TECHNICAL MEMORANDUM
TRAFFIC SAFETY & MULTIMODAL ALTERNATIVES ANALYSIS

Prepared for:	Missouri Department of Transportation
Prepared by:	Lochmueller Group
Project:	Future64: Communities. Transportation. Together. *Kingshighway to Jefferson*
Date:	February 15, 2023

INTRODUCTION

The accompanying Alternatives Analysis Traffic, Safety & Multimodal Conditions Technical Report, dated December 2, 2022, provides the analysis and resulting conclusions associated with the assessment of the No Build and three alternatives for improvement to the I-64 corridor within the PEL study area. The data within this report is intended to aid in the population of Level 2 Screening Criteria relating to vehicular or multimodal operations and safety.

TECHNICAL REPORT ORGANIZATION

This Technical Report consists of the following eight (8) sections, with the intent of introducing the various alternatives considered (including the No Build alternative), the traffic forecasting methodology, discussion the traffic, safety and multimodal aspects associated with each alternative, and finally, a comparison of the various alternatives and conclusions drawn:

1.0 Introduction
2.0 Future64PEL Project Alternatives
3.0 Traffic Forecasting
4.0 No Build Alternative
5.0 Corridor Alternative #1
6.0 Corridor Alternative #2
7.0 Corridor Alternative #3
8.0 Alternatives Comparison

Each alternative was evaluated on a standalone basis using various analytical tools and methods as outlined in the approved Methods and Assumptions Report and applied to the existing conditions in the approved Existing Traffic, Safety & Multimodal Conditions Report. Within each alternative's section, traffic operations, safety, and multimodal mobility (pedestrian, bike, transit) is discussed. This structure was chosen so that the reader could digest the mobility information while keeping the proposed configuration of each alternative readily in mind.

With respect to traffic operations, the lane configurations and associated geometrics (acceleration, deceleration, lane additions, etc.) was based upon what was required to achieve the minimum levels of service and mobility targets as presented in the approved Methods and Assumptions Report (LOS E, etc.). However, it was not always feasible to achieve the proposed minimum level of service and mobility targets. In such cases, a reasonable level of lanes and geometric improvements was assumed (multiple turn or through lanes, etc.).

Generally, the objective of the analysis for each alternative was to determine the mobility viability as proposed, determine any "red flags" associated with an alternative, and inform the screening criteria for the PEL. Once the reader has reviewed each alternative from a standalone perspective, Section 8, Alternatives Comparison, provides a summary of the alternatives with the intent of facilitating an efficient comparison. In addition, Section 8 provides a summary of key takeaways from the analysis and the subsequent comparison.

We trust that the accompanying Alternatives Analysis Traffic, Safety & Multimodal Conditions Technical Report will inform the PEL process within the confines of the approved scope

ALTERNATIVES ANALYSIS
TRAFFIC, SAFETY & MULTIMODAL CONDITIONS
TECHNICAL REPORT

Prepared for:

Prepared by:

On behalf of:

February 15, 2023

CONTENTS

APPENDICES

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway Officials
ADA	Americans with Disabilities Act
ADT	Average daily traffic
AJR	Access Justification Report
AM	Ante meridiem
BLTS	Bicycle Level of Traffic Stress
EPG	Engineering Policy Guide
EWG	East West Gateway
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FY	Fiscal year
HCM	Highway Capacity Manual
I-64	Interstate 64
LOS	Level of Service
MoDOT	Missouri Department of Transportation
MOE	Measure of Effectiveness
mph	Miles per hour
MSHP	Missouri State Highway Patrol
MTI	Mineta Transportation Institute
MUTCD	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Officials
NCHRP	National Cooperative Highway Research Program
pc/mi/ln	Passenger car per mile per lane
PEL	Planning and Environmental Linkages
PLOS	Pedestrian Level of Service
PM	Post meridiem
PMI	Potential Mobility Index
RITIS	Regional Integrated Transportation Information System
SAR	Statewide average crash rate
sec/veh	Seconds per vehicle
SPUI	Single-Point Urban Interchange
TAP	Technical Assistance Panel
ULI	Urban Land Institute
US 40	United States Highway 40
v/c	Volume to capacity
veh/ml/ln	Vehicle per mile per lane
VISSIM	Verkehr In Städten - SIMulationsmodell
vpd	Vehicles per day
vph	Vehicles per hour

1. INTRODUCTION

The purpose of the Future64 Kingshighway to Jefferson Planning and Environmental Linkages (PEL) Study for Interstate 64 (I-64) between Jefferson Ave. and Kingshighway Blvd. is to examine the existing conditions, issues, and needs of the corridor in the urban context. This type of study is generally conducted before any project construction phasing is identified, and before specific problems and solutions are known.

A key focus of this PEL is to address immediate asset management needs in the corridor while capitalizing on the opportunity to examine the corridor holistically. The intended outcome is to develop an actionable plan for near-term and long-term improvements to address transportation issues in a corridor or a specific location.

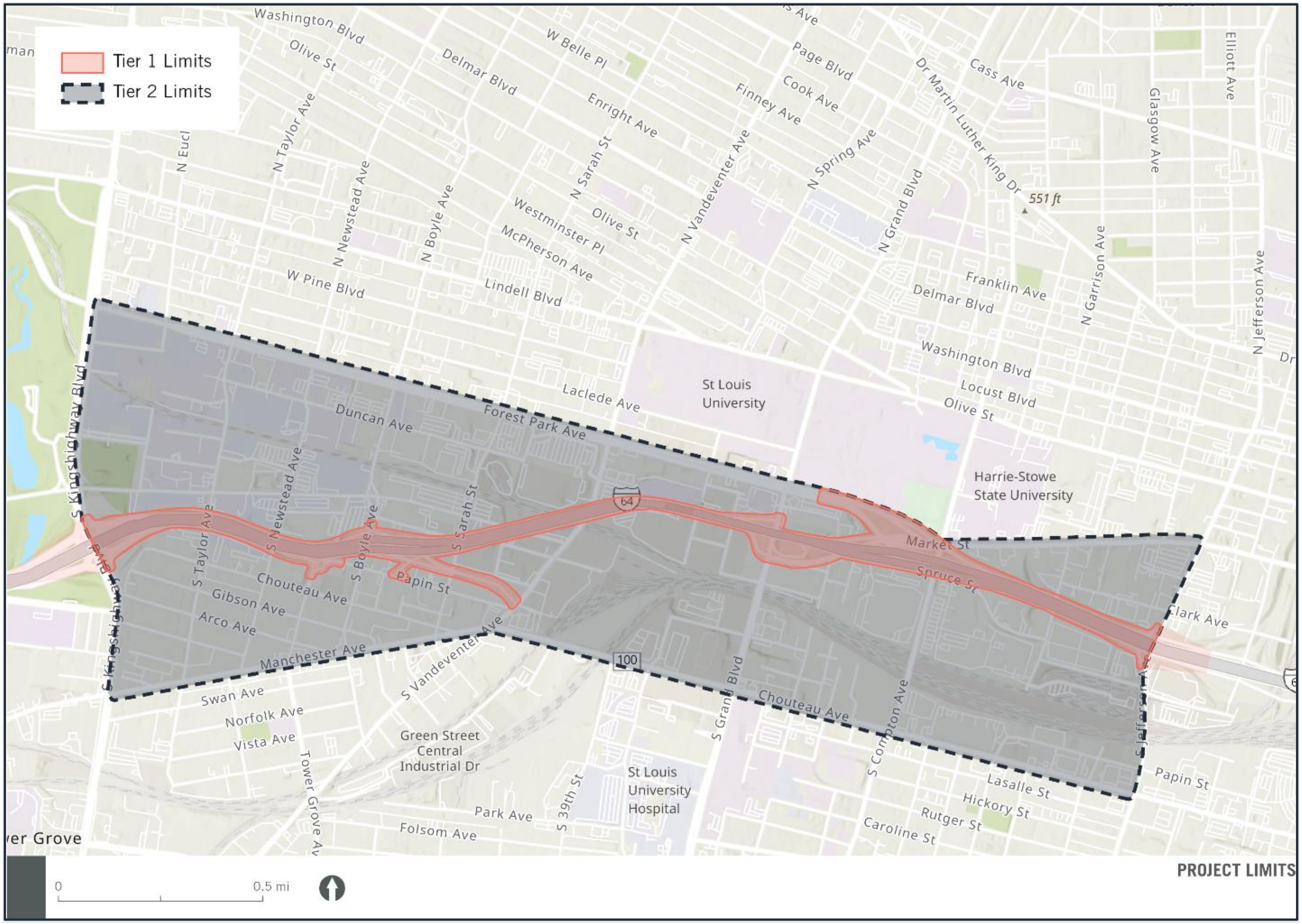
A critical first step in identifying potential transportation improvements along any corridor is to evaluate traffic, safety, and multimodal conditions as they currently exist. Gaining insight into the existing constraints can help guide the development of infrastructure improvements that address the needs and wants of all users along and adjacent to the corridor. Therefore, the Existing Conditions Technical Report, dated June 29, 2022, detailed the existing traffic, safety, and multimodal conditions within the Future64 PEL study area, in that order.

Once the existing conditions were established, the effort turned to developing the traffic forecasts for the horizon year, defined as Year 2050 for the Future64 PEL. Armed with traffic and multimodal projections, it was then possible to compare three corridor-wide improvement scenarios to one another as well as to the No Build (Maintenance Only) scenario. Each improvement scenario considers the implementation of a specific alternative at a designated location within the study area. Conversely, the No Build (Maintenance Only) scenario assumes the vehicular infrastructure would be unchanged yet maintained and that pedestrian and bicycle network improvements that have already been identified by MoDOT, City of St. Louis, and/or Great Rivers Greenway within the study area would be in place. The intent of this report is to summarize the alternatives analysis with respect to traffic, safety and multimodal conditions to inform the screening criteria for the PEL overall.

1.1. STUDY AREA

The reader is reminded that the Future64 PEL study area generally extends from Kingshighway Blvd. to the west to Jefferson Ave. to the east, and Forest Park Ave. to the north and Route 100 (Chouteau Ave./Manchester Ave.) to the south. The study area is broken into two tiers. The Tier 1 limits are defined as the area between Kingshighway Blvd. and Jefferson Ave. specific to the interstate system and contained within MoDOT right-of-way, inclusive of all merge, diverge, and weave sections, as well as the ramp terminals at each of the interchanges. Tier 2 limits encompass I-64 and the local transportation network that interfaces with I-64, including multimodal facilities, between Forest Park Ave./Market St. and Route 100 (Manchester Ave./Chouteau Ave.). The overall study area and Tier 1 and Tier 2 limits are shown in **Figure 1.**

Figure 1. Future64 PEL Study Area



The I-64 corridor between Jefferson Ave. and Kingshighway Blvd. is in a redeveloping, dense, urban environment where major stakeholders are actively planning for new employment centers, housing units, retail, and entertainment. Additionally, the corridor features significant existing and planned multimodal investments, and thus this study evaluates transportation use by all modes. I-64 is directly tied to the local City of St. Louis street grid via several interchanges. Therefore, the study area includes portions of the local transportation network, which necessitates an urban corridor-based approach to consider investment needs for not only MoDOT but other local agencies and partners as well.

Detailed information with respect to the existing roadway network within Tier 1 and Tier 2, inclusive of the six interchanges along I-64 and the 52 intersections analyzed (including 13 ramp terminals), can be found in Sections 1.2 and 2.1 of the Existing Traffic, Safety & Multimodal Conditions Technical Report.

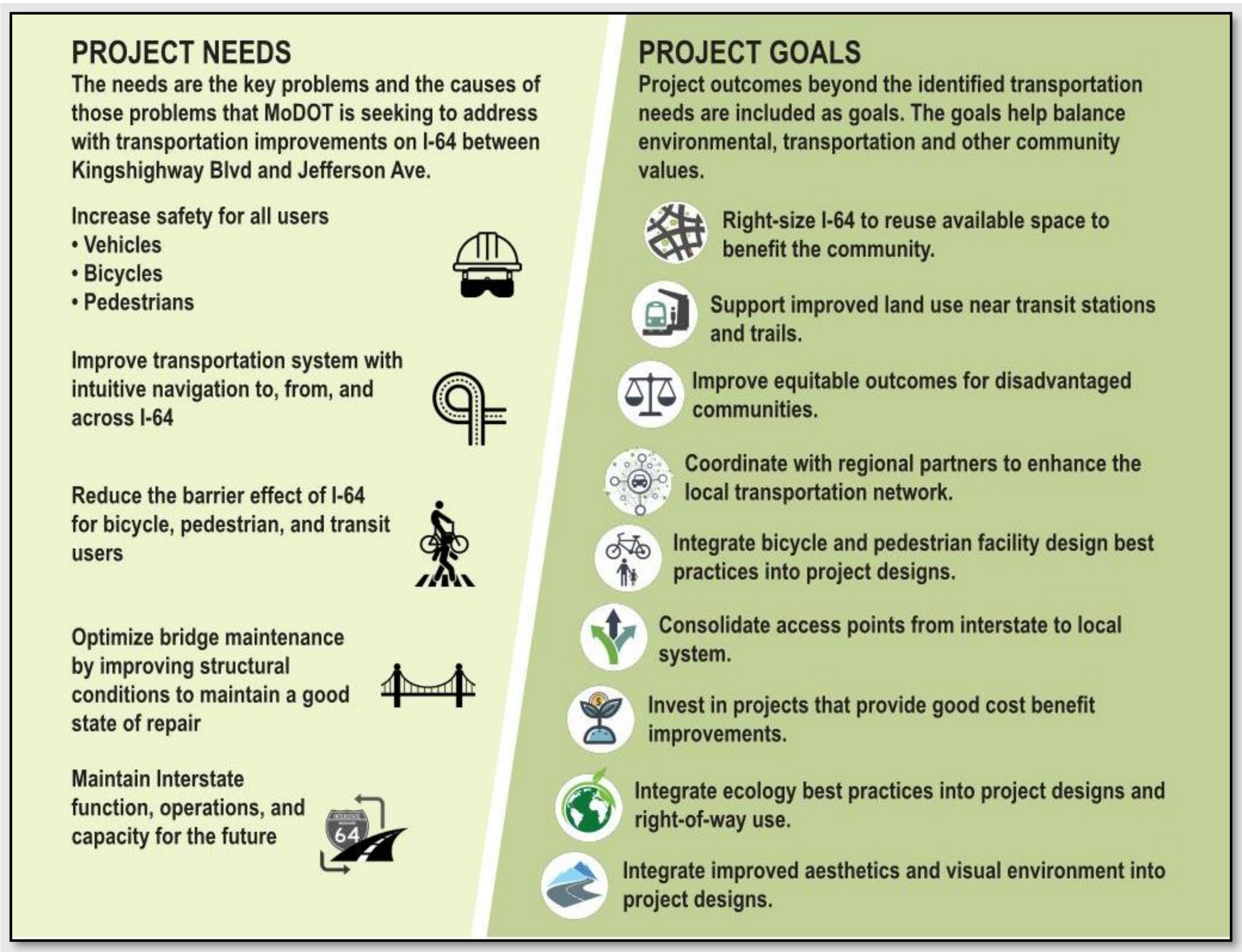
1.2. PURPOSE & NEED

A critical process within the Future64 PEL was the development of a Purpose and Need Statement, which was completed in July 2022 with FHWA concurrence. The Purpose for the PEL was defined as:

> *The purpose of the reasonable transportation improvements on I-64 between Kingshighway Blvd. and Jefferson Ave. is to renew and modify the transportation system to have safe and reliable facilities for all users that improve access to destinations and support community vitality for the long term.*

In addition, the needs for transportation improvements on I-64 between Kingshighway Blvd. and Jefferson Ave. were characterized by the points illustrated in **Figure 2.** The July 2022 Purpose and Need Statement provides supporting evidence for the five needs identified. In addition, the Statement includes nine goals for the Future64 PEL that include opportunities for community buildings, equitable outcomes, regional coordination, strategic investments, incorporation of best practices and placemaking, as also shown below in Figure 2.

Figure 2. Future64 PEL Needs & Goals



Again, the objective of this technical report is to evaluate with respect to traffic operations, safety, and multimodal conditions the three corridor-wide improvement scenarios as well as to the No Build (Maintenance Only) scenario with the intent of satisfying the identified needs from the Purpose and Need Statement while striving to achieve the goals set for the corridor. To accomplish this, Measures of Effectiveness (MOE) were approved in the Methods & Assumptions Report (June 2022) and utilized in this Technical Report that relate to the purpose and need presented above. The measures used in this report include both movement of vehicles and people, as shown in **Table 1**.

Table 1. Measures of Effectiveness Application

Facility	MOE	Application to Purpose & Need
I-64 Corridor	Speed Density Throughput Interchange Spacing Gore Spacing Ramp Lengths Acceleration/Deceleration Lengths Shoulder Widths	• Increased safety for vehicles • Improved transportation system for vehicles with intuitive navigation • Maintain interstate function • Right size I-64 • Consolidate access points for vehicles
I-64 Ramp Terminals	Queue Length Delay Volume/Capacity Ratio LOS	• Increased safety for vehicles • Improved transportation system for vehicles with intuitive navigation • Maintain interstate function • Right size I-64 • Consolidate access points for vehicles
Intersections (non-ramp terminal)	Volume/Capacity Ratio LOS	• Maintain function for vehicles
Pedestrian Facilities	PLOS Connectivity	• Increased safety for pedestrians • Reduce the barrier effect of I-64 for pedestrians and transit users • Integrate pedestrian facility design best practices
Bicycle Facilities	BLTS Connectivity	• Increased safety for cyclists • Reduce the barrier effect of I-64 for cyclists and transit users • Integrate bicycle facility design best practices
Transit	Transit Dependent Population	• Increased safety for transit users (pedestrians/cyclists) • Reduce the barrier effect of I-64 for transit users

2. FUTURE64 PEL PROJECT ALTERNATIVES

This section presents the No Build (Maintenance Only) alternative as well as the three alternatives reflective of improvements to the I-64 corridor within the study area that are being considered as part of the PEL. The No Build (Maintenance Only) corridor alternative assumes the vehicular infrastructure would be unchanged and simply maintained (bridges replaced in kind etc.) other than any future pedestrian and bicycle network improvements that have already been identified at the time of this study and would likely be in place.

Each of the improvement scenarios considers the implementation of a specific alternative at a designated location within the study area. The three corridor improvement scenarios were determined collaboratively with MoDOT during a work session in September 2022. However, it is important to note that the transportation modifications represented in the alternatives are not *commitments*, but rather recommendations to develop the alternatives for analysis purposes only. Additional study and engagement are needed through the decision-making process before MoDOT, the City of St. Louis and/or other partners commit to design and construction.

2.1. NO BUILD (MAINTENANCE ONLY) ALTERNATIVE

This scenario does not reflect any additional vehicular capacity expansions along the I-64 corridor nor the adjacent road network within the study area other than the completion of the Jefferson/22nd Street Interchange improvements (which were reflected in the Existing Conditions) and Compton Bridge replacement by the City of St. Louis. MoDOT's construction of the Jefferson/22nd Street interchange is complete, and the City's portion of that project is anticipated to be in place by May 2024. The Compton Bridge replacement should be completed by end of the year 2026. The six interchanges between Kingshighway Blvd. and Jefferson Ave./22nd St. would remain in place with their existing spacing (merge, diverge, weave and segments would all remain as reflected in the Existing Conditions). The area's intersections would remain as currently configured with the same means of traffic control.

With respect to multimodal uses, proposed improvements that have already been identified by MoDOT, City of St. Louis, and/or Great Rivers Greenway to the pedestrian and bicycle network in the study area were assumed to be in place in the No Build (Maintenance Only) scenario. These committed and likely improvements (meaning they have or are highly likely to have funds allocated for construction) consist of new segments of the Brickline Greenway, the Tower Grove-Cortex Connector, the Compton Avenue Cycle Track, Spring Avenue overpass, etc. In short, approximately 12 miles of bike/pedway projects have been committed to or are likely to be completed by 2050 and are reflected in the No Build (Maintenance Only) scenario.

The No Build (Maintenance Only) alternative is reflected in **Figure 3** and **Figure 4** while **Figure 5** reflects the above referenced pedestrian and bicycle improvements in greater detail.

Figure 3. No Build (Maintenance Only) Alternative: Tower Grove Ave./Boyle Ave./Vandeventer Ave.

