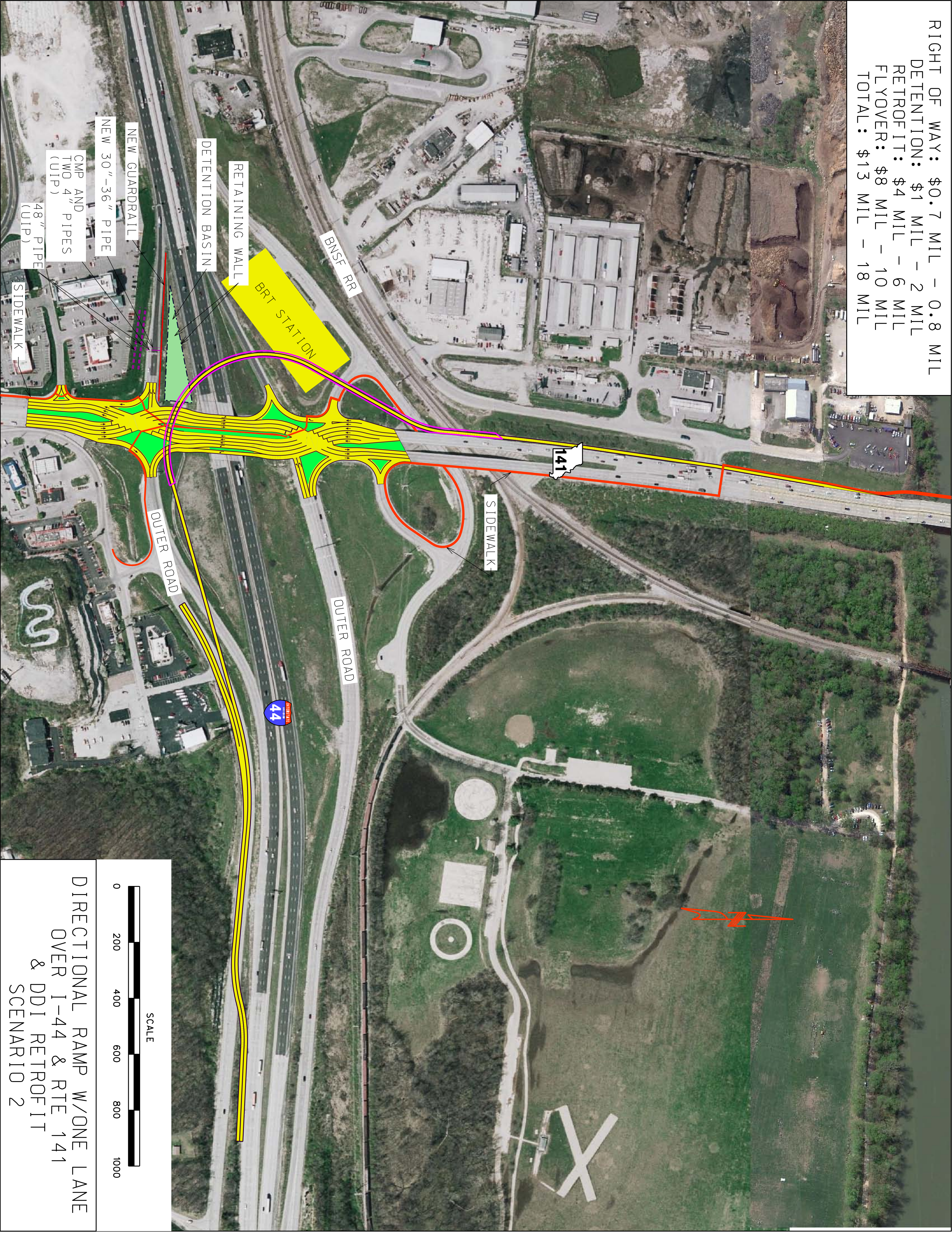
Appendix D – Conceptual Layouts for Final Alternatives

DETENTION: \$1 MIL - 2 MIL
RETROFIT: \$4 MIL - 6 MIL
TOTAL: \$5 MIL - 8 MIL



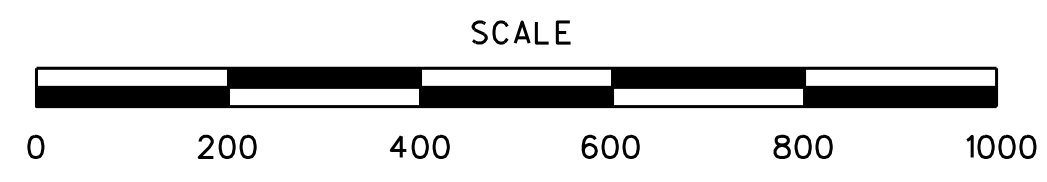
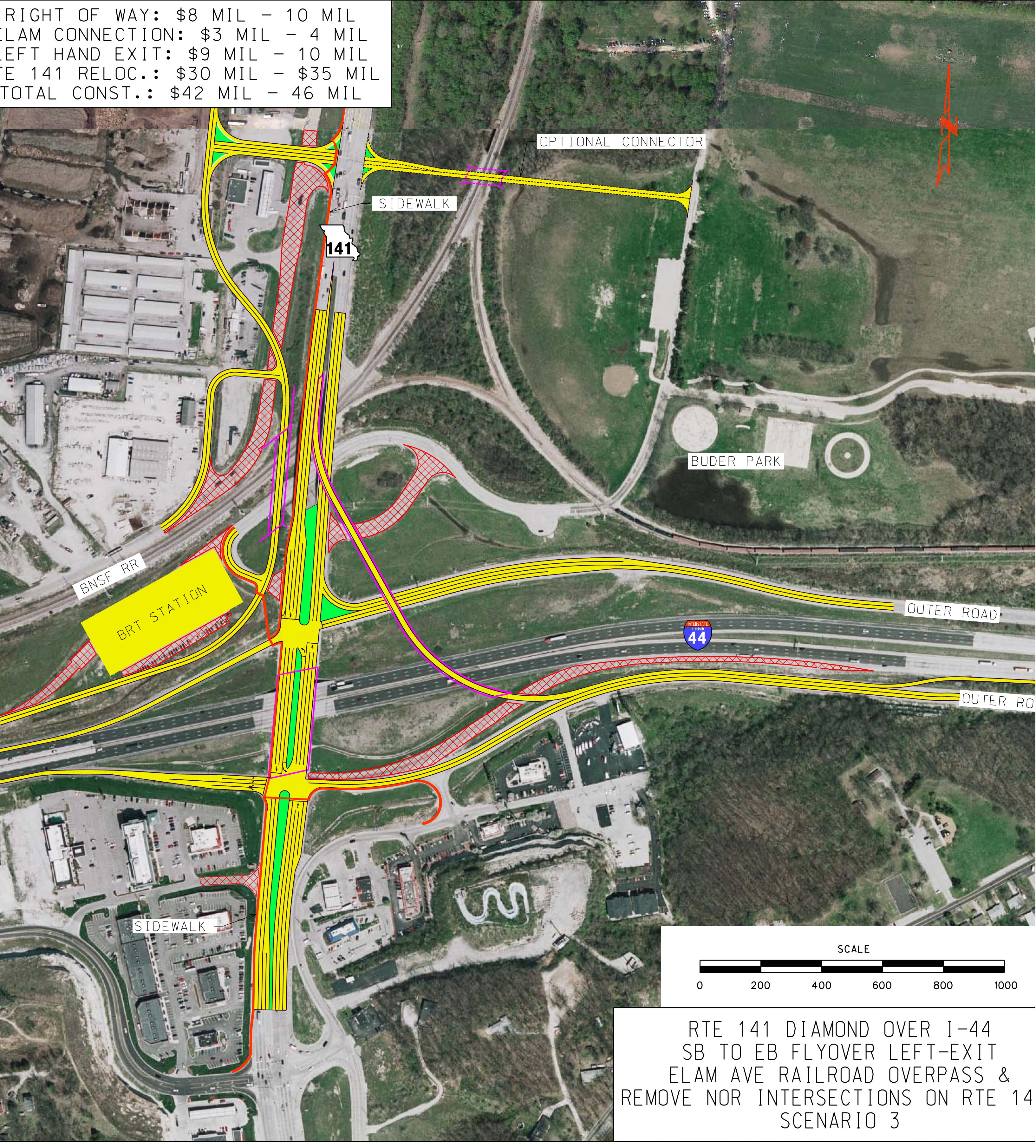
RTE 141 DDI RETROFIT
WITH OVERLAY
& PIPES
SCENARIO 1

RIGHT OF WAY: \$0.7 MIL – 0.8 MIL
DETENTION: \$1 MIL – 2 MIL
RETROFIT: \$4 MIL – 6 MIL
FLYOVER: \$8 MIL – 10 MIL
TOTAL: \$13 MIL – 18 MIL