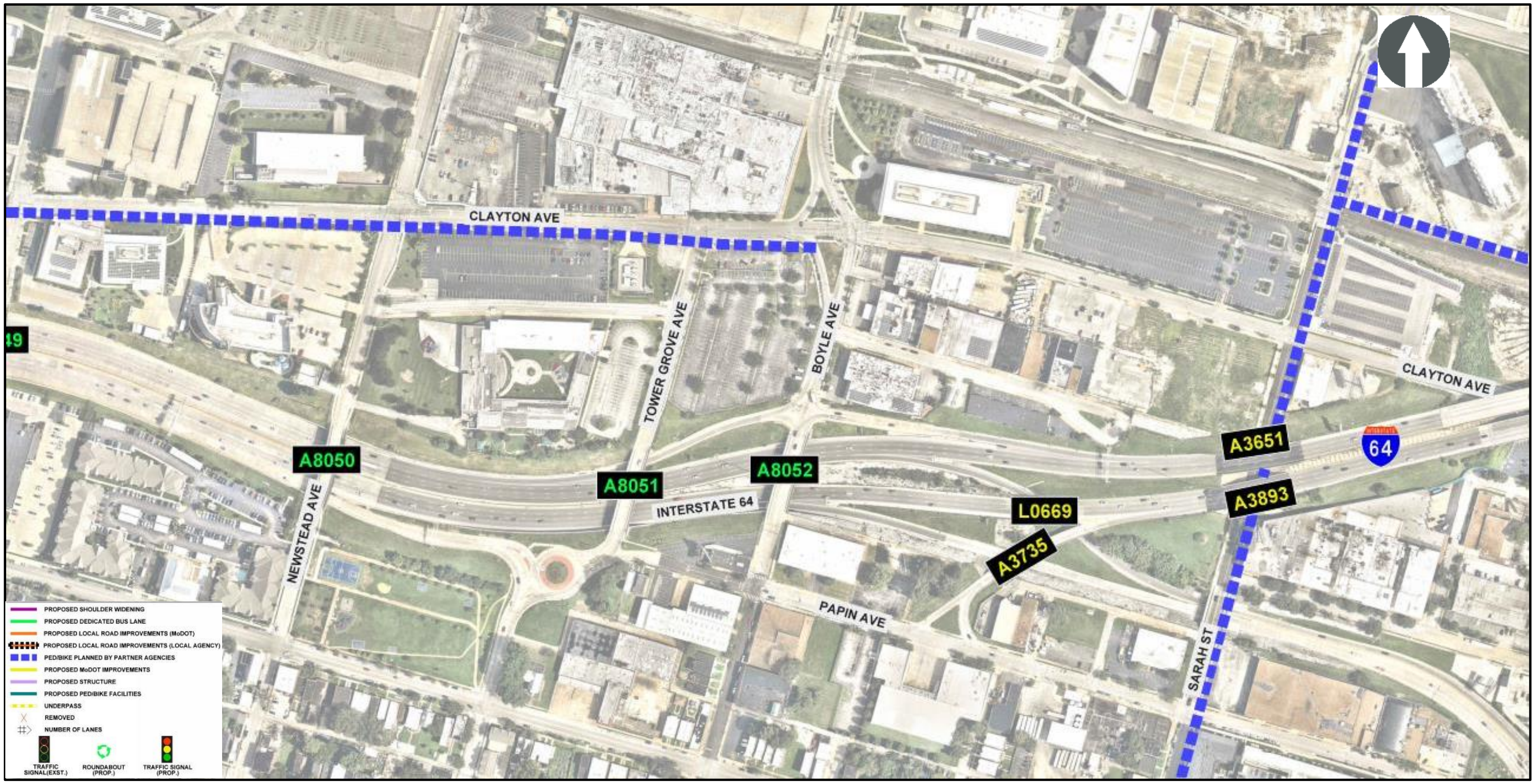


Figure 4. No Build (Maintenance Only) Alternative: Grand Blvd./Forest Park Ave./Market St./Compton Ave.

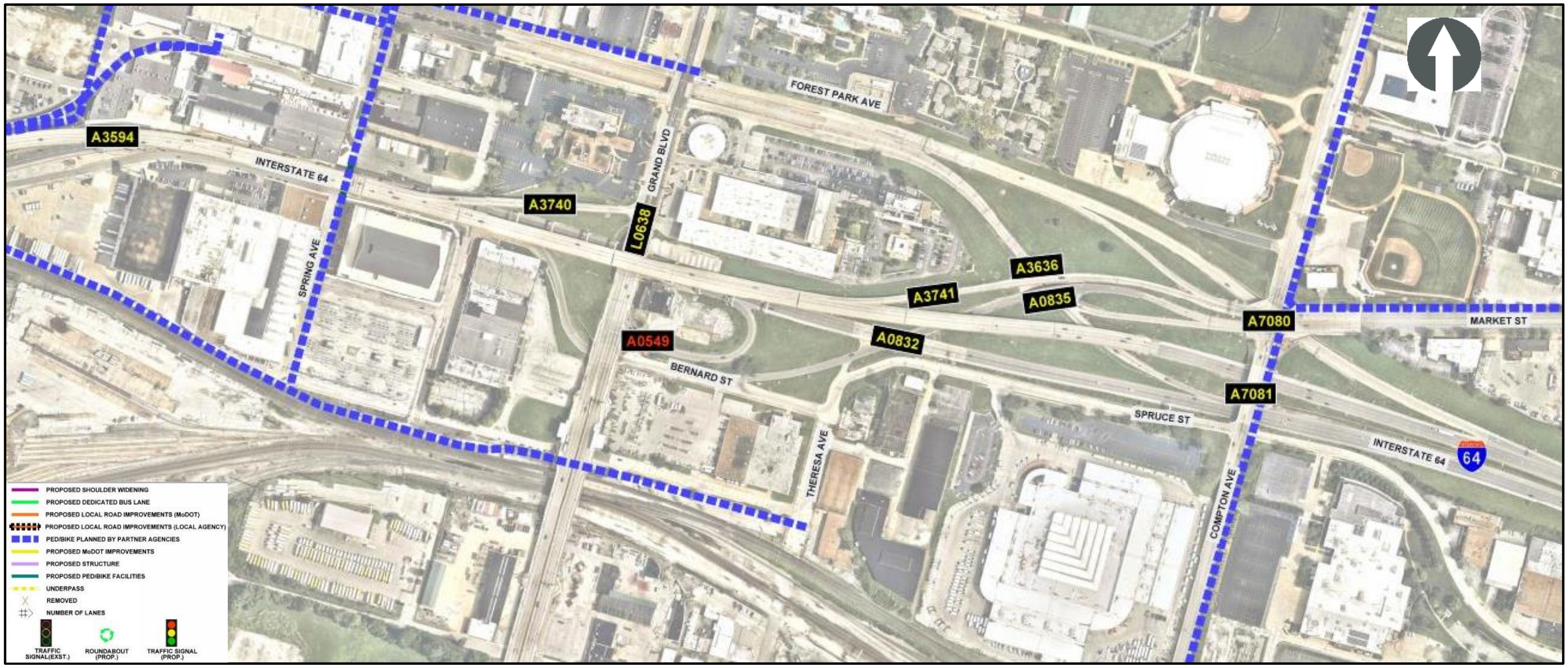
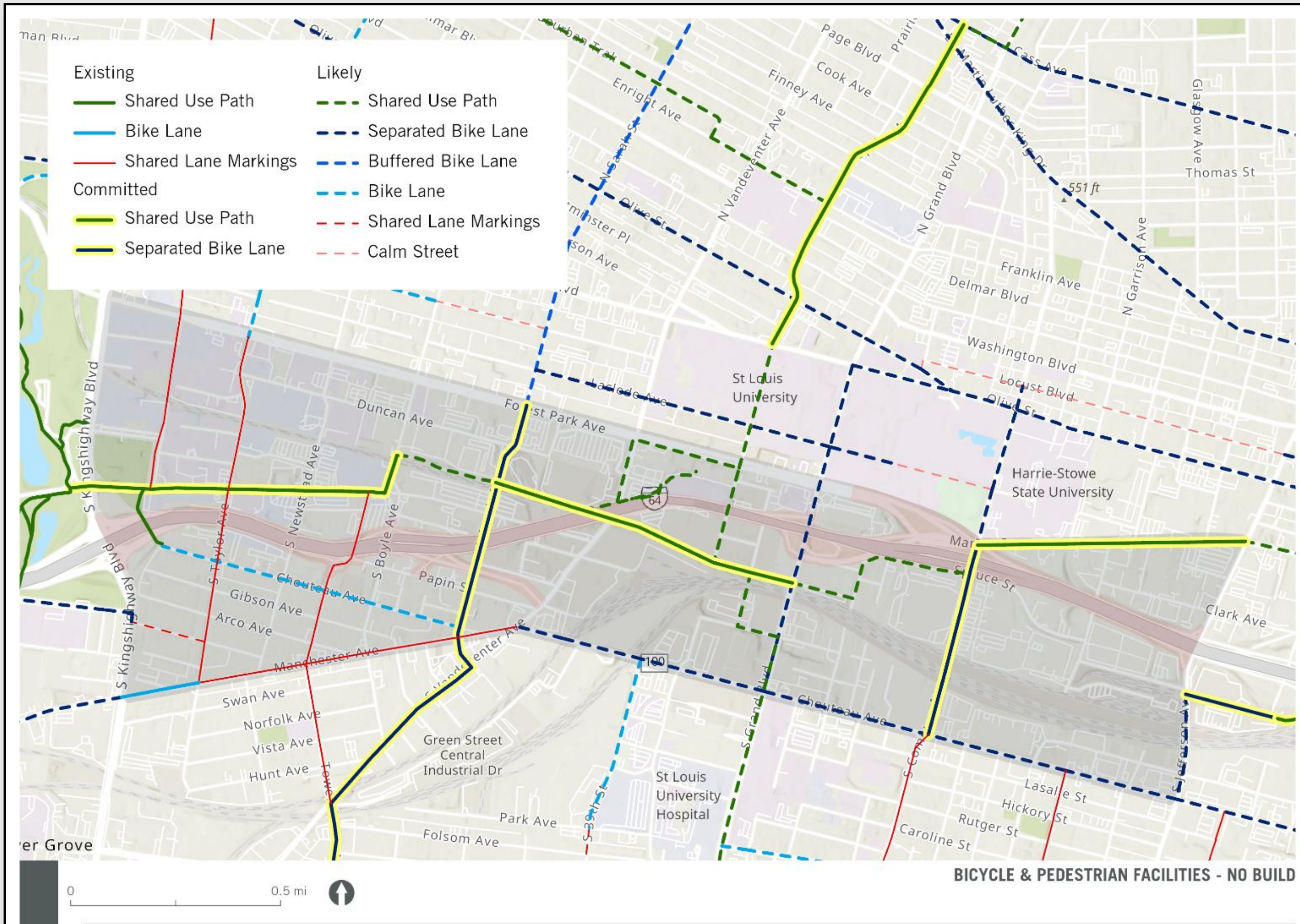


Figure 5. No Build (Maintenance Only) Scenario – Pedestrian and Bicycle Improvements



2.2. CORRIDOR ALTERNATIVE #1 SCENARIO

Corridor Alternative #1 (**Figure 6** & **Figure 7**) reflects the following improvements along the corridor (the primary party who controls the ROW in which each of the improvements falls is identified):

- Widening of the existing westbound I-64 off ramp to Boyle Avenue and lengthening of the deceleration lane to provide additional stacking capacity and deceleration length (MoDOT). Additional ROW may be required.
- Lengthening of the existing acceleration lane for eastbound traffic merging onto I-64 from Papin St (MODOT).
- Widening of the existing on ramp to westbound I-64 from Boyle Avenue (at current on ramp location) to provide for a two lane on ramp (MoDOT).
- Reconstruction of Boyle Ave. from Papin St. north to the MetroLink tracks, including the overpass of I-64, to accommodate additional lanes (MoDOT/City). Additional ROW may be required.
- Reconstruction of Clayton Ave. between Newstead Ave. and Boyle Ave. to accommodate additional lanes (City). Additional ROW may be required.
- Widening of Tower Grove Ave. to accommodate an additional left turn lane (City). Additional ROW may be required.
- Addition of a westbound off ramp from I-64 to Grand Blvd. with extended deceleration length (MoDOT).
- Relocation and widening to two lanes of the existing westbound I-64 on ramp from Grand Blvd. to align with the proposed westbound I-64 off ramp with extended acceleration lane; ramp terminal to be signalized (MoDOT).
- Removal of the existing eastbound loop ramp from I-64 to Grand Boulevard and replacement with a curved off ramp that would meet design standards and effectively provide up to 900 feet of deceleration length (MoDOT). Additional ROW may be required or parcel with sign building rezoned as advertisement only.
- Addition of an eastbound on ramp from Grand Boulevard to I-64 that would be integrated into a signalized intersection along Grand Blvd. with the reconfigured eastbound off ramp (MoDOT).
- Reconstruction of the grade separated intersection of Forest Park Ave. with Grand Blvd. to an at-grade signalized intersection. Lane additions to all four legs of the intersection (City). Additional ROW may be required.

- Addition of additional lanes along Grand Blvd. between Forest Park Ave. and the railroad overpass (MoDOT/City). Additional ROW may be required.

- Extension of Theresa Ave. from Scott Ave. to realigned Forest Park Ave (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.

- Removal of the following existing ramps (MoDOT):
    - the eastbound I-64 off ramp to Market St./Bernard St.
    - the I-64 eastbound on ramp from Forest Park Ave. (left hand ramp)
    - the westbound I-64 on ramp from Market St./Compton Ave.
    - the eastbound Forest Park Ave. to Market St./Compton Ave. ramp

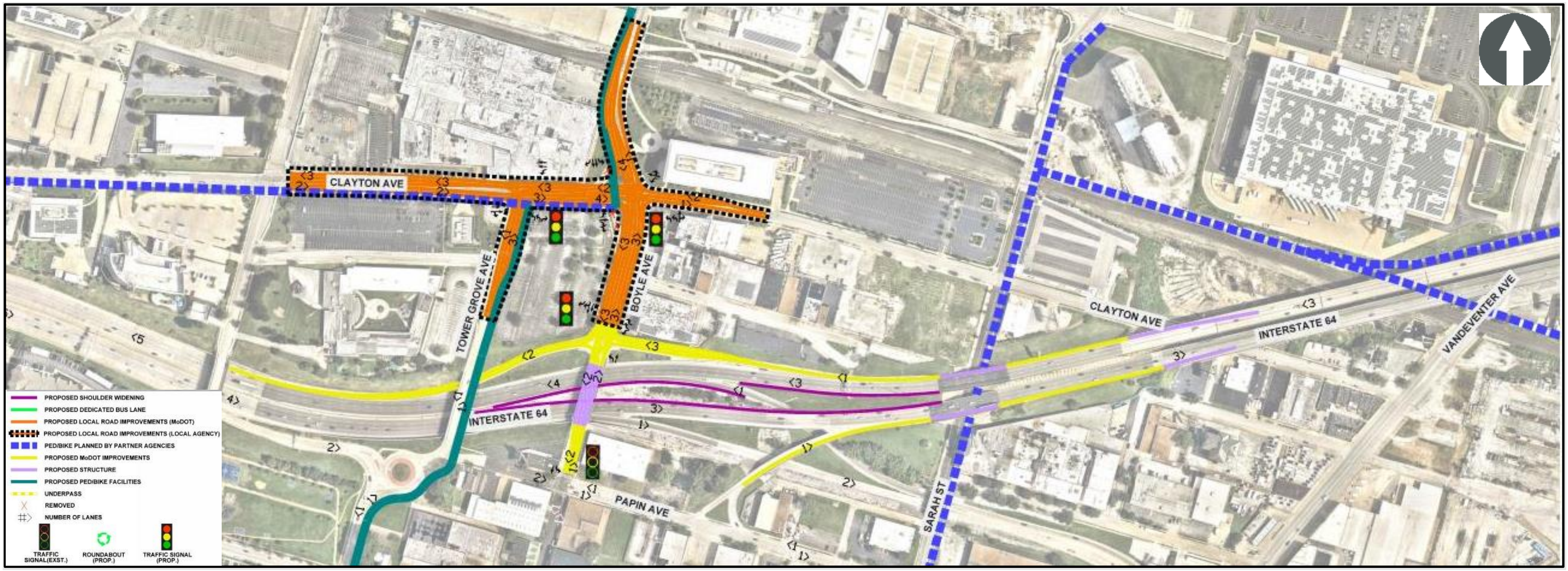
- Reconstruction of the Forest Park Ave. and Market St./Compton Ave. intersection to accommodate the removal of the above ramps and the extension of Forest Park Avenue (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.

- Widening of the inside shoulders along I-64 between Tower Grove Ave. and Sarah St. and between Theresa Ave. (extended) and Ewing Ave (MoDOT).

- Addition of all bike/pedway facilities reflected in the No Build (Maintenance Only) scenario as well as 0.8 miles of additional facilities at the following locations (reflective of approximately 12.8 miles of bicycle and pedestrian committed, likely and potential projects):
    - Tower Grove Avenue via a separate structure parallel to the Tower Grove Ave. overpass at I-64, extending north of Clayton Ave. via Boyle Ave (MoDOT over Interstate / City or Partner agency for remaining portions.)
    - Grand Blvd. to north of Forest Park Ave (City and/or other partner).
    - Forest Park Ave. between Grand Blvd. and Market St./Compton Ave (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.
    - Theresa Avenue between Scott Ave. and Forest Park Ave (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.
    - Bernard/Spruce St. between Grand Blvd. and Compton Ave (MoDOT)

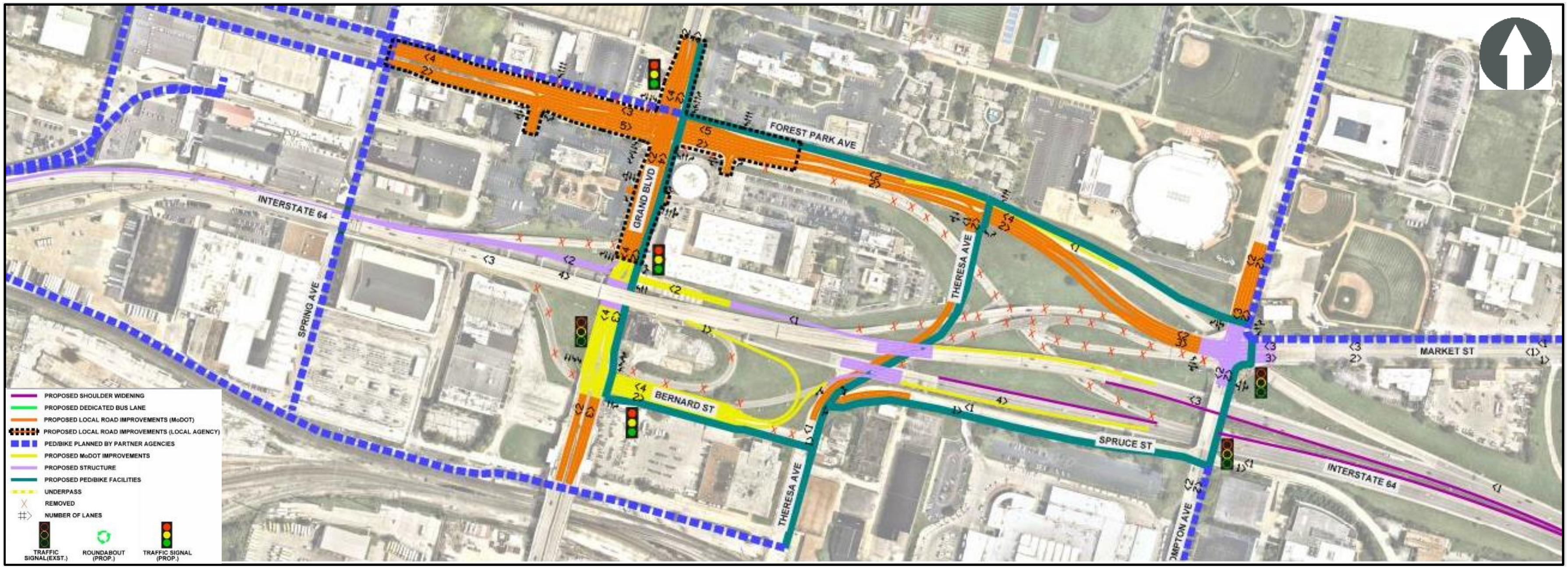
Please note that all locations where additional right of way and city street expansions are identified may have practical constraints should the City choose to move forward with further study of that respective improvement. Corridor Alternative #1, reflective of the above referenced infrastructure, pedestrian, and bicycle improvements, is shown in **Figure 6** (Tower Grove Ave./Boyle Ave./Vandeventer Ave.) and **Figure 7** (Grand Blvd./Forest Park Ave./Market St./Compton Ave.).

Figure 6. Alternative #1 Improvements: Tower Grove Ave./Boyle Ave./Vandeventer Ave.



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 7. Alternative #1 Improvements: Grand Blvd./Forest Park Ave./Market St./Compton Ave.



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

2.3. CORRIDOR ALTERNATIVE #2 SCENARIO

Corridor Alternative #2 (**Figure 8** & **Figure 9**) reflects the following improvements along the corridor (the primary party who controls the ROW in which each of the improvements falls is identified):

- Widening of the existing westbound I-64 off ramp to Boyle Avenue and lengthening of the deceleration lane to provide additional stacking capacity and deceleration length (MoDOT). Additional ROW may be required.
- Widening of the existing on ramp to westbound I-64 from Boyle Avenue (at current on ramp location) to provide for a two lane on ramp (MoDOT).
- Relocation of the eastbound I-64 on ramp from Papin St. to Boyle Ave, including lengthening of the acceleration lane on eastbound I-64; ramp terminal to be signalized (MoDOT). Additional ROW will be required.
- Removal of the existing traffic signal at Papin St. and Boyle Ave (City).
- Reconstruction of Boyle Ave. from Papin St. north to the Metrolink tracks, including the overpass of I-64, to accommodate additional lanes (MoDOT/City). Additional ROW may be required.
- Reconstruction of Clayton Ave. between Newstead Ave. and Boyle Ave. to accommodate additional lanes (City). Additional ROW may be required.
- Widening of Tower Grove Ave. to accommodate an additional left turn lane (City). Additional ROW may be required.
- Widening of the existing westbound I-64 on ramp from Grand Blvd. to accommodate two lanes with extended acceleration length; installation of a traffic signal at the ramp terminal (MoDOT).
- Removal of the existing eastbound loop ramp from I-64 at Grand Blvd. and replacement with an off ramp that would intersect the proposed roundabout of Bernard St./Theresa Ave./Spruce St., east of Grand Blvd (MoDOT).
- Reconstruction of Bernard St. to intersect Grand Blvd. at grade with a signal south of I-64 (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.
- Addition of an eastbound slip-on ramp to I-64 from a one-way Spruce St., east of the proposed Theresa Ave. extension (MoDOT).
- Realignment of existing eastbound I-64 from the beginning of Bridge No. A0832 to 650' east of Compton (MoDOT).
- Reconstruction of the grade separated intersection of Forest Park Ave. with Grand Blvd. to an at-grade signalized intersection. Lane additions to all four legs of the intersection (City).
- Addition of additional lanes along Grand Blvd. between Forest Park Ave. and Bernard St. (MoDOT/City). Additional ROW may be required.