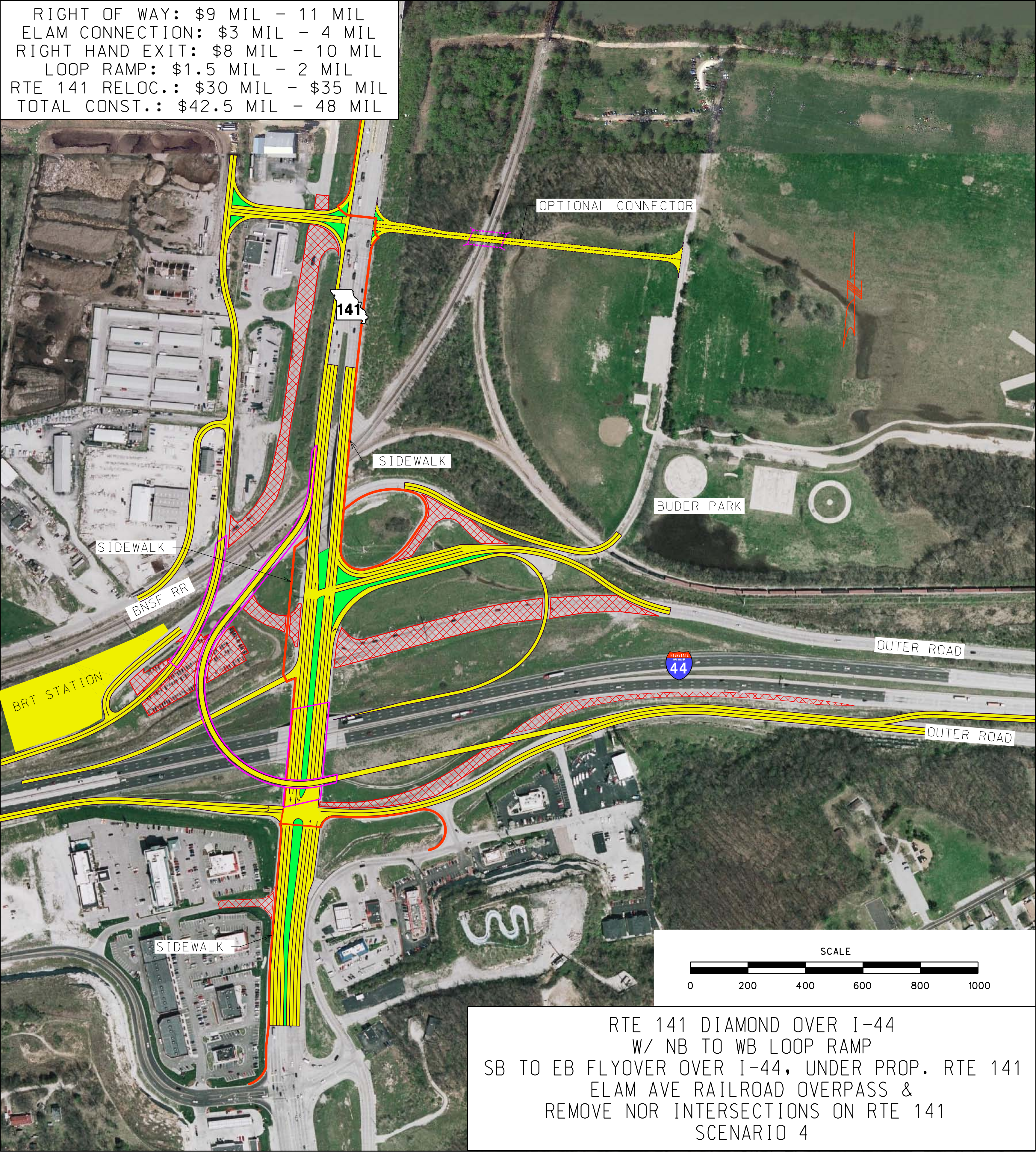
DIRECTIONAL RAMP W/ONE LANE
OVER I-44 & RTE 141
& DDI RETROFIT
SCENARIO 2

RIGHT OF WAY: \$8 MIL - 10 MIL
ELAM CONNECTION: \$3 MIL - 4 MIL
LEFT HAND EXIT: \$9 MIL - 10 MIL
RTE 141 RELOC.: \$30 MIL - \$35 MIL
TOTAL CONST.: \$42 MIL - 46 MIL



RTE 141 DIAMOND OVER I-44
SB TO EB FLYOVER LEFT-EXIT
ELAM AVE RAILROAD OVERPASS &
REMOVE NOR INTERSECTIONS ON RTE 14
SCENARIO 3

RIGHT OF WAY: \$9 MIL - 11 MIL
ELAM CONNECTION: \$3 MIL - 4 MIL
RIGHT HAND EXIT: \$8 MIL - 10 MIL
LOOP RAMP: \$1.5 MIL - 2 MIL
RTE 141 RELOC.: \$30 MIL - \$35 MIL
TOTAL CONST.: \$42.5 MIL - 48 MIL



RTE 141 DIAMOND OVER I-44
W/ NB TO WB LOOP RAMP
SB TO EB FLYOVER OVER I-44, UNDER PROP. RTE 141
ELAM AVE RAILROAD OVERPASS &
REMOVE NOR INTERSECTIONS ON RTE 141
SCENARIO 4