- Extension of Theresa Ave. from its current terminus south of the railroad (via grade separation) north to realigned Forest Park Ave.; effectively providing a continuous connection between Chouteau Ave. and Forest Park Ave (MoDOT/City). Portion between Bernard and realigned Forest Park Ave. is currently owned by MoDOT ownership may or may not be relinquished to City following construction. Portion south of Bernard is within City ROW.

- Removal of the following existing ramps (MoDOT):
    - the eastbound I-64 off ramp to Market St./Bernard St.
    - the I-64 eastbound on ramp from Forest Park Ave. (left hand ramp)
    - the westbound I-64 on ramp from Market St./Compton Ave.
    - the eastbound Forest Park Ave. to Market St./Compton Ave. ramp

- Reconstruction of the Forest Park Ave. and Market St./Compton Ave. intersection to accommodate the removal of the above ramps and the extension of Forest Park Avenue (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.

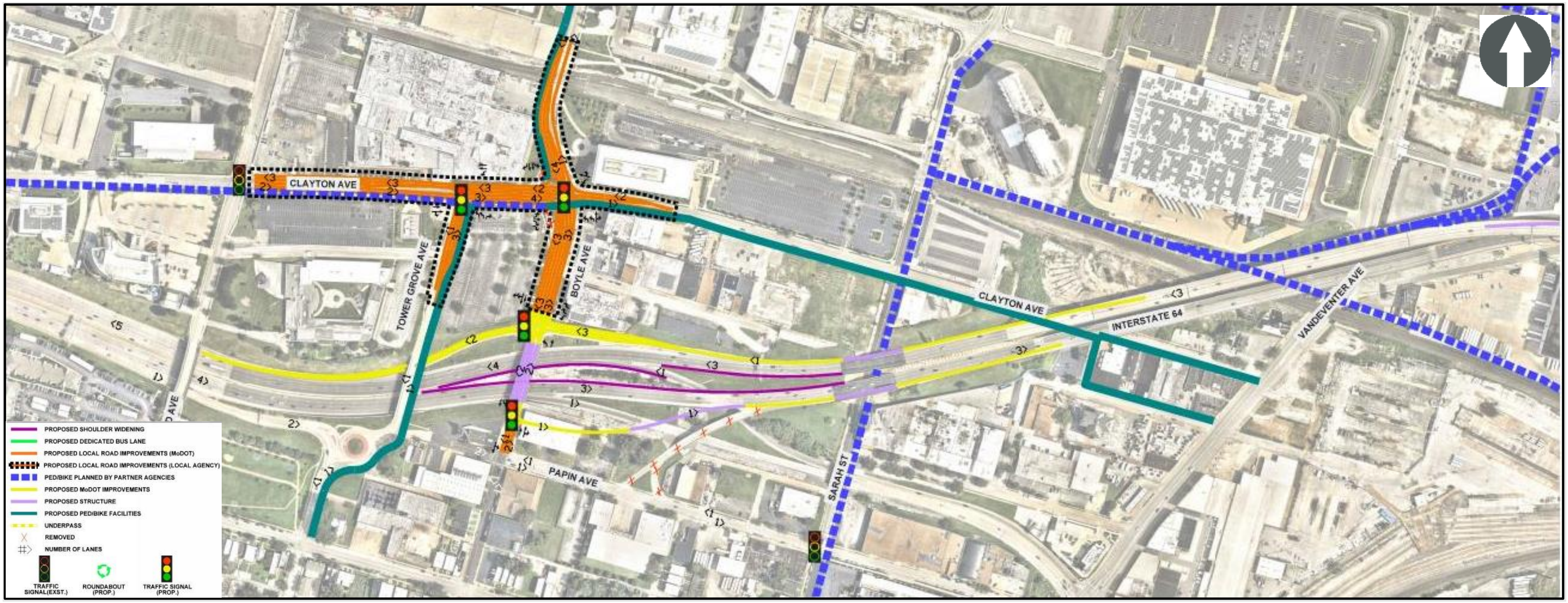
- Widening of the inside shoulders along I-64 between Tower Grove Avenue and Sarah Street and between Theresa Ave. (extended) and Ewing Ave (MoDOT).

- Addition of all bike/pedway facilities reflected in the No Build scenario as well as 1.5 miles of additional facilities at the following locations (reflective of approximately 13.5 miles of bicycle and pedestrian committed, likely and potential projects):
    - Tower Grove Ave. across I-64, extending north of Clayton Ave. via Boyle Ave. (MoDOT over Interstate/City or Partner agency for remaining portions.)
    - Grand Blvd. to north of Forest Park Ave.; with multi-use paths provided via parallel structures adjacent to the Grand Blvd. bridge (MoDOT over between the ramp terminals, City and/or other partner for remaining portions)
    - Forest Park Ave. between Grand Blvd. and Market St./Compton Ave. (City and/or other partner)
    - Theresa Avenue between Scott Ave. and Forest Park Ave. (MoDOT) Currently owned by MoDOT ownership may or may not be relinquished to City following construction.
    - Bernard/Spruce St. between Grand Blvd. and Compton Ave. (MoDOT)

    - Addition of dedicated bus lanes along both sides of Grand Blvd. between Forest Park Ave. and Chouteau Ave. This would provide the foundation for potential future enhanced transit service along the entirety of the #70 Grand MetroBus route.

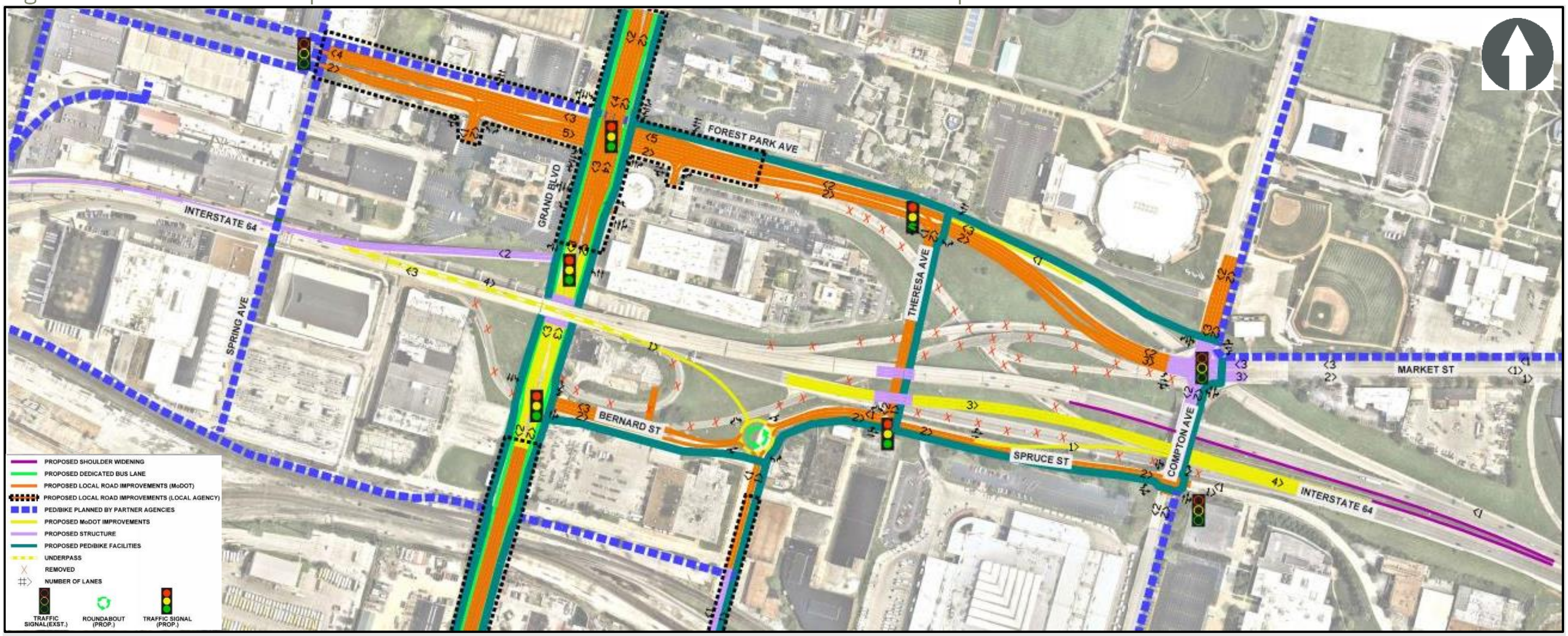
Please note that all locations where additional ROW and city street expansions are identified may have practical constraints should the City choose to move forward with further study of that respective improvement. Corridor Alternative #2, reflective of the above referenced infrastructure, pedestrian, and bicycle improvements, is shown in **Figure 8** (Tower Grove/Boyle/Vandeventer) and **Figure 9** (Grand/Forest Park/Market/Compton).

Figure 8. Alternative #2 Improvements: Tower Grove Ave./Boyle Ave./Vandeventer Ave.



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 9. Alternative #2 Improvements: Grand Blvd./Forest Park Ave./Market St./Compton Ave.



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

2.4. CORRIDOR ALTERNATIVE #3 SCENARIO

Corridor Alternative #3 (**Figure 10** & **Figure 11**)reflects the following improvements along the corridor (the primary party who controls the ROW in which each of the improvements falls is identified):

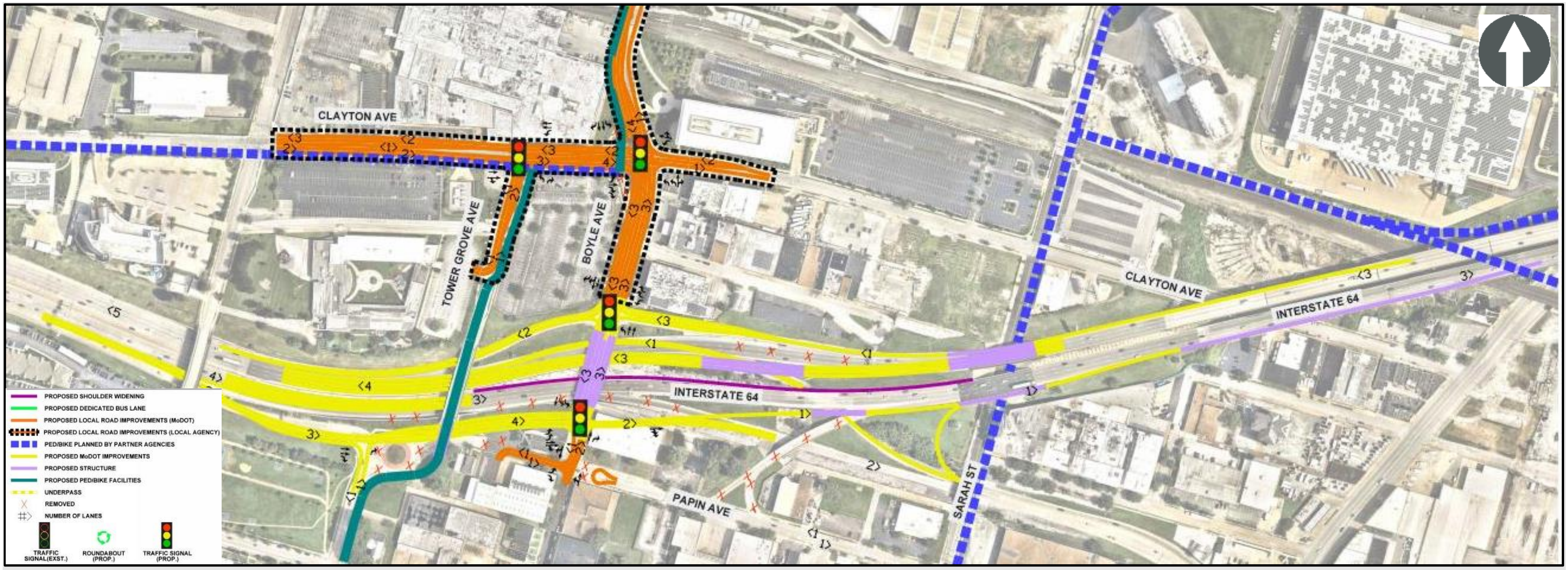
- Widening of the existing westbound I-64 off ramp to Boyle Avenue and lengthening of the deceleration lane to provide additional stacking capacity and deceleration length (MoDOT). Additional ROW may be required.
- Widening of the existing on ramp to westbound I-64 from Boyle Avenue (at current on ramp location) to provide for a two lane on ramp (MoDOT).
- Removal of the existing eastbound I-64 off ramp to Tower Grove Ave. roundabout and the eastbound I-64 on ramp from Papin St. (MoDOT)
- Addition of a new one-way eastbound outer roadway along the south side of I-64 that would provide access to Tower Grove Ave. to the south, Boyle Ave. (signalized), Vandeventer Ave. and terminating as an eastbound on ramp to I-64 east of Boyle Ave. (MoDOT) Additional ROW will be required.
- Relocation of the westbound I-64 on ramp from Vandeventer Ave. to a right sided merge condition (MoDOT).
- Realignment of WB I-64 from Newstead Ave. to Sarah St. (MoDOT)
- Addition of a ramp from Vandeventer Ave. to the proposed eastbound outer road, thereby facilitating access from Vandeventer Ave. to eastbound I-64. (MoDOT) Additional ROW will be required.
- Reconstruction of Boyle Ave. from Papin St. north to the MetroLink tracks, including the overpass of I-64, to accommodate additional lanes (MoDOT/City) Additional ROW may be required.
- Reconstruction of Clayton Ave. between Newstead Ave. and Boyle Ave. to accommodate additional lanes (City). Additional ROW may be required.
- Cul-de-sac on Papin St. east of Boyle Avenue and removal of the existing traffic signal (City).
- Closure of Tower Grove Ave. between Stix ECC and Elementary School and the proposed outer road to vehicular traffic (MoDOT). Additional ROW may be required.
- Addition of a westbound off ramp from I-64 to Grand Blvd. with extended declaration length (MoDOT).

- Relocation and widening to two lanes of the existing westbound I-64 on ramp from Grand Blvd. to align with the proposed westbound I-64 off ramp with extended acceleration lane; ramp terminal to be signalized (MoDOT).
- Removal of the existing eastbound loop ramp from I-64 at Grand Blvd. and replacement with an off ramp that would intersect the proposed roundabout of Theresa Ave./Spruce St., east of Grand Blvd (MoDOT).
- Addition of an eastbound I-64 on ramp from Grand Boulevard that would be "braided/grade separated" with the proposed off ramp from eastbound I-64. The ramp terminal of the proposed on ramp with Grand Blvd. would be signalized (MoDOT).
- Bernard St. would be removed (MoDOT).
- Reconstruction of the grade separated intersection of Forest Park Ave. with Grand Blvd. to an at-grade signalized intersection. Lane additions to all four legs of the intersection (City). Additional ROW may be required.
- Addition of additional lanes along Grand Blvd. between Forest Park Ave. and proposed eastbound I-64 on ramp (MoDOT between ramp terminals/City remaining portion of improvements).
- Extension of Theresa Ave. from its current terminus at Scott Ave. north to realigned Forest Park Ave.; with the addition of a roundabout at its intersection with Spruce St. and the proposed eastbound off ramp from I-64 (MoDOT) Currently owned by MoDOT ownership may or may not be relinquished to City following construction.
- Removal of the following existing ramps (MoDOT):
    - the eastbound I-64 off ramp to Market St./Bernard St.
    - the I-64 eastbound on ramp from Forest Park Ave. (left hand ramp)
    - the westbound I-64 off ramp to Forest Park Ave.
    - the westbound I-64 on ramp from Market St./Compton Ave.
    - the eastbound Forest Park Ave. to Market St./Compton Ave. ramp
- Reconstruction of the Forest Park Ave. and Market St./Compton Ave. intersection to accommodate the removal of the above ramps and the extension of Forest Park Avenue (MoDOT). Currently owned by MoDOT ownership may or may not be relinquished to City following construction.
- Widening of the inside shoulders along I-64 between Tower Grove Ave. and Sarah St. and between Theresa Ave. (extended) and Ewing Ave (MoDOT).
- Addition of all bike/pedway facilities reflected in the No Build (Maintenance Only) scenario as well as 0.8 miles of additional facilities at the following locations (reflective of approximately 12.8 miles of bicycle and pedestrian committed, likely and potential projects):

- Grade separated bike/pedway crossing of Tower Grove Ave. at proposed outer road (MoDOT)
- Repurpose of the existing Tower Grove Ave. I-64 overpass to bike/pedway/no auto traffic (MoDOT)
- Tower Grove Ave. across I-64, extending north of Clayton Ave. via Boyle Ave. (City and/or other partner)
- Grand Blvd. to north of Forest Park Ave. (City and/or other partner)
- Forest Park Ave. between Grand Blvd. and Market St./Compton Ave (MoDOT) Currently owned by MoDOT; may or may not be relinquished to City following construction.
- Theresa Avenue between Scott Ave. and Forest Park Ave. (MoDOT) Currently owned by MoDOT; may or may not be relinquished to City following construction.
- Bernard/Spruce St. between Grand Blvd. and Compton Ave. (MoDOT) Currently owned by MoDOT; may or may not be relinquished to City following construction.

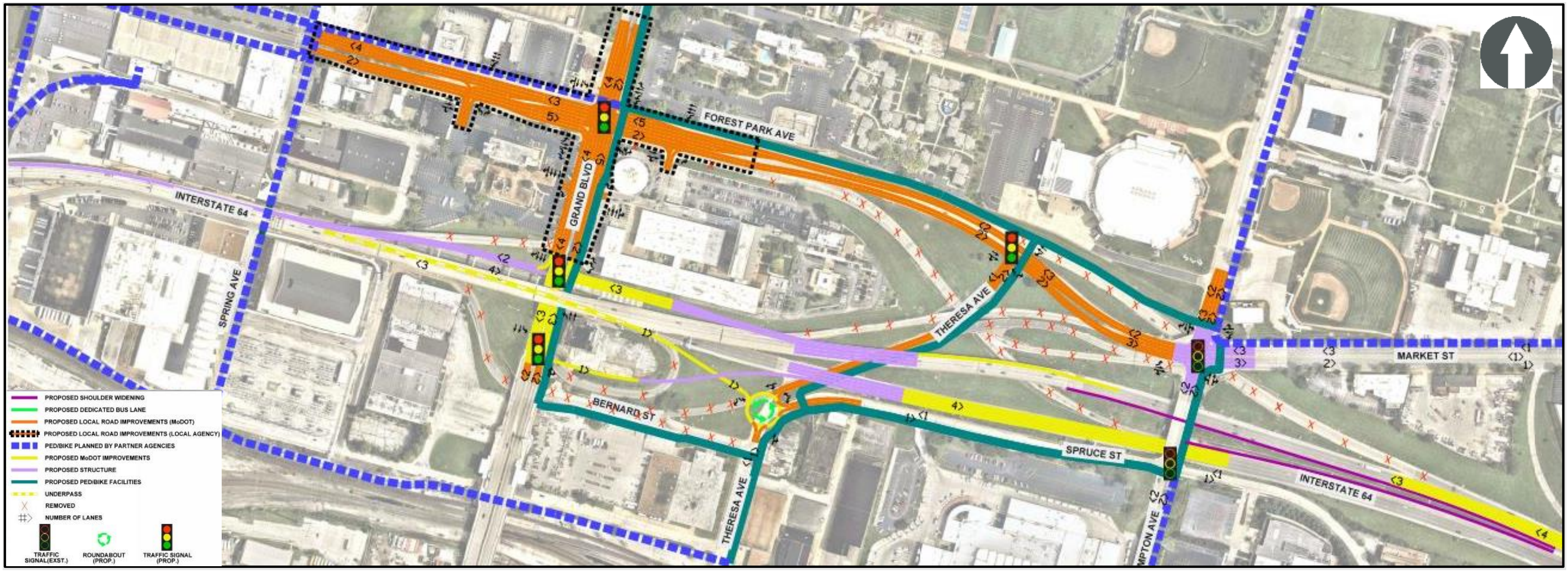
Please note that all locations where additional ROW and city street expansions are identified may have practical constraints should the City choose to move forward with further study of that respective improvement. Corridor Alternative #3, reflective of the above referenced infrastructure, pedestrian, and bicycle improvements, is shown in **Figure 10** (Tower Grove/Boyle/Vandeventer) and **Figure 11** (Grand/Forest Park/Market/Compton).

Figure 10. Alternative #3 Improvements: Tower Grove Ave./Boyle Ave./Vandeventer Ave.



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 11. Alternative #3 Improvements: Grand Blvd./Forest Park Ave./Market St./Compton Ave.



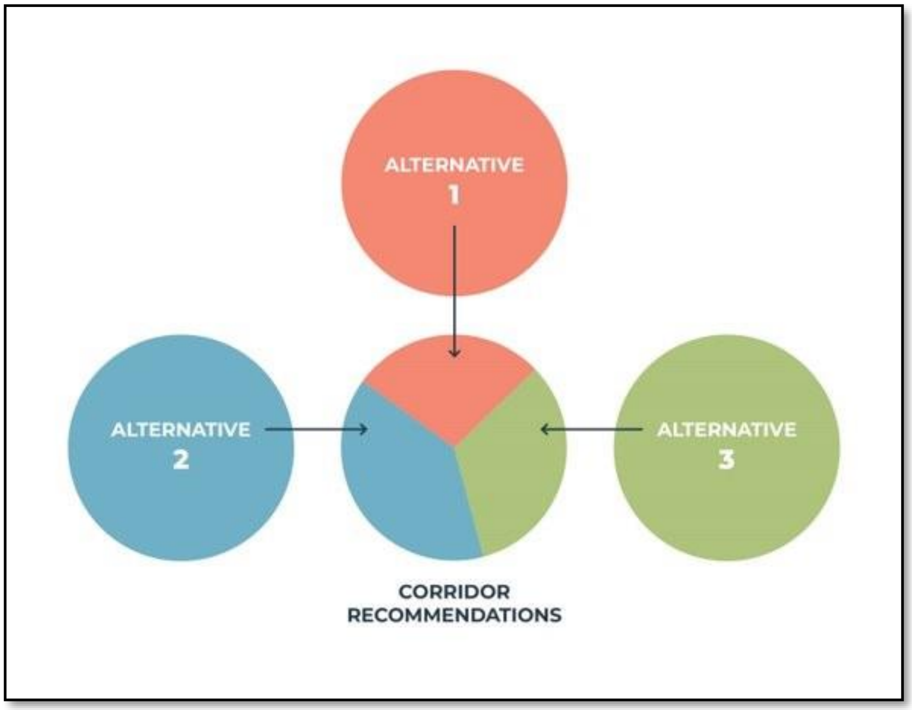
Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

2.5. EVOLUTION OF POTENTIAL FUTURE IMPROVEMENTS

As presented, each of the alternative scenarios considers the implementation of a specific improvement at a designated location within the study area. This was necessary to vet the potential improvements from a traffic, safety and multimodal perspective to determine if they could be considered for inclusion in the PEL's actionable plan for near-term and long-term improvements to address transportation issues in the study area. The development and evaluation of the transportation improvement options reflected in the Future64 alternatives followed MoDOT's policy for maintaining a Level of Service E for auto traffic in urban areas, as outlined in the approved Methods & Assumptions Report. Although local roadways such as Clayton or Boyle Avenues are not the authority of MoDOT, the MoDOT policy was applied to local roadways in the alternatives analysis to assess the capacity recommended for minimizing vehicle delay during peak traffic hours (note that the added capacity includes both turn lanes and through lanes).

Therefore, it is imperative that the reader of this report understand that what is reflected in the three alternatives are ***potential*** transportation improvements along the corridor at various locations. Many of these elements will require further study prior to proceeding to design and/or construction should MoDOT, the City of St. Louis or other partners decide to move forward. During this refinement process, decisions can be made by the governing agency that take into consideration the impacts upon all users of the system, as well as the surrounding properties. Furthermore, it is imperative to understand that a potential transportation improvement reflected in any one alternative can be combined with improvements shown in other alternatives. Figure 12 reflects how the corridor recommendations could represent elements from each of the alternatives and is not mutually exclusive to any one alternative.

Figure 12. Evolution of Corridor Recommendations



3. TRAFFIC FORECASTING

This section details the methodology utilized and the resulting weekday peak hour traffic forecasts for the Year 2050, which was used as the basis for the Alternatives and No Build (Maintenance Only) scenarios analysis for traffic operations, safety and multimodal. It should be noted that special event traffic was not evaluated for Grand Center or Midtown entertainment venues as part of the PEL. Therefore, traffic forecasts for these events were not developed.

3.1. METHODOLOGY

Traffic volume forecasts for the Year 2050 were developed in accordance with the methodology outlined in Section 6.0 Traffic Forecast of the approved *Methods and Assumptions Report for Traffic, Safety & Multimodal Analysis*, finalized on June 24, 2022. The traffic forecasts were calculated based upon existing traffic volume counts, historic traffic volume trends (trend line analysis), and outputs from East West Gateway's (EWG) regional travel demand model. The MPO's travel demand model provides data for the base year (2019) as well as the MPO's horizon year (2045) transportation network, the latter of which assumes that all the fiscally constrained projects listed in the EWG Long-Range Transportation Plan: Connected 2045 were added to the model's transportation network. Annual Growth rates obtained from the EWG's regional travel model by analyzing the MPO's base year (2019) and horizon year (2045) traffic volumes were then applied to the PEL's existing traffic volumes to ultimately generate forecasted 2050 traffic volumes for the major roadways within the study area that would be utilized to analyze the No Build and Build alternative scenarios.

Extensive coordination took place throughout the duration of the PEL to ensure that land use plans and socioeconomic data reflect the future Study Area. The PEL's Steering Committee provided input with regards to committed, likely and possible future developments. In addition, input was sought from several stakeholders within the Study Area, such as Saint Louis University and Washington University Medical Campus. Consequently, 41 potential land use developments within and in the proximity of the Study Area were provided to EWG for incorporation into the regional travel demand model.

Upon review, EWG included 35 of the potential land use development in the regional travel demand model, as listed in **Table 2** and illustrated in **Figure 13**. As a result, the total population within and in proximity to the Study Area increased by 4,748 persons and the total employment increased by 7,522 persons. Six possible land use developments were not included due to lack of adequate information or funding sources associated with these projects.

Figure 13. Potential Land Use Projects Within Study Area

Table 2. Future Land Use Projects Incorporated into the EWG Regional Travel Demand Model

Project Name	Locator #	Residential Units	Population			Employment		
			Total	2025	2045	Total	2025	2045
Armory District	#1	0	0	0	0	147	147	0
BJC Campus Renewal Project	#2	0	0	0	0	0	0	0
Target + Apartments	#4	196	234	234	0	170	170	0
Grove Lofts	#4	60	68	68	0	30	30	0
WU Neuroscience Research Building	#5	0	0	0	0	875	875	0
Mill Creek Flats	#5	105	189	189	0	20	20	0
City Foundry Phase II Apartments	#7	282	324	324	0	600	355	245
Green Streets Apartments (Next to Armory)	#8	500	634	634	0	0	0	0
2200 LaSalle at Lafayette Square	#9	128	230	230	0	0	0	0
4200/4210 Duncan Ave.	#10	0	0	0	0	800	800	0
Arbor on Arco	#11	95	170	170	0	0	0	0
4112 Clayton Ave. Cortex KDG	#12	160	192	192	0	800	475	325
Top Golf	#13	0	0	0	0	100	100	0
Lux Living Apartments	#14	144	140	140	0	0	0	0
NW Quadrant of Grand at Chouteau	#15	400	480	0	480	1,290	0	1,290
SSM Health expansion (Surgery Center)	#16	0	0	0	0	235	235	0
BJC Siteman Cancer Center	#17	0	0	0	0	250	250	0
North Silo Lot Redevelopment	#18	0	0	0	0	250	0	250
WU Mixed-Use Redevelopment	#19	0	0	0	0	70	70	0
BJC Floor Addition	#20	0	0	0	0	0	0	0
Terra at the Grove	#21	307	367	367	0	0	0	0
Green Streets Bar K	#22	0	0	0	0	200	200	0
O'Loughlin Family Champions Center	#23	0	0	0	0	25	25	0
Union at the Grove	#24	160	190	190	0	0	0	0

Project Name	Locator #	Residential Units	Population			Employment		
			Total	2025	2045	Total	2025	2045
St. Louis City SC Stadium	#25	0	0	0	0	1,500	1,500	0
The Marshall student housing	#26	192	458	458	0	0	0	0
Edge of Lafayette Square	#30	0	154	0	154	0	0	0
City Foundry Phase 3 Mixed-Use	#31	0	0	0	0	0	0	0
Butler Brothers	#32	384	460	460	0	20	20	0
Market & Jefferson	#33	0	0	0	0	100	0	100
JC Midtown, Martin	#34	0	0	0	0	90	90	0
Park and Vista	#37	40	44	44	0	0	0	0
1500 S Grand	#38	20	22	22	0	0	0	0
Ronald McDonald Home	#38	60	68	68	0	0	0	0
Albion West End	#41	293	324	324	0	0	0	0

Note: Project #s 27, 28, 29, 35, 42 and 43 were not incorporated into the EWG regional travel demand model. Projects #36 and #40 were removed due to insufficient information available.

Upon receipt of the travel demand model's output, a collaborative meeting with MoDOT representatives was held to discuss the existing counts, historic growth trends, growth rates based on the travel demand model outputs, and gain consensus regarding the annualized growth rates that were utilized to predict traffic volumes and traffic flow patterns for the PEL's Year 2050 No-Build. It should be noted that historical traffic data from 2020 and 2021 were not considered due to Covid-related impacts on regional travel. The approved annualized traffic growth rates for I-64 and non-interstate corridors within the Study Area are presented in **Table 3.**

Due to traffic volume balancing and updated projections related to WUMC that were received after the MPO's travel demand model's modifications, it was necessary to slightly adjust the approved growth rates. Therefore, the applied traffic growth rates to the models are also presented in Table 3 for comparative purposes.

Table 3. Annual Traffic Growth for I-64 & Major Corridors

Location	Approved Annual Growth Rate	Applied Annual Growth Rate
I-64 Corridor		
West of Kingshighway Blvd.	0.1%	0.14%
East of Kingshighway Blvd.	0.1%	0.22%
West of Grand Blvd.	0.1%	0.22%
East of Grand Blvd.	0.35%	0.47%
East of Jefferson Ave.	0.3%	0.30%
Major Corridors (Non-Interstate)		
Kingshighway Blvd. South of I-64	0.1%	0.1%
Kingshighway Blvd. North of I-64	0.1%	0.1%
Forest Park Ave. East of Kingshighway Blvd.	0.5%	0.5%
Forest Park Ave. West of Grand Ave.	0.9%	0.9%
Grand Ave. South of I-64	0.5%	0.5%
Grand Ave. North of I-64	0.5%	0.5%
Manchester Ave. West of Vandeventer Ave.	0.5%	0.5%
Manchester Ave. East of Grand Blvd.	0.5%	0.5%
Jefferson Ave. South of I-64	0.5%	0.5%
Jefferson Ave. North of I-64	0.5%	0.5%

3.2. PROJECTED MODAL SPLITS

The EWG travel demand model was also used to determine the likely modal splits between automobile and non-motorized trips on daily basis. Output from the model's base and horizon years was referenced so that the relative increase in each mode's attractiveness could be determined. Recall, that for the horizon year (2045) transportation network, all fiscally constrained projects listed in the Long-Range Transportation Plan were added to the travel demand model's transportation network. **Table 4** summarizes the daily modal split to/from the PEL's Study Area, as determined by the EWG regional model. These trips do not include any trips which traveled through the Study Area as through trips (originated and destined outside the PEL's Study Area).

Table 4. Daily Trips by Mode within the Study Area

Travel Modes	Travel Demand Model Year				% Increase in Daily Trips (2019 – 2045)
	2019		2045		
	Trips	Modal Split	Trips	Modal Split	
Auto	74,908	87.2%	89,141	82.9%	19.0%
Walk	9,153	10.7%	16,294	15.2%	78.0%
Bike	400	0.5%	628	0.6%	57.0%
Transit	1,404	1.6%	1,446	1.3%	3.0%

As can be seen, walking is anticipated to experience the greatest increase in modal split, with an increase of 78% of daily trips and an increase in modal split by 4.5%. This result is not surprising given the increased infrastructure likely to be in place by the year 2045 to accommodate pedestrians as well as the increased emphasis on mixed use developments within the area. Vehicular traffic would still dominate the modal split by the year 2045, with more than 80% of the trips accomplished via automobile, which is not surprising given the major employers within the Study Area, such as the Washington University Medical Campus.

Although the modal splits, as calculated, demonstrate continued reliance on motor vehicles, additional factors beyond the scope of this study would further refine the potential for modal shift. Area organizations such as St. Louis City, GRG, Metro Transit, large employers / universities / hospitals could further influence modal shift beyond what is modeled by focusing on transportation demand management through supportive policies, incentives, and infrastructure changes.

3.3. TRAFFIC VOLUME FORECASTS

Using the annualized growth rates presented in Section 3.1 and an understanding of the modal splits presented in Section 3.2, it was possible to build the traffic forecast for the PEL's horizon year of 2050. This year was chosen since it represented roughly 20 years after the likely construction of any of the infrastructure projects considered as part of the PEL process. It was assumed that the potential interchange projects would require five to seven years following conclusion of the PEL process to complete the Access Justification and NEPA processes, finalize design and complete construction.

Traffic volume forecasts were prepared for the No Build (Maintenance Only) and the three corridor alternatives. The volumes were refined to represent a balanced and cohesive network based upon MoDOT's Engineering Policy Guide (EPG) Section 905.3.4.5 using the "Higher Volume Distributed" method. This was completed to provide realistic results for the model. As with the base volumes, there were cases where traffic volumes varied significantly between two intersections and the "Split the Difference" method was implemented to not overcompensate for any one specific location.

3.3.1. No Build (Maintenance Only) Corridor Alternative

The No Build (Maintenance Only) scenario assumes that the existing road network would remain as is, without significant infrastructure reconfiguration. Therefore, the traffic forecasts for the Year 2050 No Build (Maintenance Only) Corridor Alternative simply applies the growth rates presented above to the base traffic volumes presented in the Existing Traffic, Safety & Multimodal Conditions Technical Report. **Figure 14** and **Figure 15** present the Year 2050 No Build (Maintenance Only) volumes for the I-64 corridor and ramps, while **Figure 16** through **Figure 21** illustrate the No Build (Maintenance Only) intersection turning movement volumes within the Study Area.

Figure 14. No Build (Maintenance Only) Alternative: I-64 Corridor Year 2050 Peak Hour Traffic – Kingshighway to Vandeventer

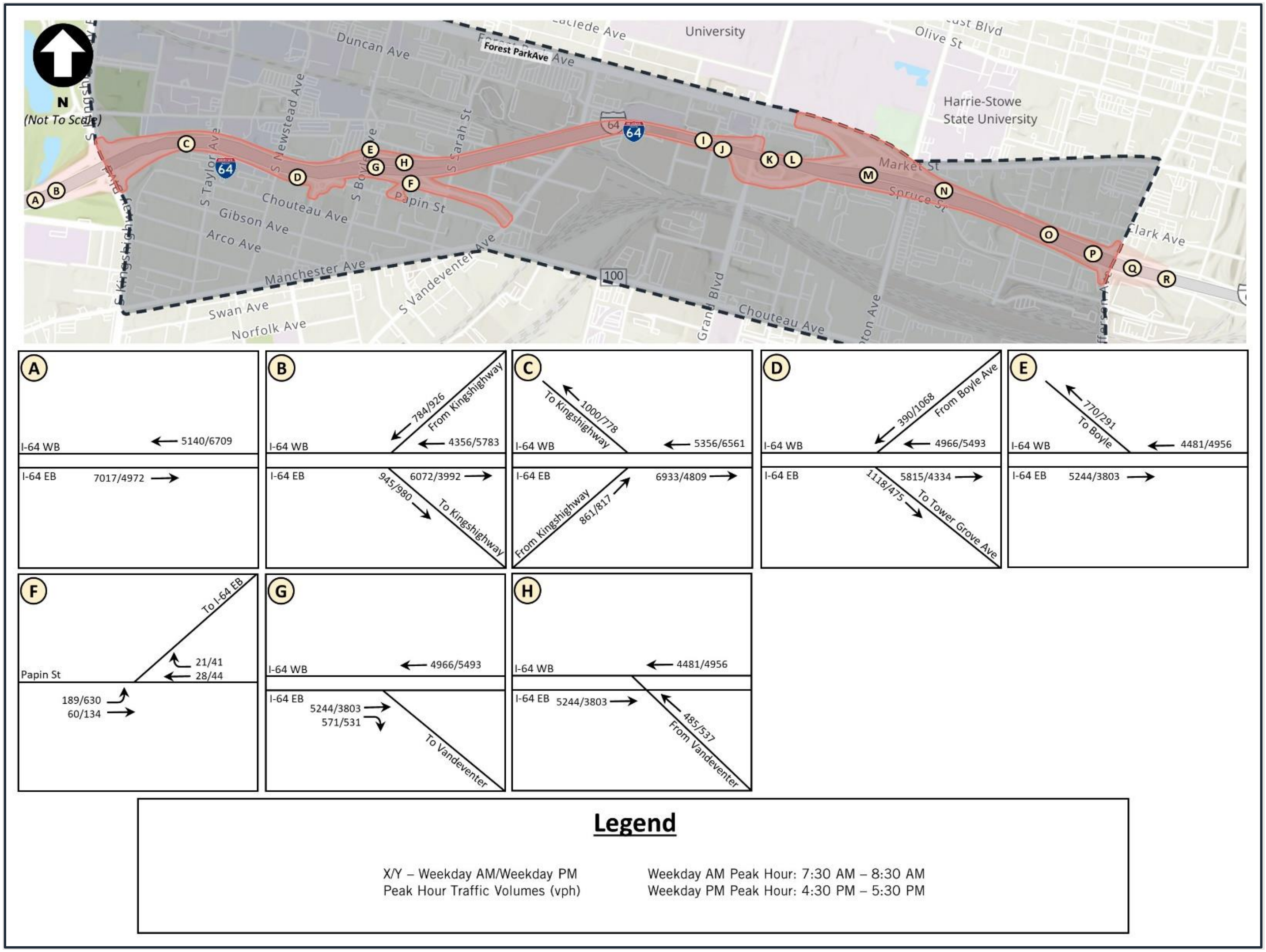


Figure 15. No Build (Maintenance Only) Alternative: I-64 Corridor Year 2050 Peak Hour Traffic – Grand to 22nd

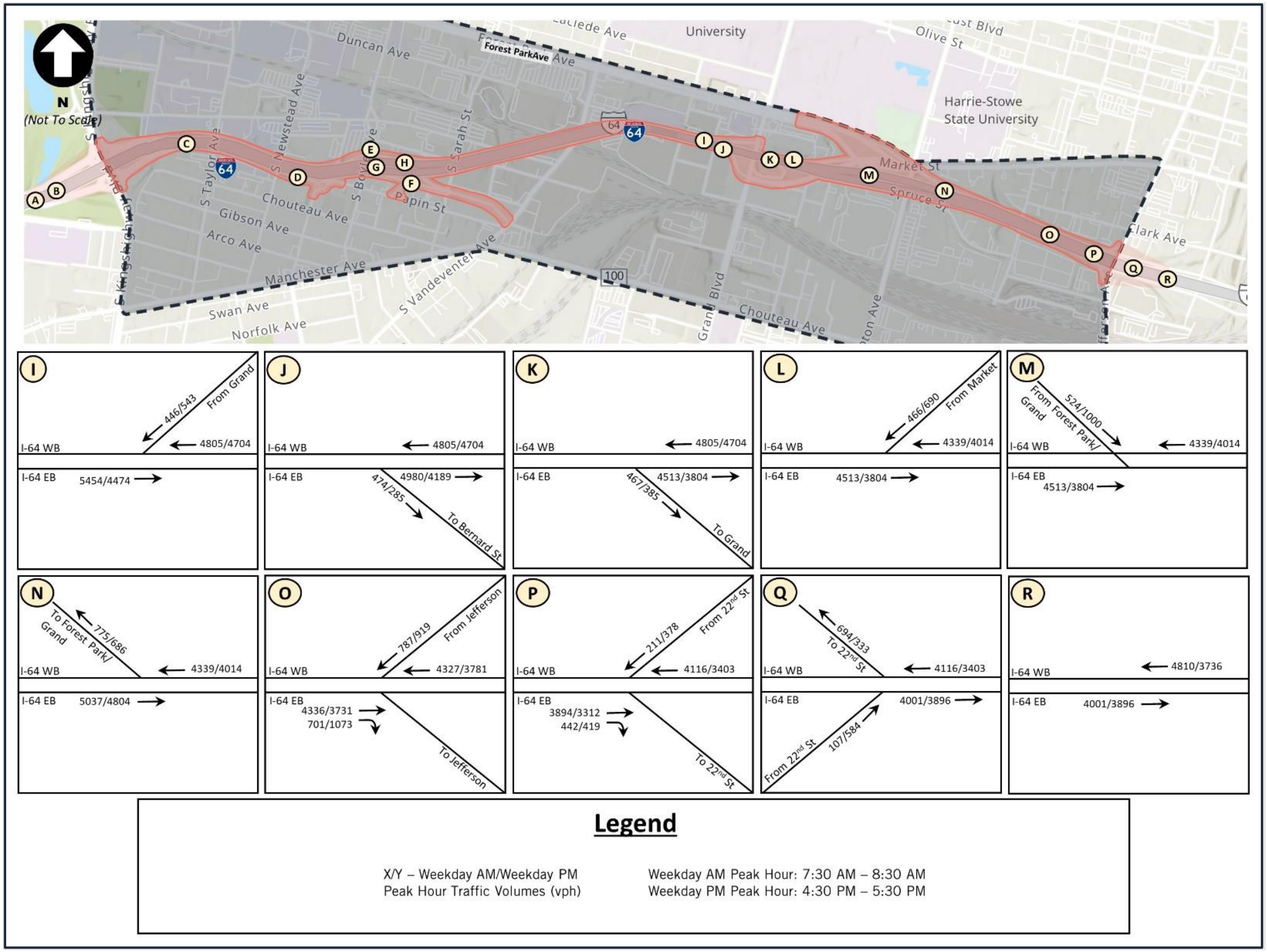


Figure 16. No Build (Maintenance Only) Alternative: Year 2050 Peak Hour Traffic Sheet Layout