CD ROAD: \$15 MIL - 20 MIL



BARRIER

WATSON ROAD

S GEYER ROAD

INTERSTATE
44

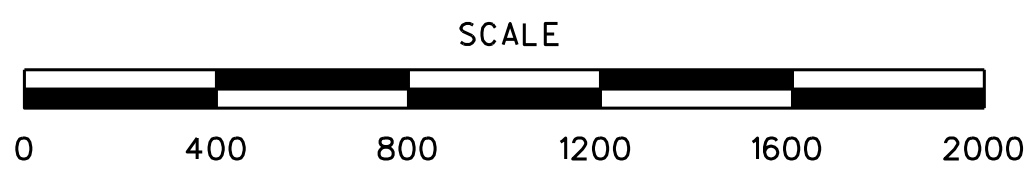
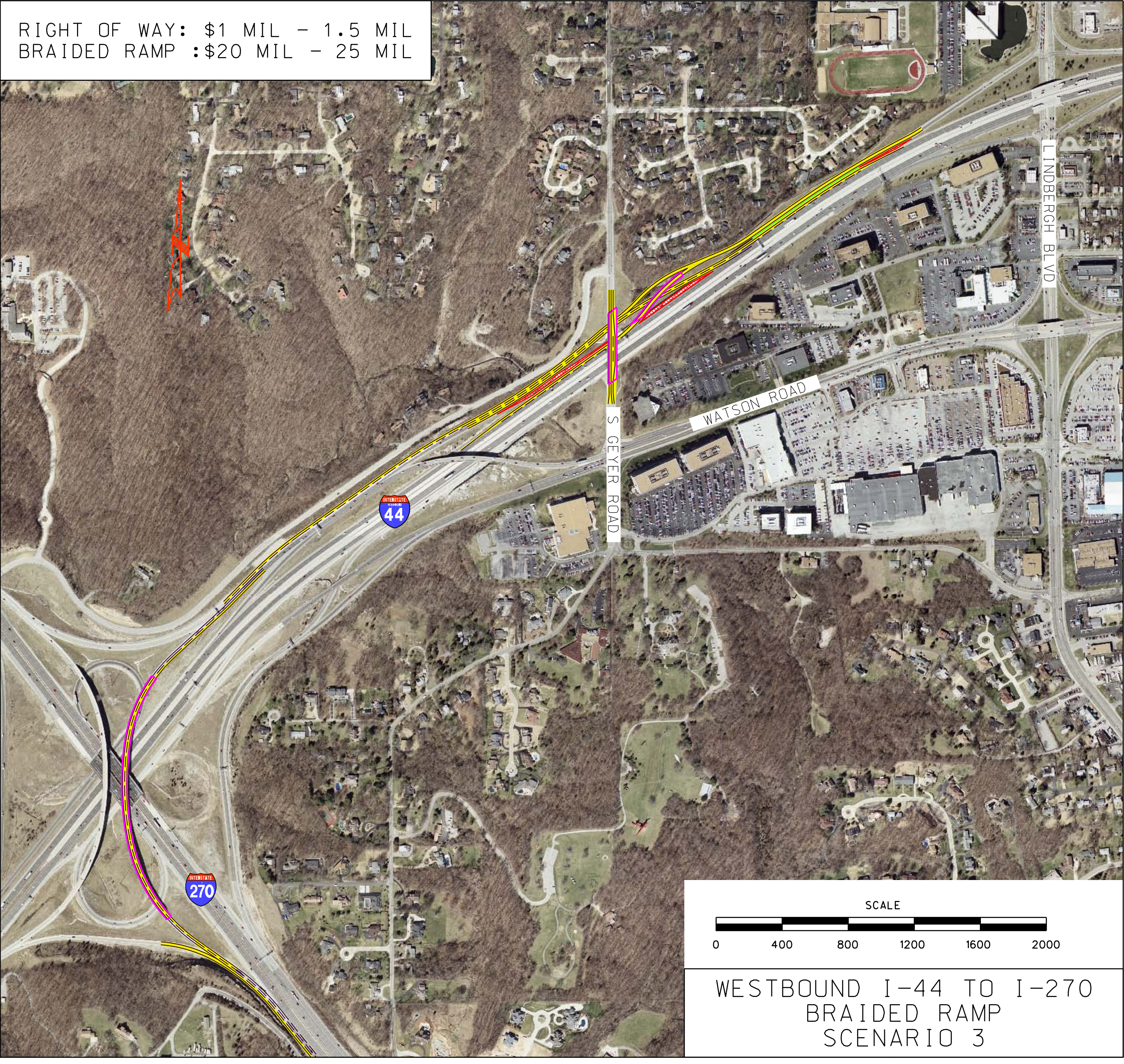
INTERSTATE
270

SCALE

0 200 400 600 800 1000

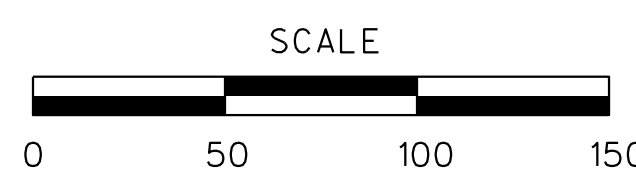
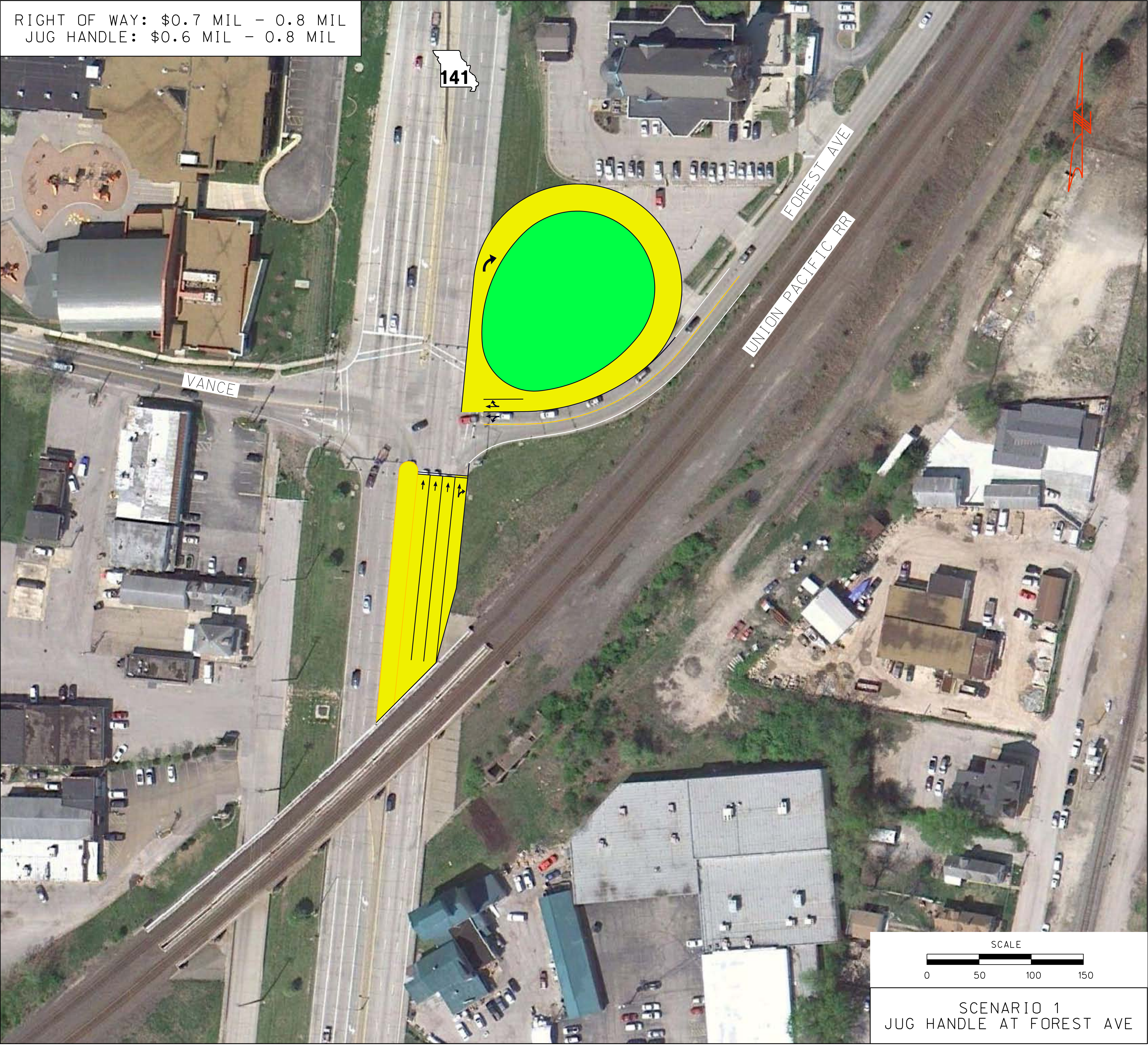
WESTBOUND I-44
TO I-270
SCENARIO 2

RIGHT OF WAY: \$1 MIL - 1.5 MIL
BRAIDED RAMP :\$20 MIL - 25 MIL



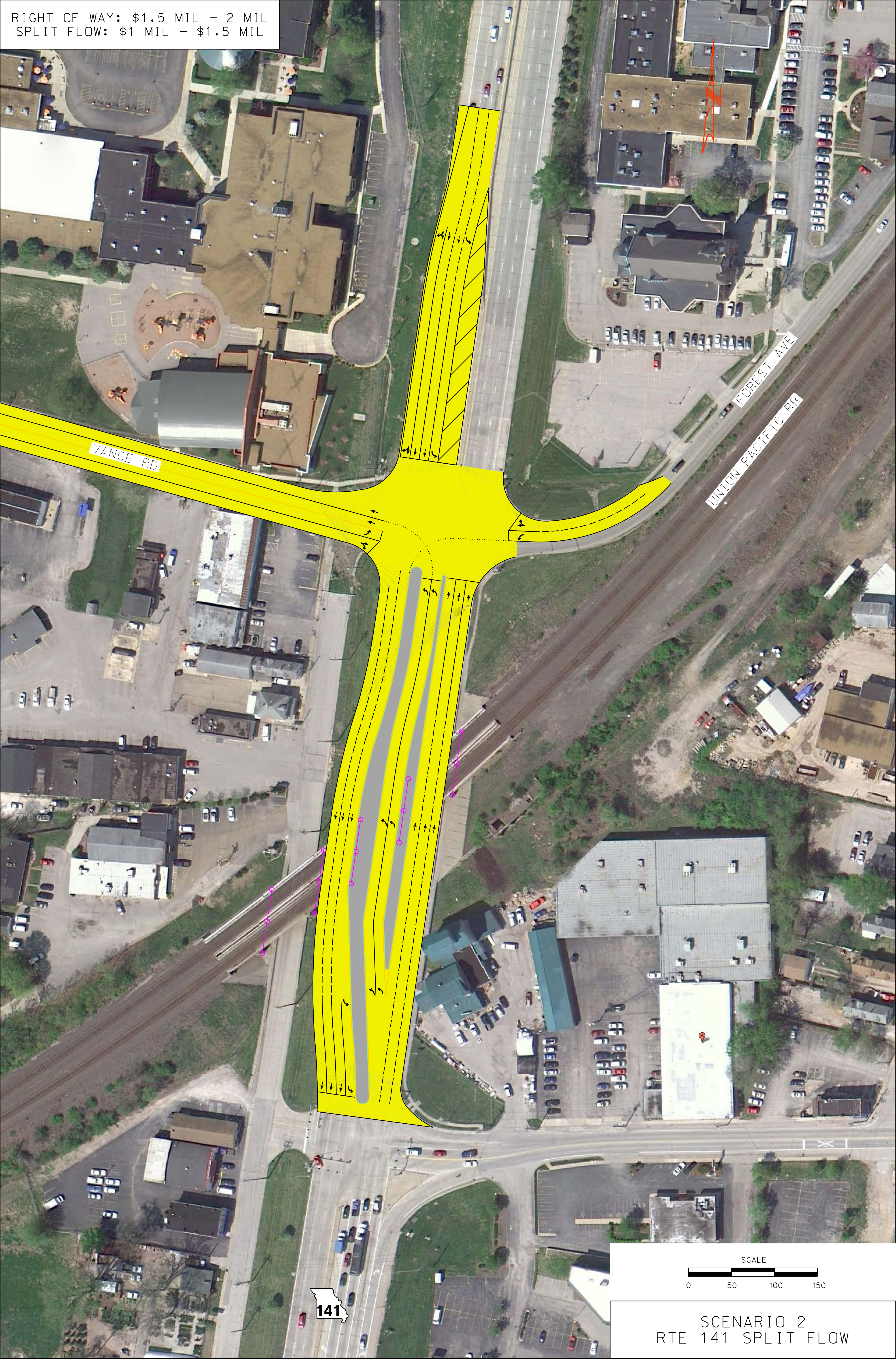
WESTBOUND I-44 TO I-270
BRAIDED RAMP
SCENARIO 3