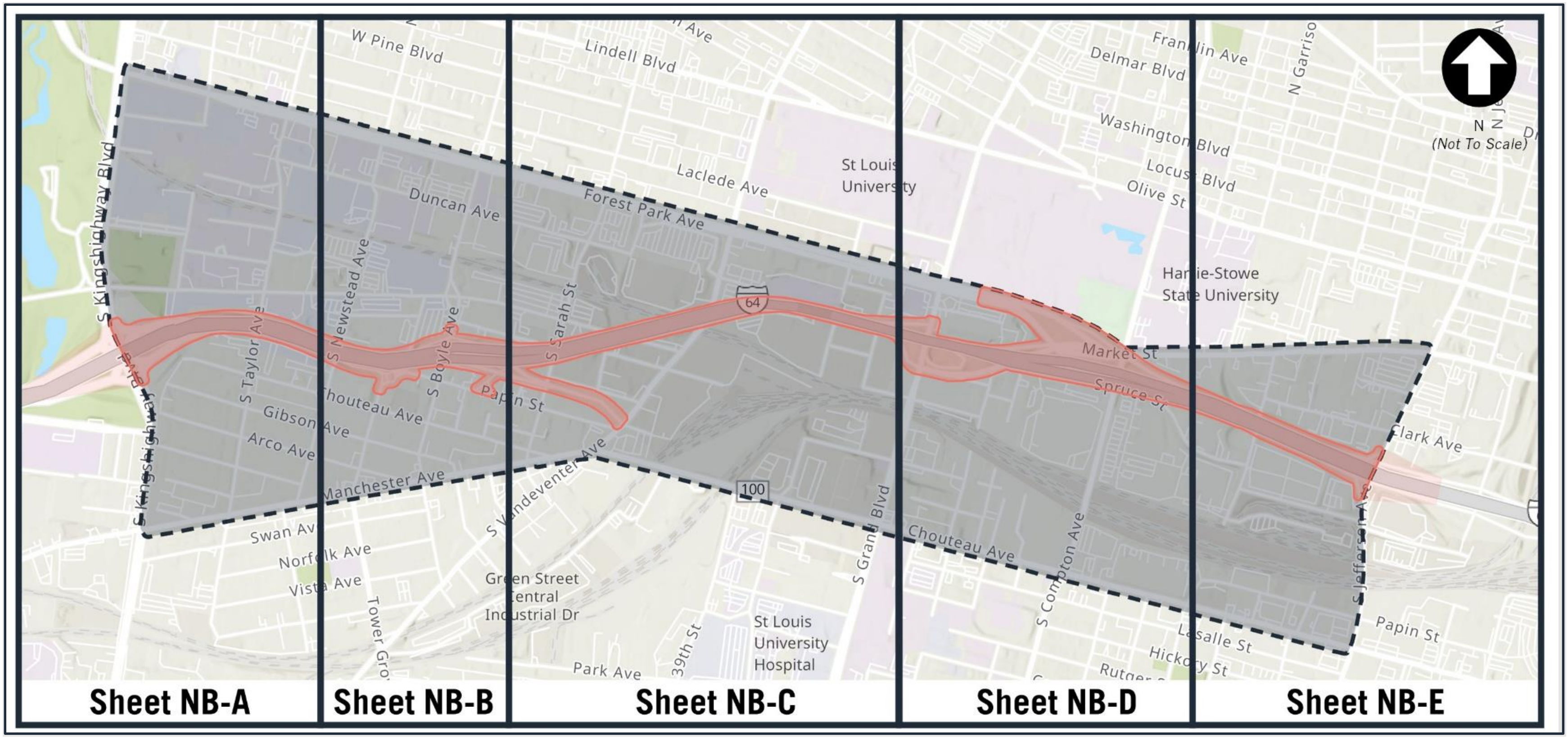


Figure 17. No Build (Maintenance Only) Alternative: Year 2050 Peak Hour Traffic - Sheet NB-A

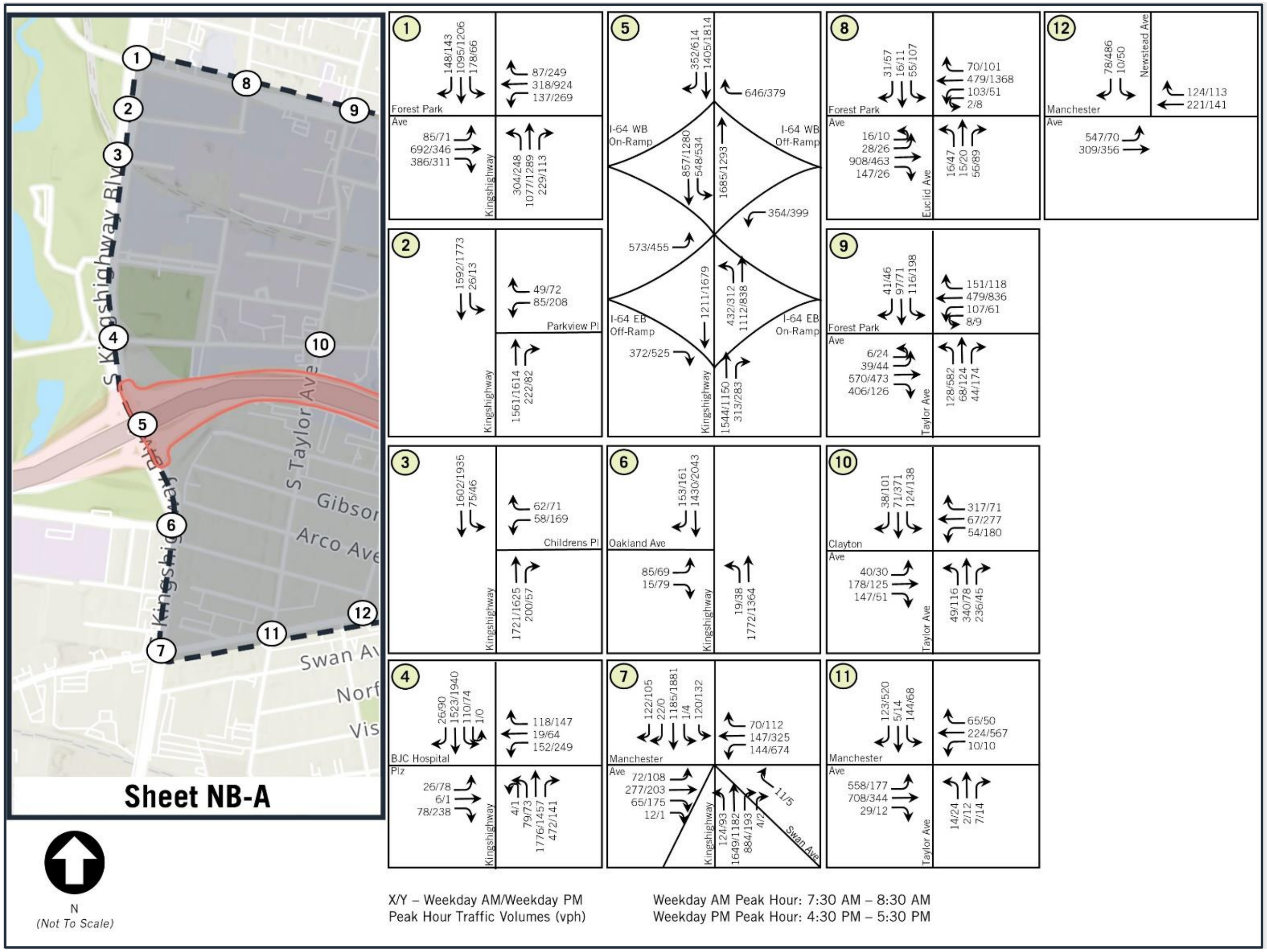


Figure 18. No Build (Maintenance Only) Alternative: Year 2050 Peak Hour Traffic - Sheet NB-B

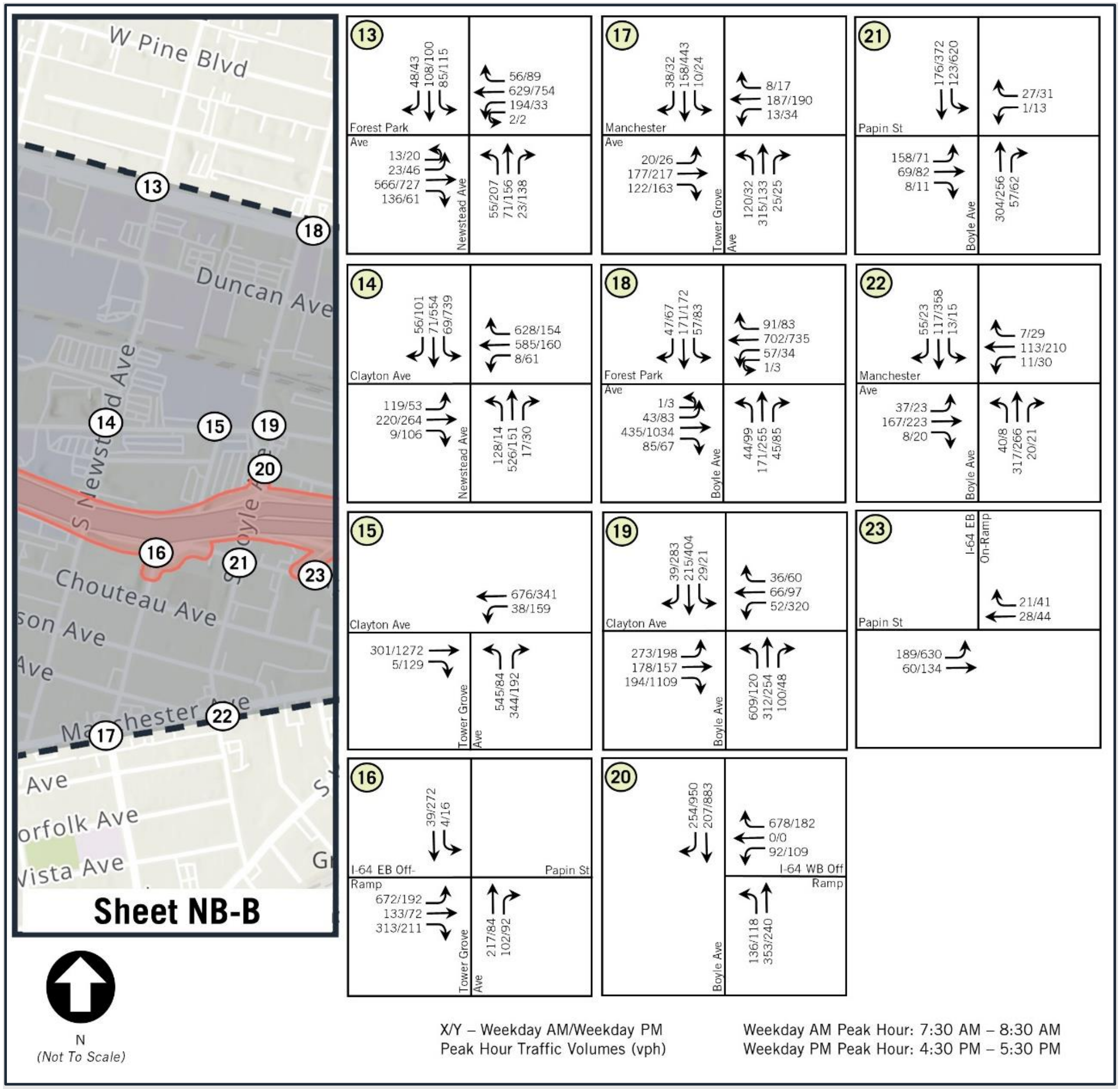


Figure 19. No Build (Maintenance Only) Alternative: Year 2050 Peak Hour Traffic - Sheet NB-C

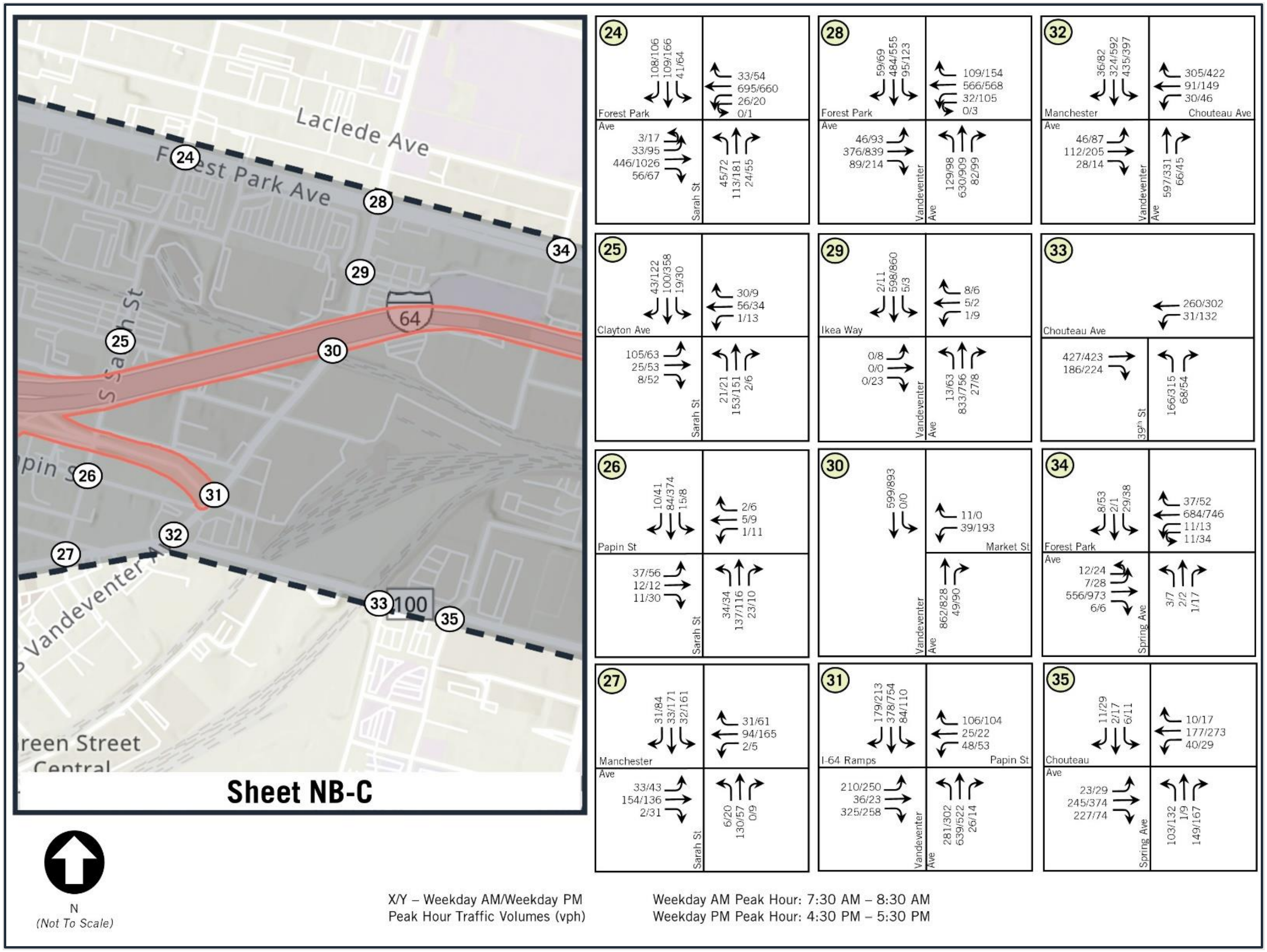


Figure 20. No Build (Maintenance Only) Alternative: Year 2050 Peak Hour Traffic - Sheet NB-D

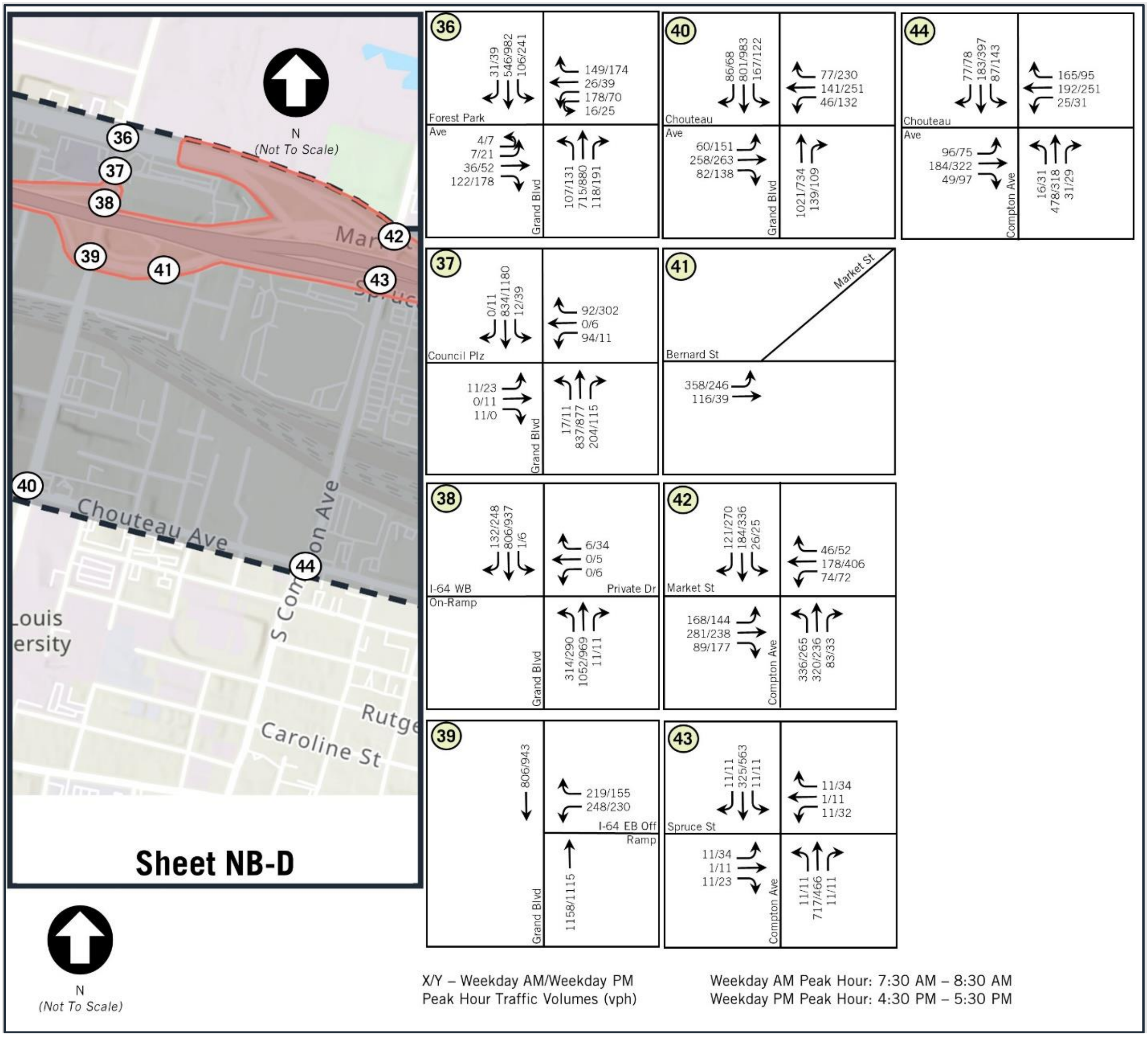
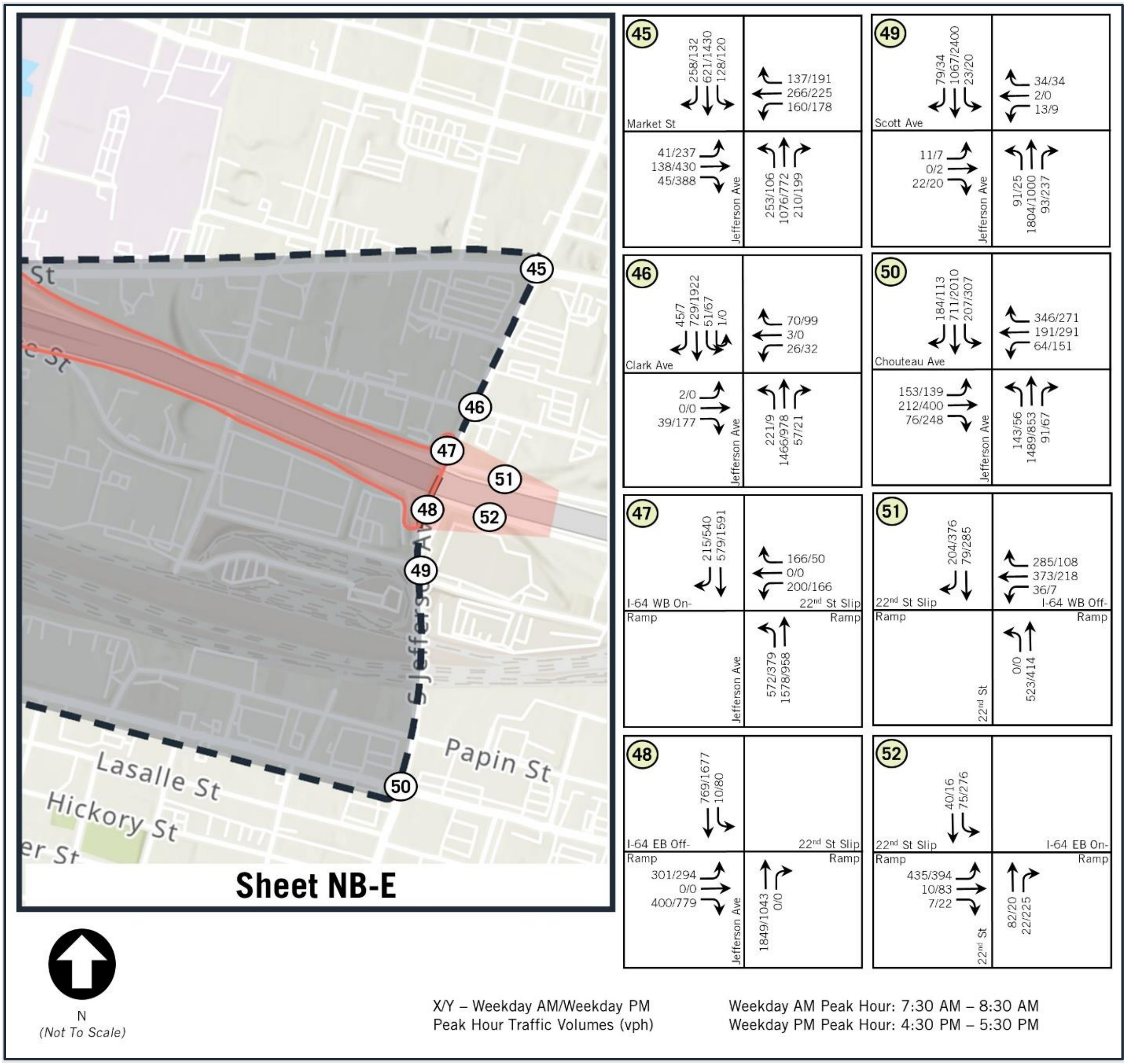


Figure 21. No Build (Maintenance Only) Alternative: Year 2050 Peak Hour Traffic - Sheet NB-E



3.3.2. Corridor Alternative #1

Corridor Alternative #1 assumes that the road network would be modified as previously described in Section 2.2. The traffic forecasts for the Year 2050 No Build (Maintenance Only) Corridor Alternative were rerouted to represent the changes to the infrastructure, such as the removal of the I-64 eastbound ramp from Forest Park Avenue. **Figure 22** and **Figure 23** present the Year 2050 Corridor Alternative #1 volumes for the I-64 corridor and ramps, while **Figure 24** (Tower Grove/Boyle) and **Figure 25** (Grand/Compton) illustrate the intersection turning movement volumes within the Study Area assuming Corridor Alternative #1 is in place.

Note that Figure 24 and Figure 25 only present those intersections near the I-64 corridor where the turning movement volumes would be impacted by the proposed changes in the infrastructure. Intersections further removed from the interstate corridor, such as Forest Park Avenue at Kingshighway or Chouteau at Jefferson, are not presented since the forecasted volumes would not differ from those presented in the No Build (Maintenance Only) alternative.

Figure 22. Alternative #1: I-64 Corridor Year 2050 Peak Hour Traffic – Kingshighway to Vandeventer

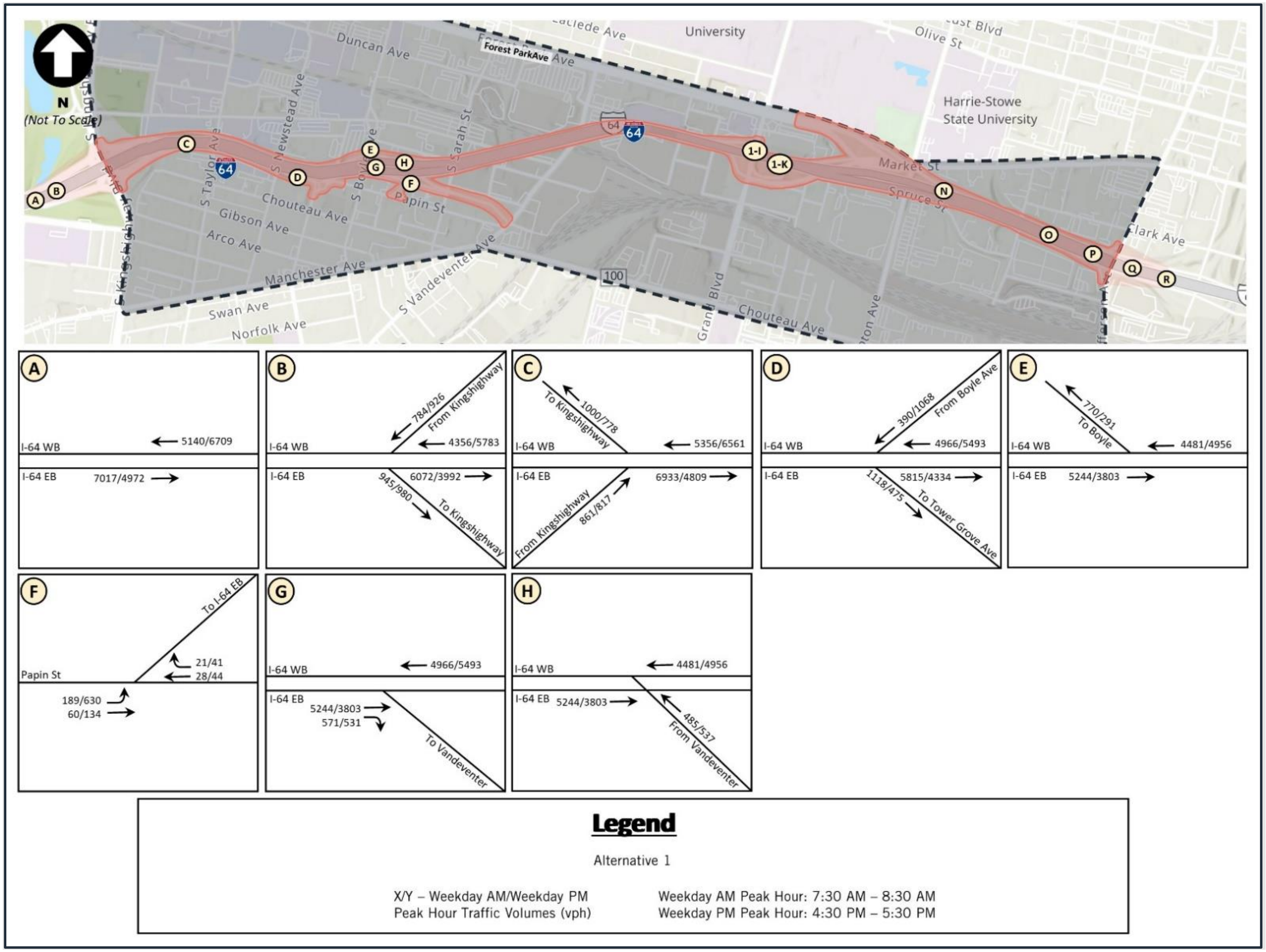


Figure 23. Alternative #1: I-64 Corridor Year 2050 Peak Hour Traffic – Grand to 22nd

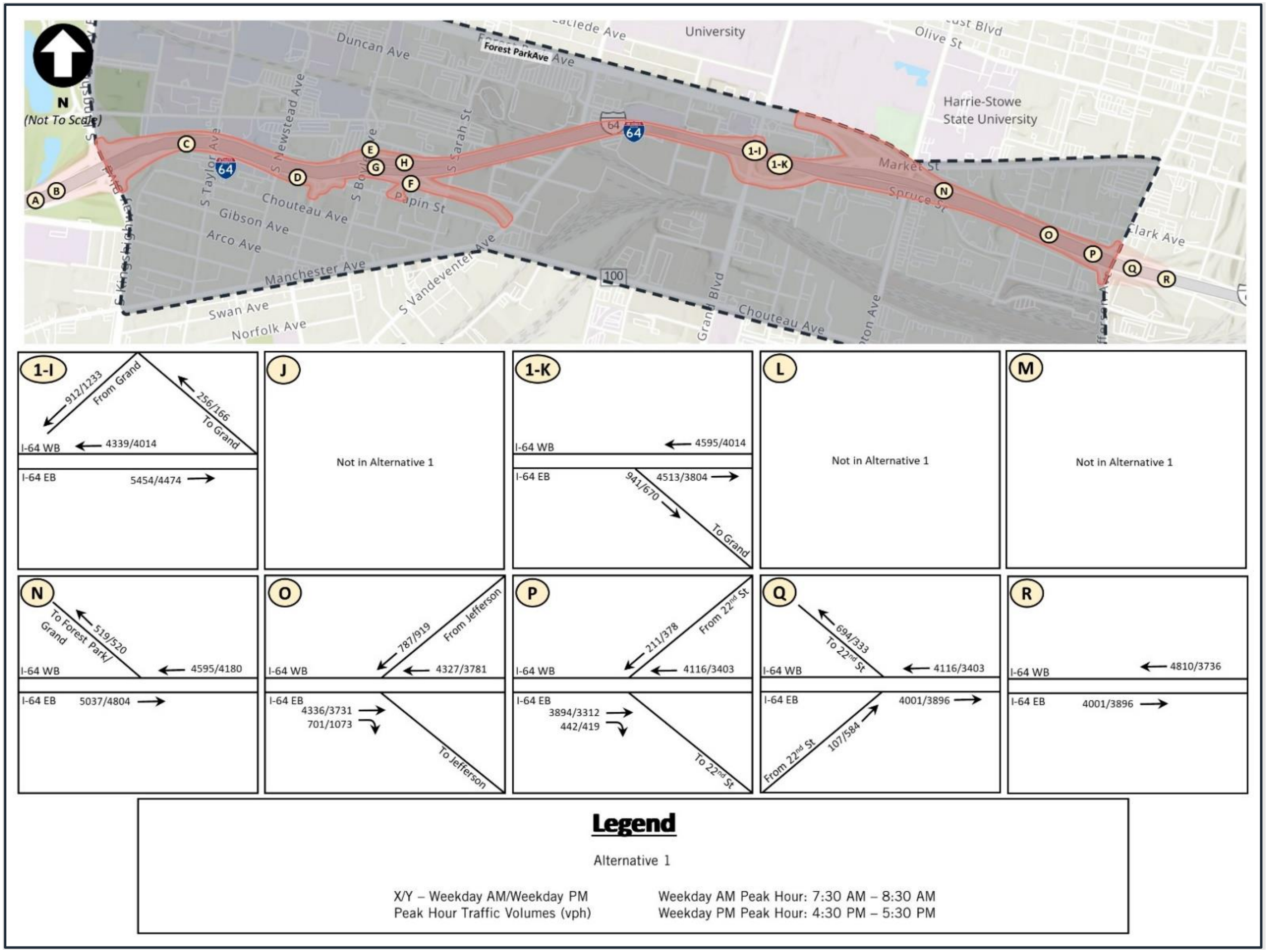
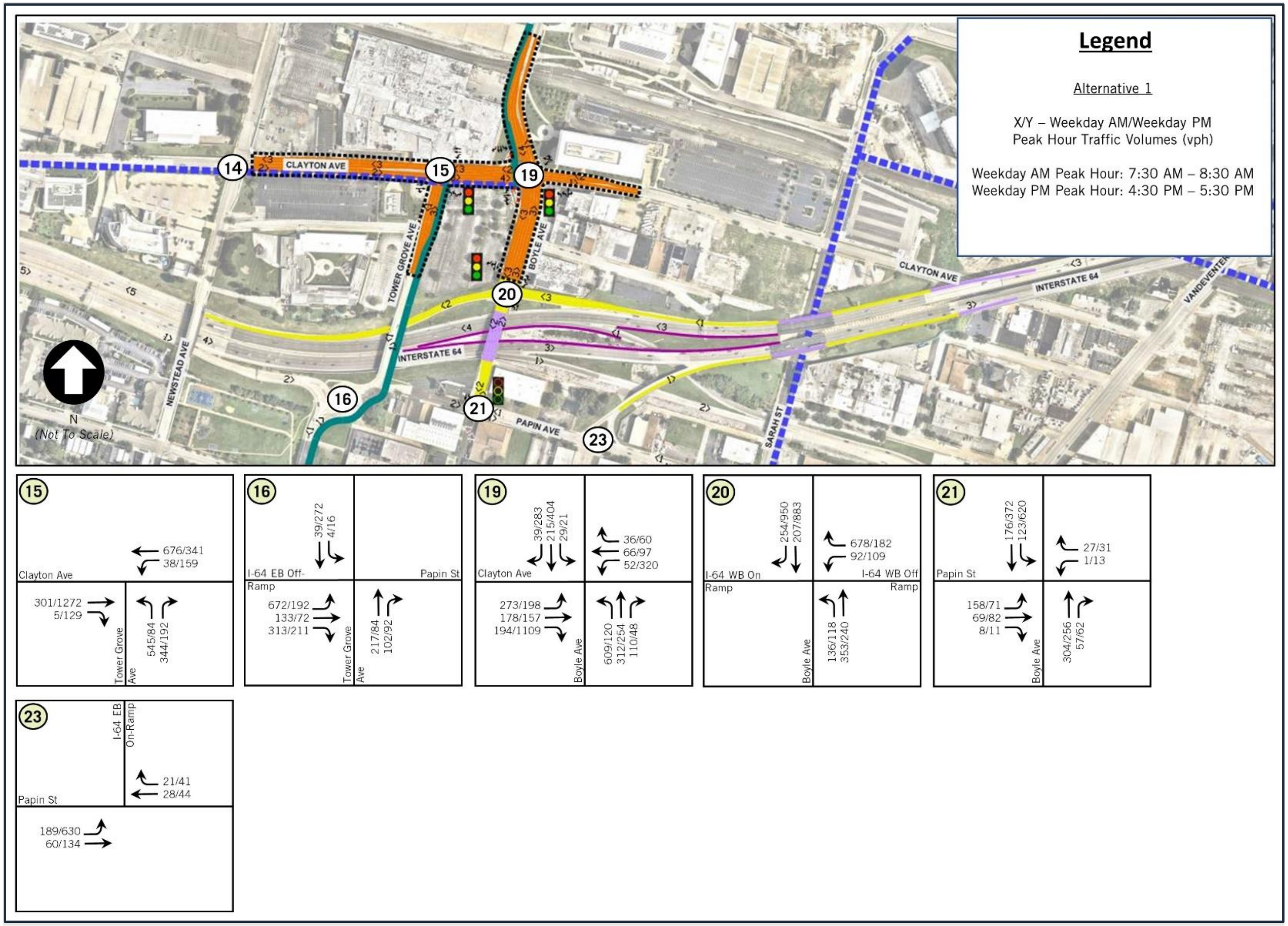
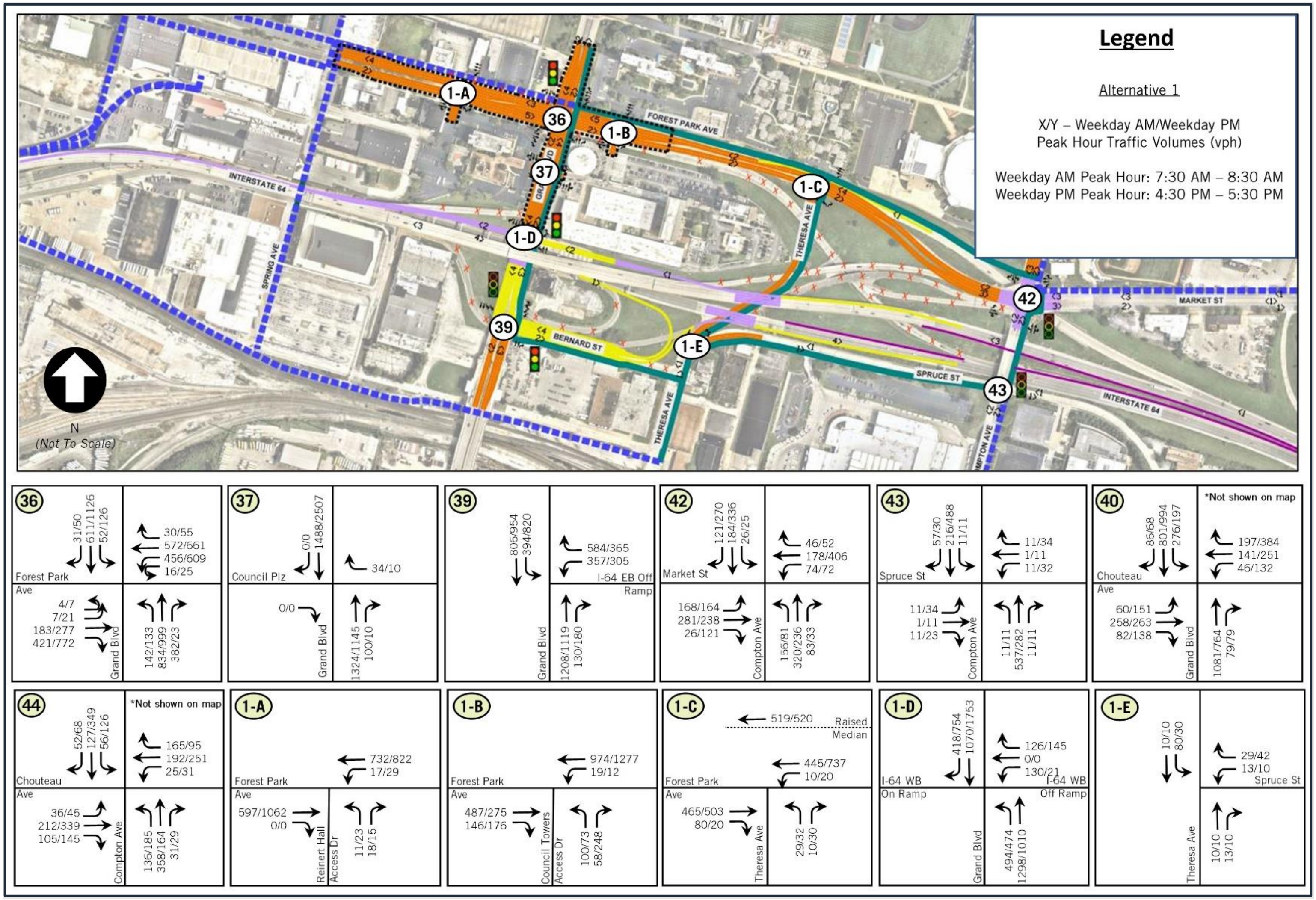


Figure 24. Alternative #1: Year 2050 Peak Hour Traffic - Sheet 1A



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 25. Alternative #1: Year 2050 Peak Hour Traffic - Sheet 1B



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

3.3.3. Corridor Alternative #2

Corridor Alternative #2 assumes that the road network would be modified as previously described in Section 2.3. The traffic forecasts for the Year 2050 No Build (Maintenance Only) Corridor Alternative were rerouted to represent the changes to the infrastructure, such as the relocation of the eastbound I-64 on ramp from Papin to Boyle Avenue or the removal of the eastbound I-64 on ramp from Forest Park Avenue. **Figure 26** and **Figure 27** present the Year 2050 Corridor Alternative #2 volumes for the I-64 corridor and ramps, while **Figure 28** (Tower Grove/Boyle) and **Figure 29** (Grand/Compton) illustrate the intersection turning movement volumes within the Study Area assuming Corridor Alternative #2 is in place.

As with the traffic forecast for Corridor Alternative #1, Figure 28 and Figure 29 only present those intersections near the I-64 corridor where the turning movement volumes would be impacted by the proposed changes in the infrastructure. Intersections further removed from the interstate corridor are not presented since the forecasted volumes would not differ from those presented in the No Build (Maintenance Only) alternative.

Figure 26. Alternative #2: I-64 Corridor Year 2050 Peak Hour Traffic – Kingshighway to Vandeventer

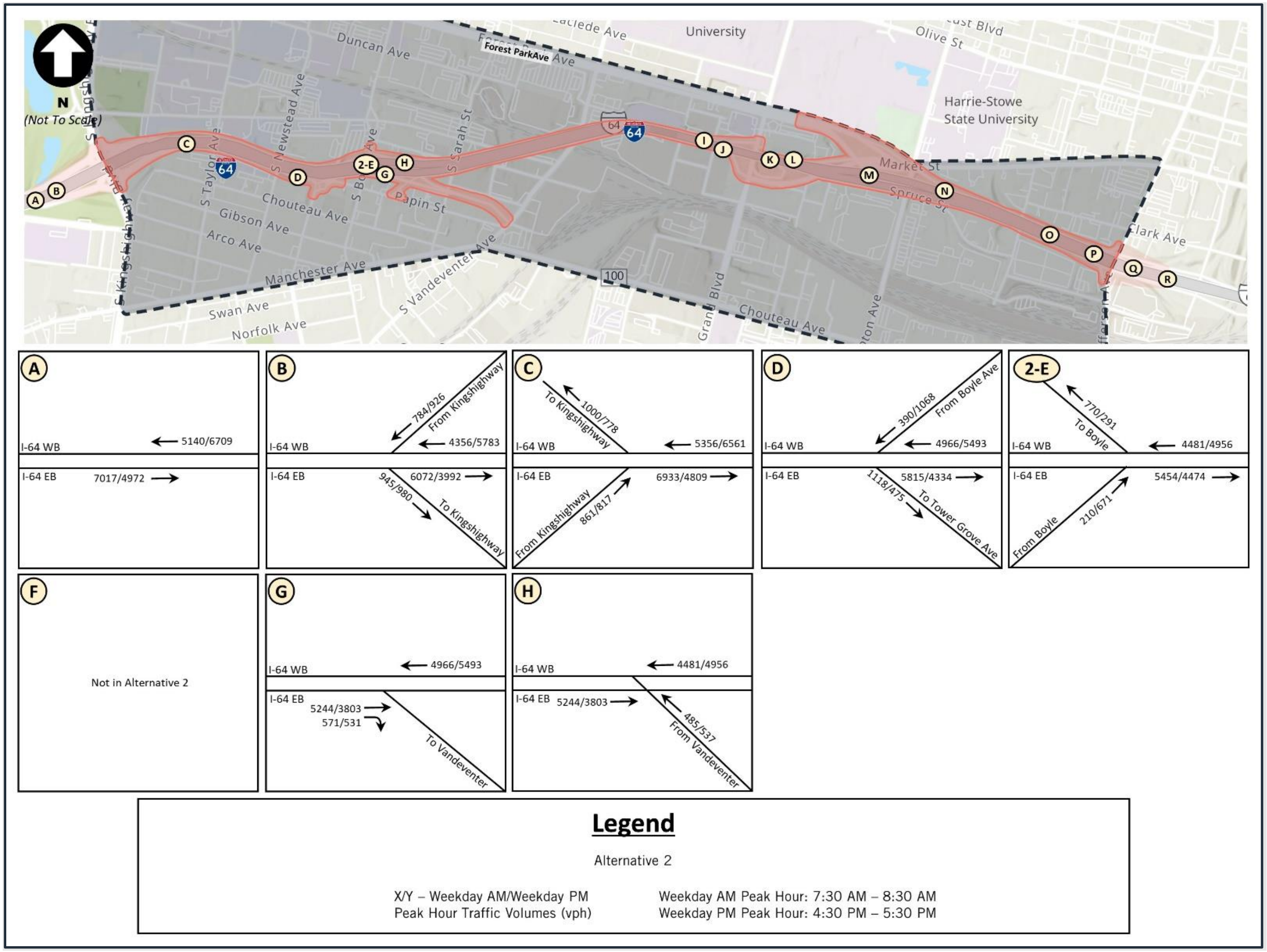
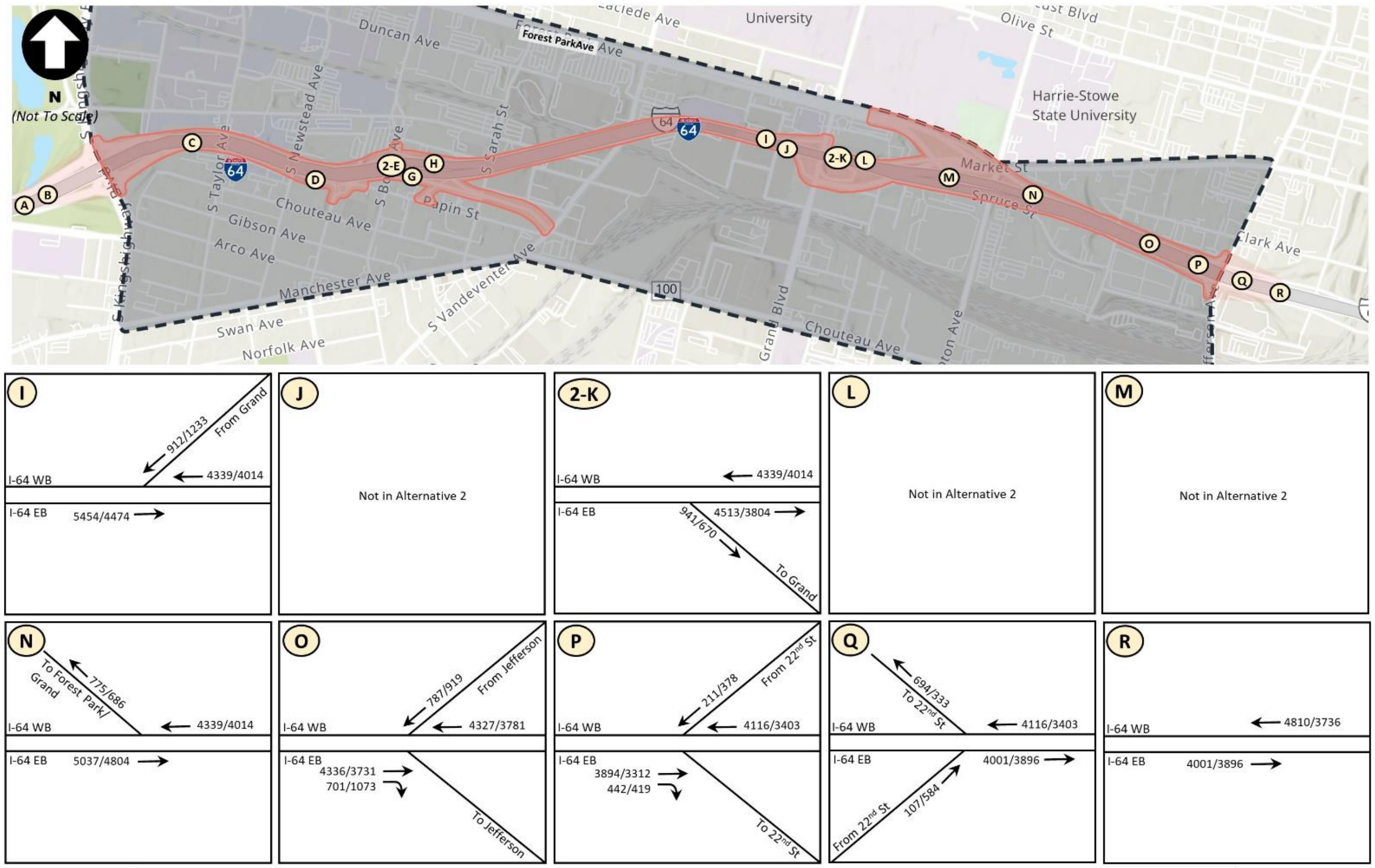