RIGHT OF WAY: \$0.7 MIL - 0.8 MIL
JUG HANDLE: \$0.6 MIL - 0.8 MIL



SCENARIO 1
JUG HANDLE AT FOREST AVE

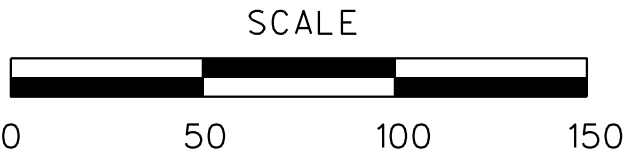
RIGHT OF WAY: \$1.5 MIL - 2 MIL
SPLIT FLOW: \$1 MIL - \$1.5 MIL



VANCE RD

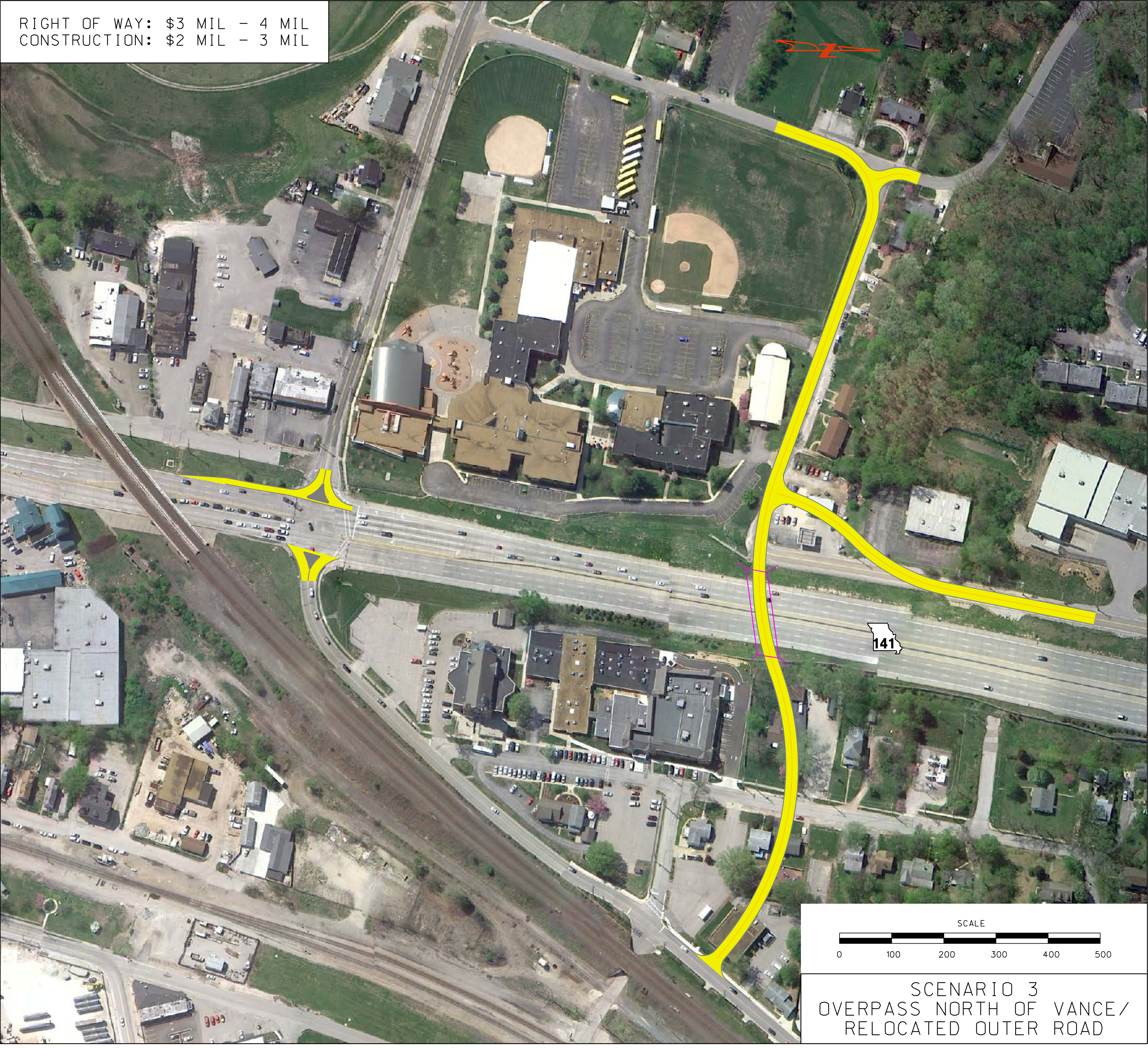
FOREST AVE

UNION PACIFIC RR

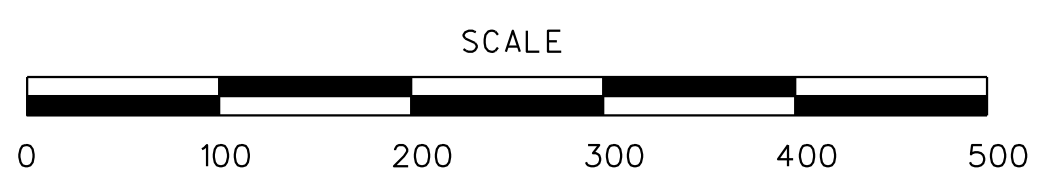


SCENARIO 2
RTE 141 SPLIT FLOW

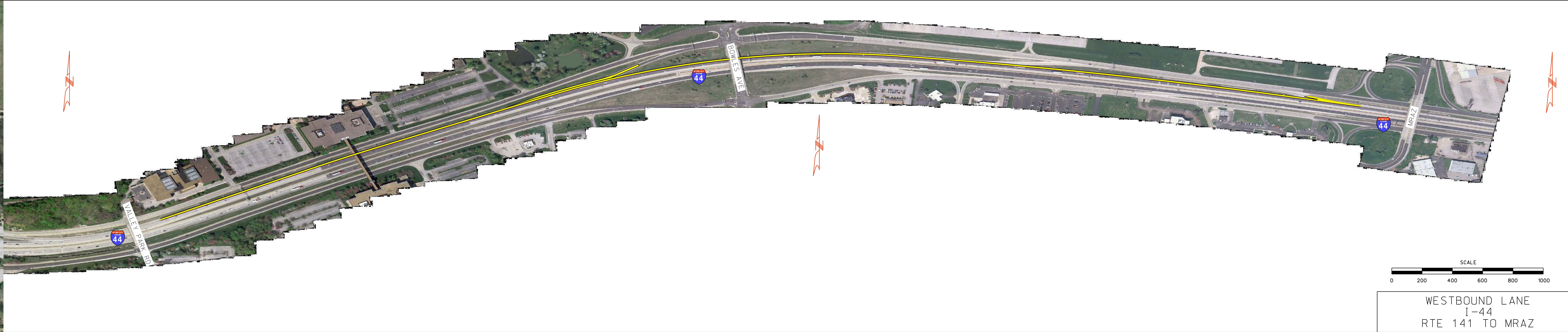
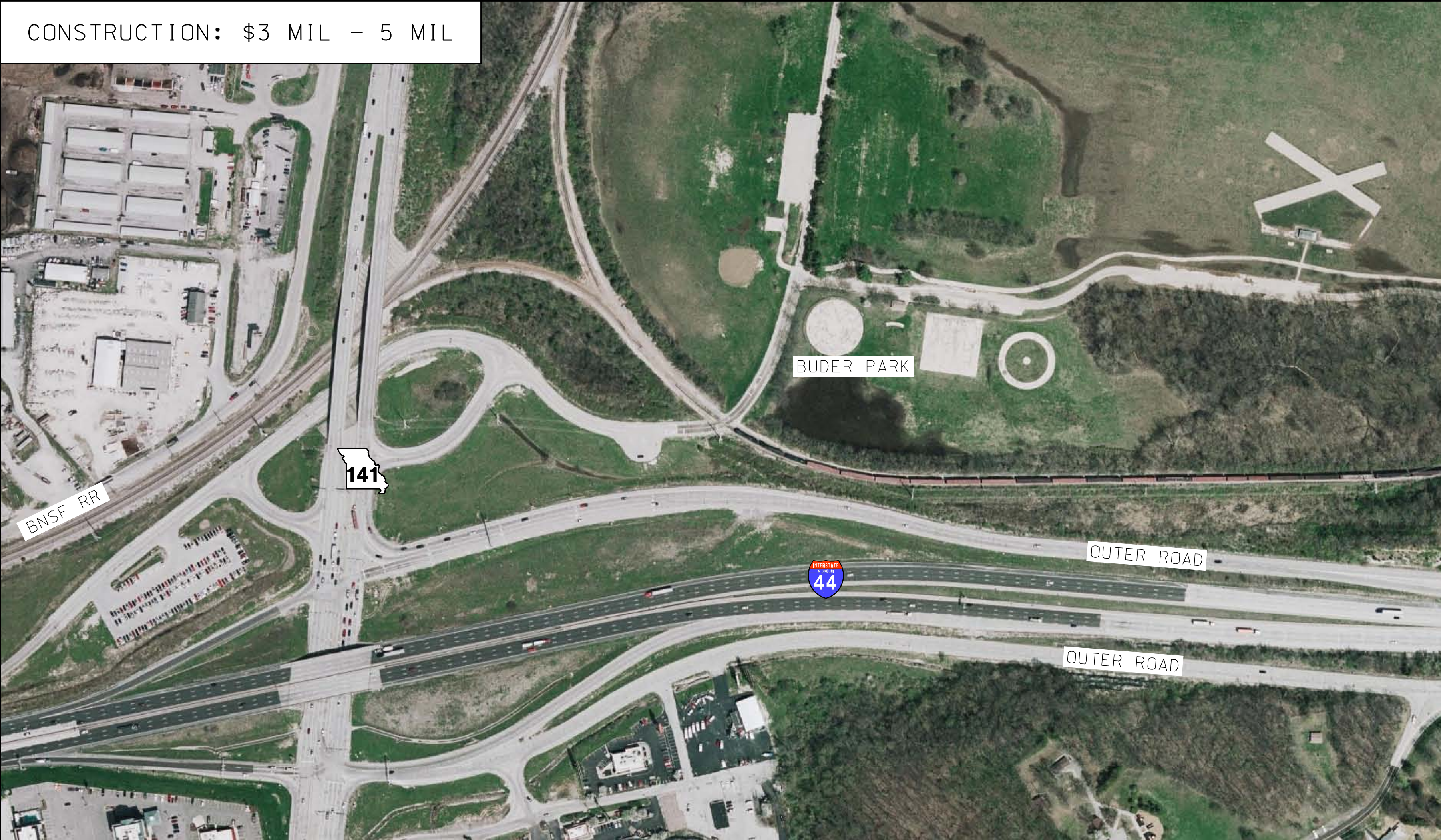
RIGHT OF WAY: \$3 MIL - 4 MIL
CONSTRUCTION: \$2 MIL - 3 MIL