Figure 27. Alternative #2: I-64 Corridor Year 2050 Peak Hour Traffic – Grand to 22nd



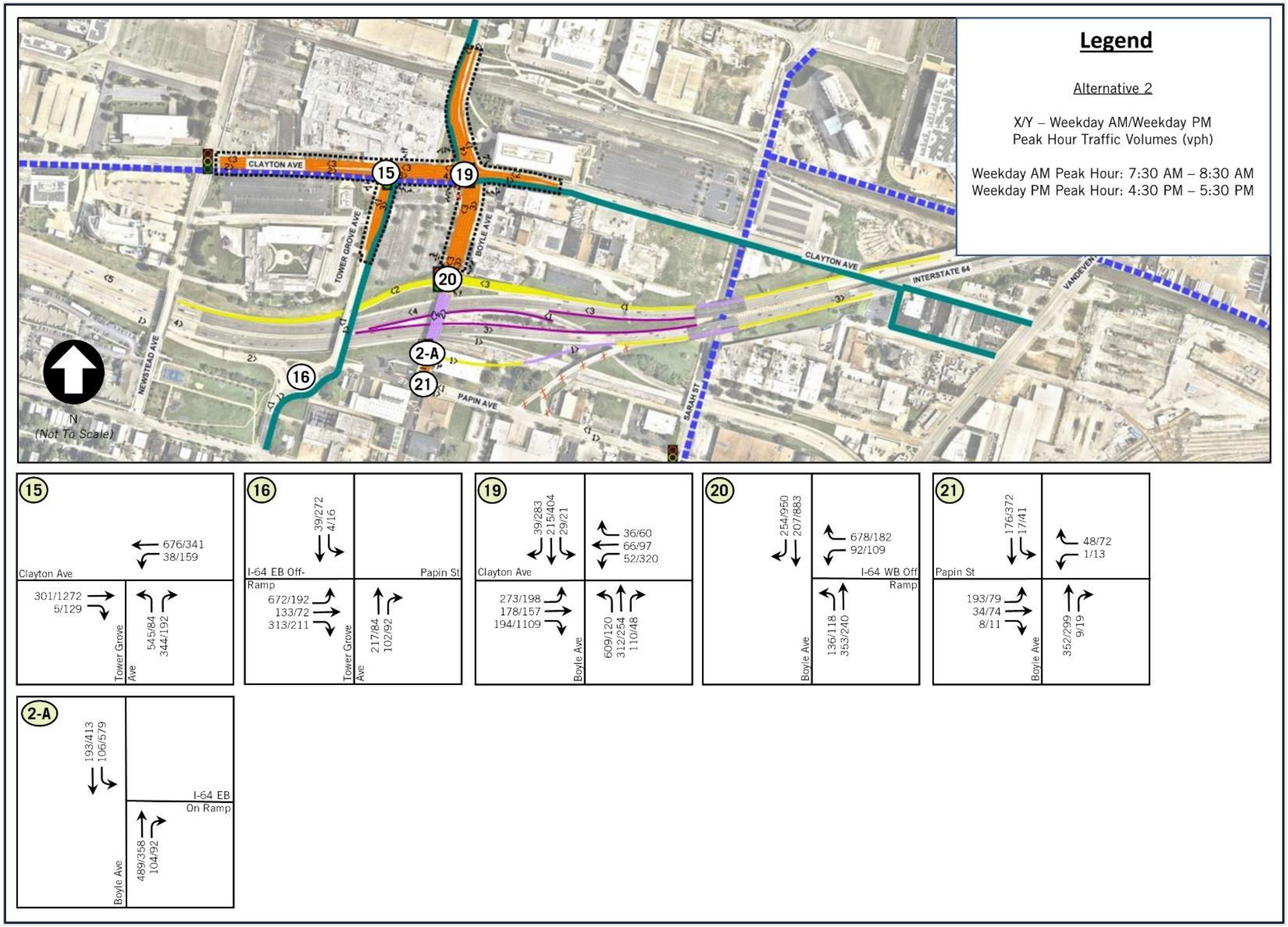
Legend

Alternative 2

X/Y – Weekday AM/Weekday PM Peak Hour Traffic Volumes (vph)

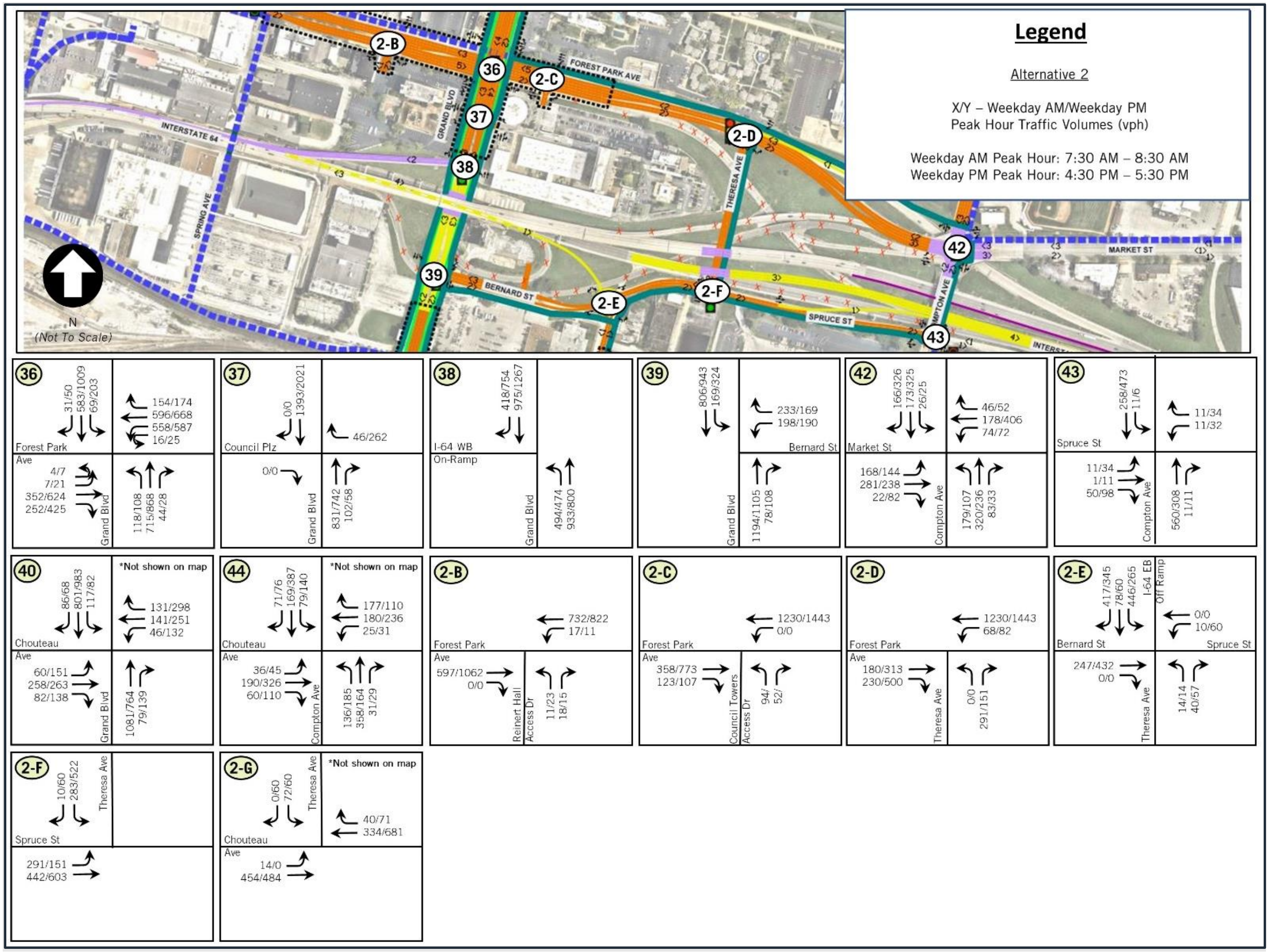
Weekday AM Peak Hour: 7:30 AM – 8:30 AM
Weekday PM Peak Hour: 4:30 PM – 5:30 PM

Figure 28. Alternative #2: Year 2050 Peak Hour Traffic - Sheet 2A



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 29. Alternative #2: Year 2050 Peak Hour Traffic - Sheet 2B



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

3.3.4. Corridor Alternative #3

Corridor Alternative #3 assumes that the road network would be modified as previously described in Section 2.4. The traffic forecasts for the Year 2050 No Build (Maintenance Only) Corridor Alternative were rerouted to represent the changes to the infrastructure, such as the removal of the I-64 ramps to and from Forest Park Avenue or the removal of vehicular traffic from the Tower Grove overpass. **Figure 30** and **Figure 31** present the Year 2050 Corridor Alternative #3 volumes for the I-64 corridor and ramps, while **Figure 32** (Tower Grove/Boyle) and **Figure 33** (Grand/Compton) illustrate the intersection turning movement volumes within the Study Area assuming Corridor Alternative #3 is in place.

As with the traffic forecast for Corridor Alternatives #1 and #2, Figure 32 and Figure 33 only present those intersections near the I-64 corridor where the turning movement volumes would be impacted by the proposed changes in the infrastructure. Intersections further removed from the interstate corridor are not presented since the forecasted volumes would not differ from those presented in the No Build (Maintenance Only) alternative.

Figure 30. Alternative #3: I-64 Corridor Year 2050 Peak Hour Traffic – Kingshighway to Vandeventer

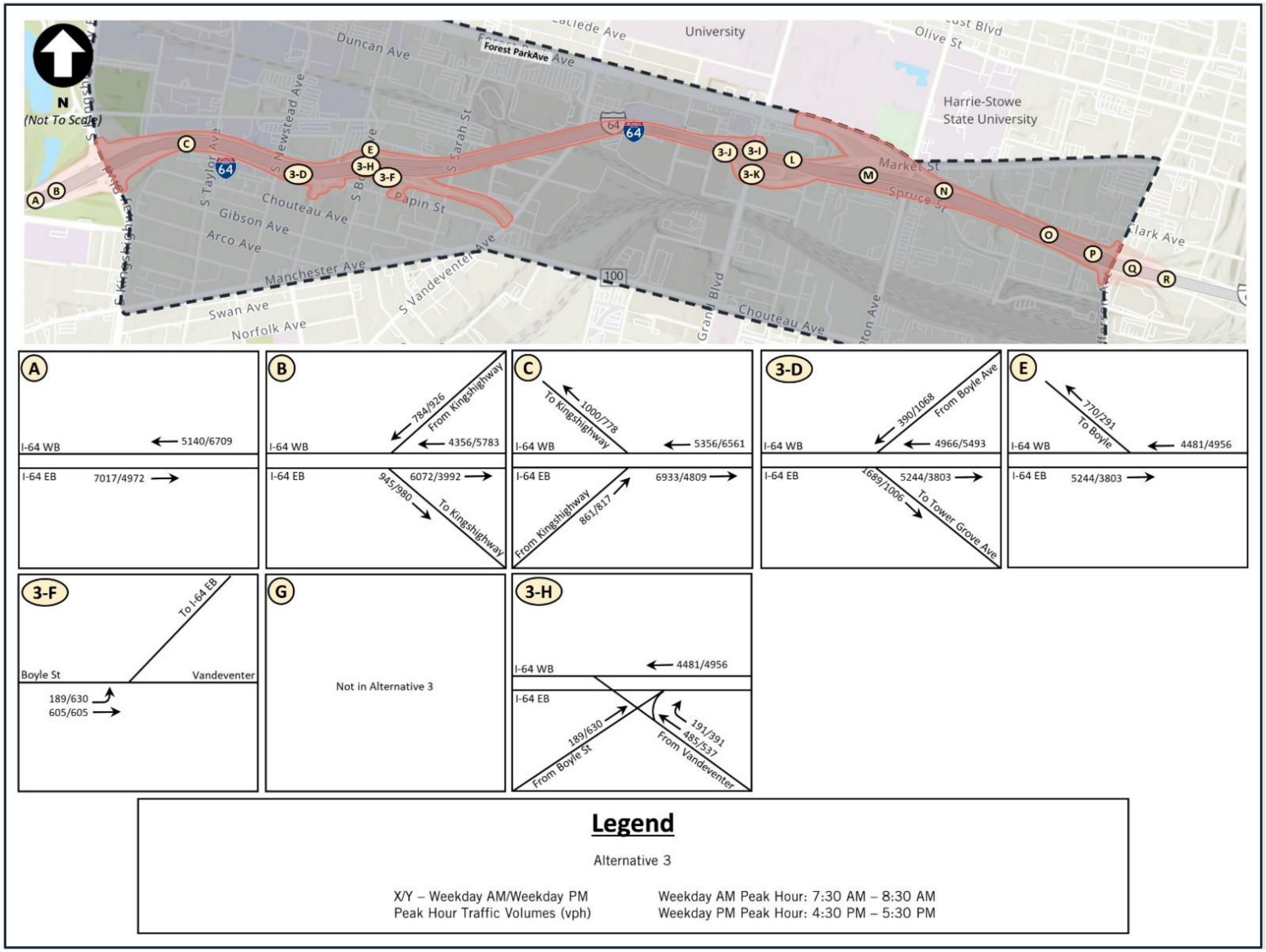


Figure 31. Alternative #3: I-64 Corridor Year 2050 Peak Hour Traffic – Grand to 22nd