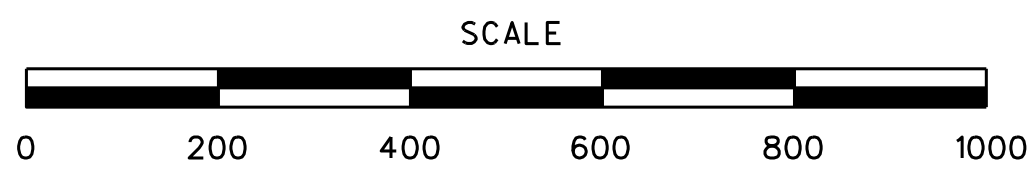
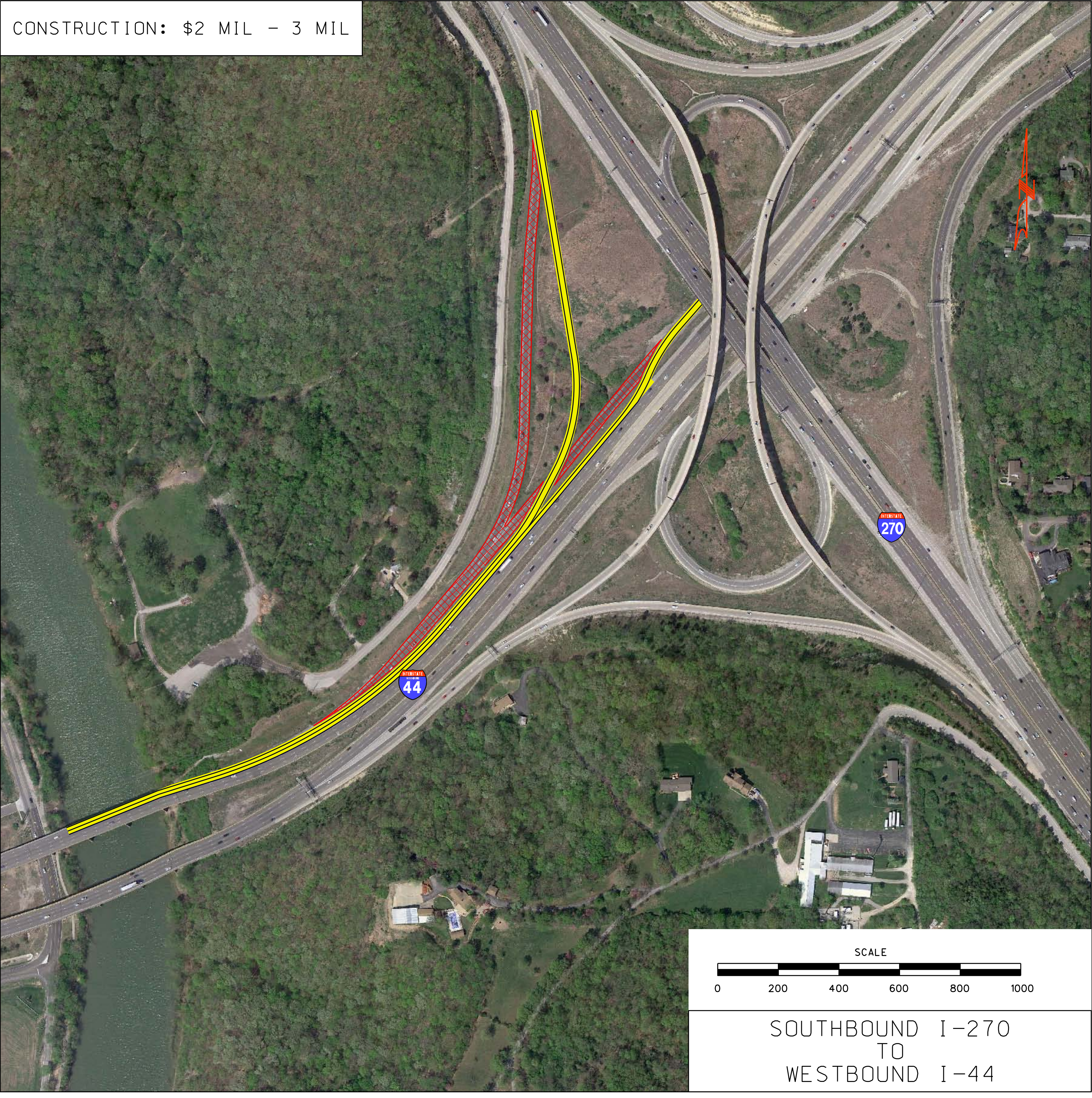
141



SCENARIO 3
OVERPASS NORTH OF VANCE/
RELOCATED OUTER ROAD



CONSTRUCTION: \$2 MIL - 3 MIL



SOUTHBOUND I-270
TO
WESTBOUND I-44

CONSTRUCTION: \$1 MIL - 1.5 MIL



MARSHALL
ROAD

PEDESTRIAN &
BIKE PATH

141

ELAM

SCALE



0 200 400 600 800 1000

RTE 141 DDI
SIDEWALK