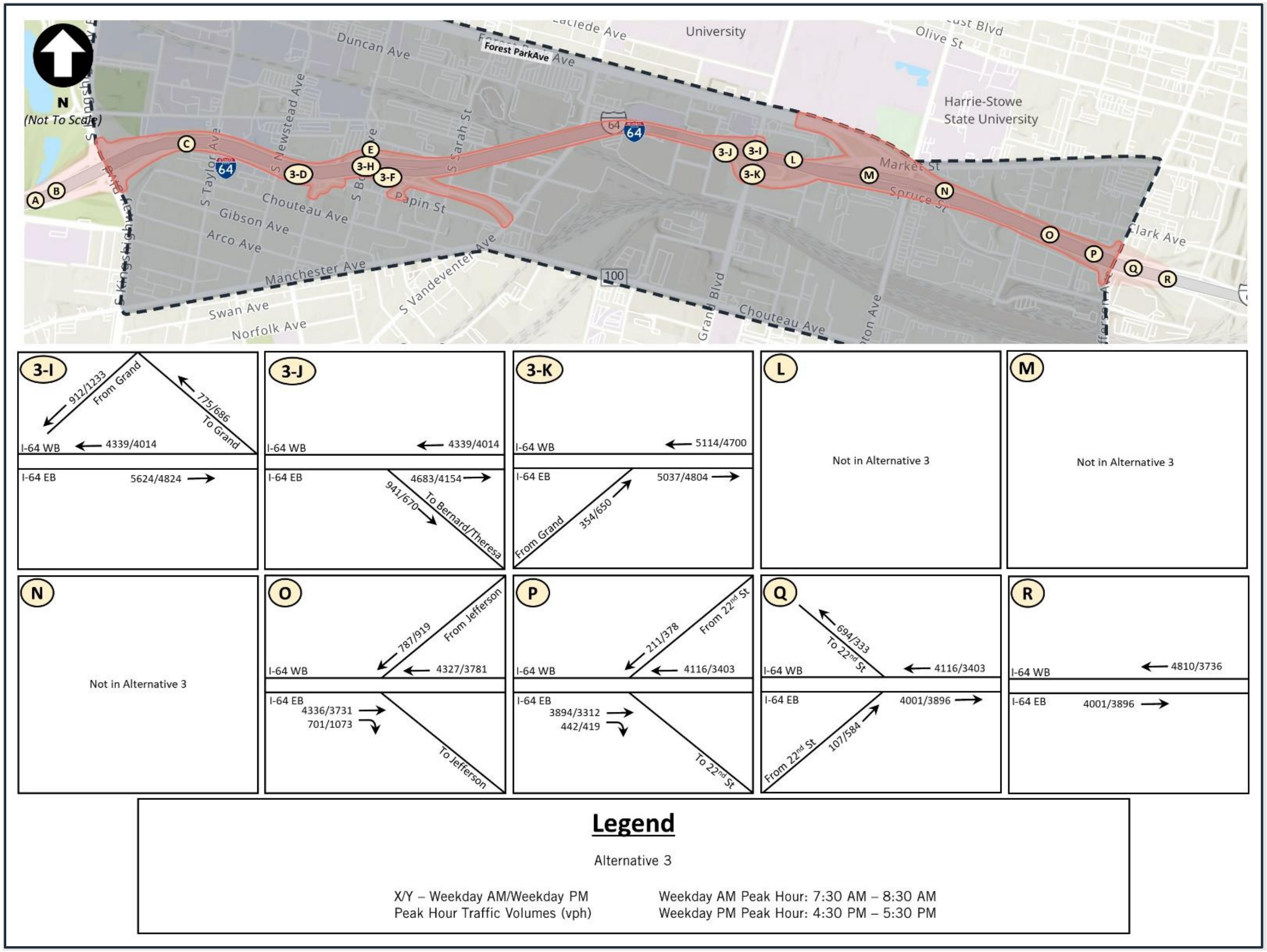
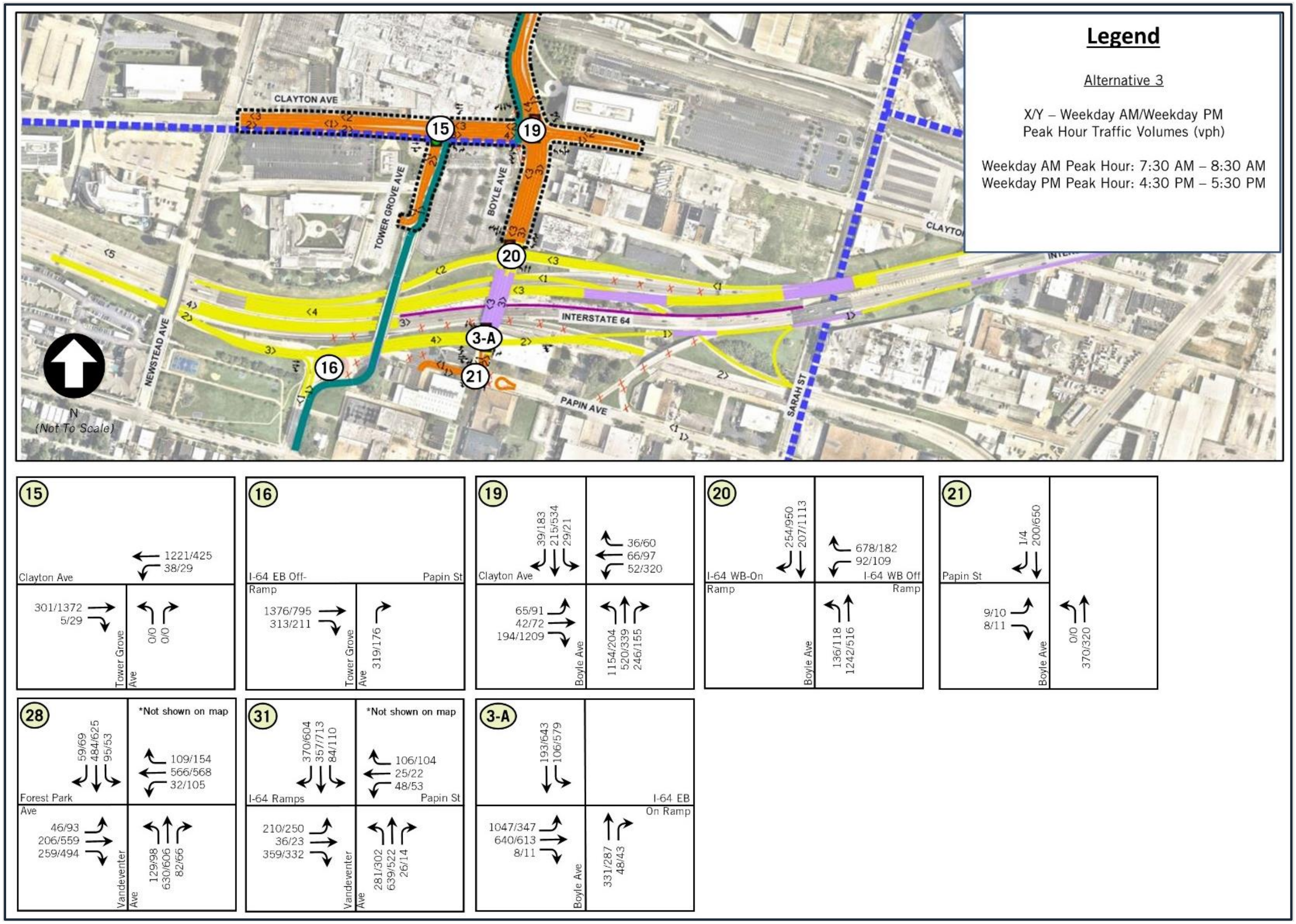
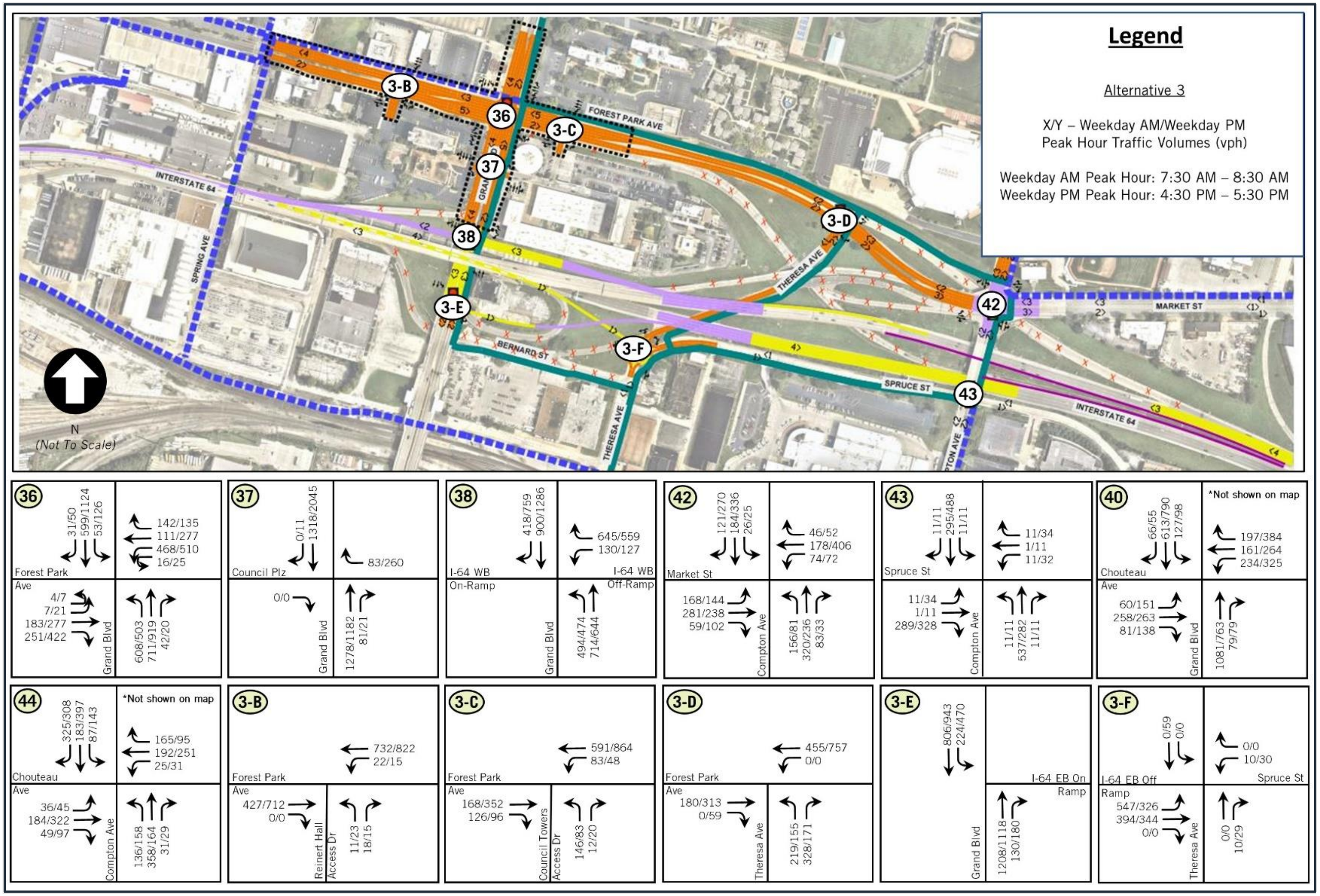


Figure 32. Alternative #3: Year 2050 Peak Hour Traffic - Sheet 3A



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 33. Alternative #3: Year 2050 Peak Hour Traffic - Sheet 3B



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

4. NO BUILD (MAINTENANCE ONLY) ALTERNATIVE

The methodology, and associated assumptions, for the PEL were summarized in the Methods and Assumptions Report, as required by Section 905.3.7.1 of MoDOT's EPG which provides guidance for MoDOT reviewed Transportation Impact Analysis. The Methods and Assumptions Report was reviewed and approved by MoDOT before commencing with the existing and alternative analysis. The agreed upon methodology is also presented in the Existing Traffic, Safety & Multimodal Conditions Report, Section 2.3. The reader is reminded that special event traffic for Grand Center or Midtown entertainment venues was not evaluated as part of the PEL.

The following subsections present the findings of the traffic operations, safety, and multimodal analysis as it pertains to the Year 2050 No Build (Maintenance Only) Corridor Alternative, which assumes that the existing road network would remain as is, without significant infrastructure reconfiguration beyond the committed and likely multimodal projects previously identified and shown in Figure 3 and Figure 4. It should be noted that with respect to I-64 mainline operations, it was assumed that the constraint to the west of the Study Area, at I-64 and Hampton was resolved and no longer spilling back into the Study Area, as agreed upon by MoDOT in July 2022.

4.1. TRAFFIC OPERATIONS

In accordance with Sections 905.3.2 and 905.3.5 in MoDOT's EPG, VISSIM and Synchro were the primary and predominant tools used for the traffic operations analysis. Using the calibrated VISSIM model from the Existing Conditions, the Year 2050 No Build (Maintenance Only) traffic conditions along I-64 within Tier 1 limits were evaluated, including its ramp terminals. Synchro and Sidra were used to evaluate the surrounding road network within the Tier 2 limits (signalized/unsignalized intersections and roundabouts) for the Year 2050 No Build (Maintenance Only) AM and PM peak hours. The HCM guidelines were used to evaluate merge, diverge, and weaving operations as a supplement to the VISSIM model.

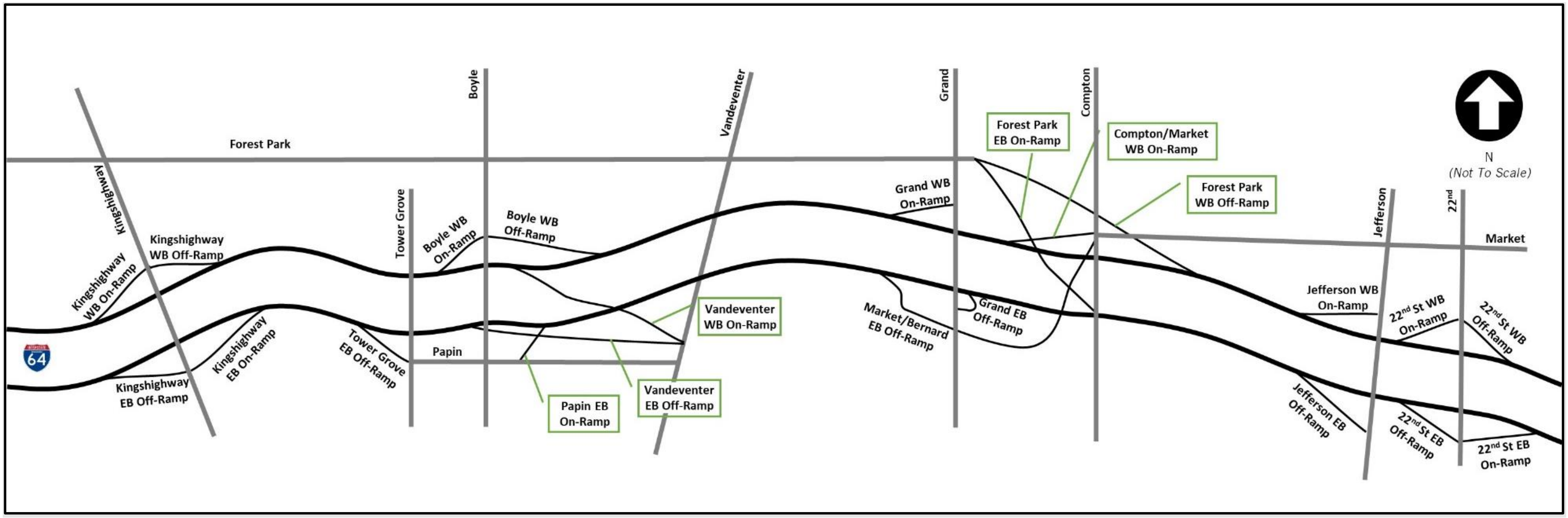
4.1.1. Tier 1 Limits: I-64

The primary focus of the PEL study is on the I-64 infrastructure within MoDOT's right-of-way and how it can be improved to meet the needs and goals of the study. The Tier 1 limits include the I-64 mainline and MoDOT right-of-way, from the western gore points of the ramps to and from Kingshighway Blvd. to the eastern gore points of the ramps at 22nd St. (which operates as a split diamond interchange with Jefferson Ave.). The limits include I-64, inclusive of all merge, diverge, and weave sections, as well as the ramp terminals at each of the interchanges.

4.1.1.1. Access to I-64

Under the No Build (Maintenance Only) alternative, the Tier 1 limits would continue to include six interchanges with I-64 and access points that connect I-64 to 12 local and regional roadways. **Figure 34** schematically depicts the locations of access to and from I-64 and the distances between these access points.

Figure 34. No Build (Maintenance Only) Alternative: I-64 Access to Road Network (Schematic)



4.1.1.2. Validation of Year 2050 No Build (Maintenance Only) Traffic Models

The traffic simulation model calibration process was achieved during the evaluation of the existing conditions with the development of a base model that replicated existing conditions. The future year models (Year 2050) cannot be "validated" with respect to delays or queues since they are projections of forecasted conditions rather than replications of existing. Therefore, the same calibration parameters from the validated existing condition models form the basis for the Year 2050 No Build (Maintenance Only) scenario, where the traffic forecasts presented in Section 3.3.1 were used to update the model's origin-destination matrix.

Due to the inherent stochastic nature of simulation (imposed by random seeds), multiple simulation runs using different seed numbers were required for each time period, and the reported model results were averaged across runs. Based on the characteristics of this model network, the planning-level effort associated with the PEL study and the agreed-upon level of effort during scoping, it was determined that 10 simulation runs were sufficient to obtain an appropriate level of confidence in the results.

4.1.1.3. VISSIM Results

A summary of the following Measures of Effectiveness (MOE) along the I-64 corridor and at its ramp terminals (by approach) are provided for the Year 2050 No Build (Maintenance Only) conditions analysis:

- Speed (I-64)
- Density (I-64)
- Throughput (I-64)
- Vehicular delay (ramp terminals)
- Vehicular queue lengths (ramp terminals)
- Volume/capacity ratio (ramp terminals)
- LOS (I-64 and ramp terminals)

This report presents, graphically, the overall conditions for the Year 2050 No Build (Maintenance Only) alternative. Detailed operating results from the VISSIM and Synchro models are provided in Appendix A. **Figure 35** and **Figure 36** illustrate the Year 2050 No Build (Maintenance Only) operating conditions, as modeled. As shown, in the Tier 1 limits the interstate experiences poor levels of service at many locations during the peak hours assuming no infrastructure improvements to the I-64 corridor.

Figure 35. No Build (Maintenance Only) Alternative: Year 2050 Conditions - AM Tier 1 VISSIM Analysis

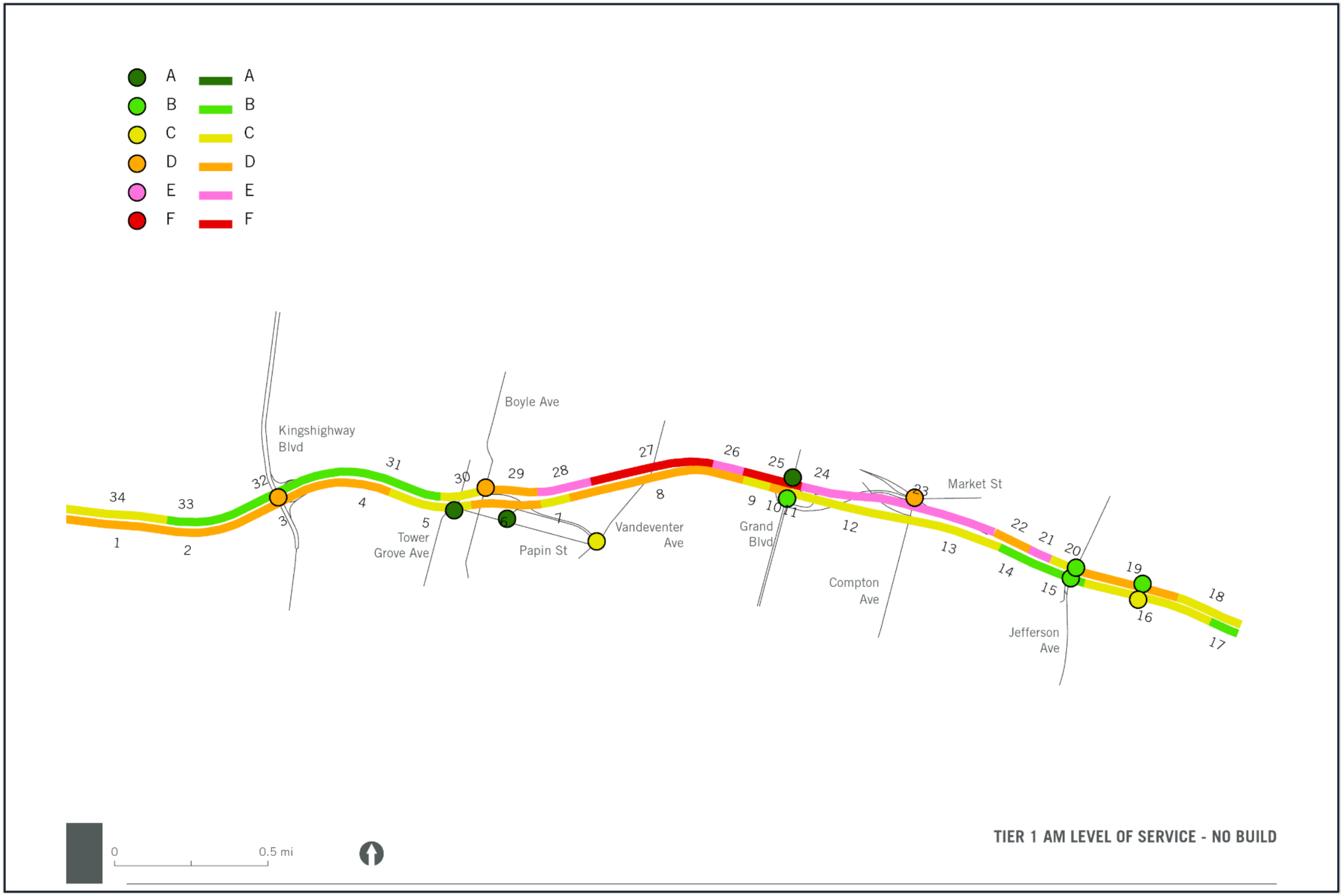


Figure 36. No Build (Maintenance Only) Alternative: Year 2050 Conditions - PM Tier 1 VISSIM Analysis

Overall conditions for the No Build (Maintenance Only) VISSIM network were summarized with regards to average delay, average stops, total delay and throughput. It should be noted that total delay includes the latent delay associated with vehicles unable to enter the network and throughput volumes include traffic traveling through critical intersections immediately adjacent to the interstate that were included due to their potential to influence I-64 operations (such as Clayton at Boyle or Forest Park at Grand). **Table 5** summarizes these network parameters for the No Build (Maintenance Only) alternative.

Table 5. No Build (Maintenance Only) Alternative: Overall Network Performance

Time Period/Variable	No Build (Maintenance Only) Alternative
AM Peak Hour	
Average Delay	133 sec/veh
Average Stops	6.3 stops/veh
Throughput	27,588 veh
PM Peak Hour	
Average Delay	86 sec/veh
Average Stops	2.5 stops/veh
Throughput	29,856 veh

The VISSIM model for the No Build (Maintenance Only) alternative indicates congestion at the following locations:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
  - I-64 eastbound off ramp at Kingshighway Blvd. endures queues which extend back almost to the gore point of the off ramp. However, the maximum queue length is almost four times the average queue length indicating that the occurrence of lengthy queues is low. It is important to note that persistence of these congested conditions can cause safety concerns.
- Clayton Ave. and Boyle Ave - This intersection is discussed in this section due to its proximity to the Tier 1 zone. Please refer to the Tier 2 Synchro Analysis exhibits for the intersection LOS results.
  - This intersection fails during morning peak hour due to lengthy delays and vehicular queues.
  - The eastbound approach operates at LOS F and experiences excessive average queues.
  - The southbound approach operates at LOS F and experiences excessive average queues.

- I-64 westbound between 22nd St. and Boyle Ave. is highly congested. This is due to the diverging traffic movements via the westbound off ramp at Boyle Ave. The existing off ramp struggles to service the traffic destined for the medical campus; particularly given the queue spillback from the intersection to the north at Clayton And Boyle Avenues. This results in queueing back onto the interstate, resulting in significant vehicular backups that, on occasion, extend back to the east end of the study area.

PM PEAK HOUR

- The I-64 westbound and eastbound off ramps both experience considerable congestion. Clayton Ave. and Boyle Ave. - This intersection is discussed in this section due to its proximity to the Tier 1 zone. Please refer to the Tier 2 Synchro Analysis exhibits for the intersection LOS results.
    - The intersection at Clayton Ave. and Boyle Ave. experiences significant congestion in terms of excessive delays and vehicular queues.
    - The eastbound approach operates at LOS F and experiences excessive average queues.
    - The southbound approach operates at LOS F and experiences excessive average queues.

4.1.1.4. Synchro Results

The Year 2050 No Build (Maintenance Only) operating conditions at the intersections within Tier 1 and Tier 2 limits were evaluated using Synchro 11, which is a traffic flow model based on the HCM. The Synchro analysis was completed in accordance with Section 905.3.5.2.3 of MoDOT's EPG. The roundabout at the intersection of the I-64 eastbound off ramp at Tower Grove Ave. was analyzed using Sidra 8, which is based upon methodologies used by the HCM. The Sidra analysis was completed in accordance with Section 905.3.5.2.2 of MoDOT's EPG.

Detailed operating conditions for Tier 1 limits are provided in Appendix A as modeled by Synchro and Sidra. The intersections within the Tier 1 limits operate reasonable overall. The minimal expected growth rates along many of the study corridors allow each intersection within Tier 1 to have an overall LOS D or better, with the exception of I-64 and Kingshighway which operates with an overall LOS E during the AM peak hour (which is still considered acceptable). It should be noted that modest signal timings adjustments were made within the No Build (Maintenance Only) synchro models to better accommodate the future volumes.

In addition to LOS, the volume to capacity (v/c) ratios were analyzed. Several ramp terminals experience high v/c ratios with particular movements. While the intersections overall appear to operate well in the 2050 No Build (Maintenance Only) Scenario, some individual movements experience borderline operating conditions. The following intersections have individual movements that operate at a LOS F or have a v/c ratio above 0.90 for an off ramp from I-64 or 0.95 for all other movements:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
  - ♦ The southbound left-turn has a failing LOS with a v/c ratio of 1.17. The eastbound queue extends down the ramp at times diminishing the available deceleration length, posing a potential safety concern for motorists exiting I-64.
- I-64 Westbound off ramp and Boyle Ave.
  - ♦ The westbound approach of the off ramp with Boyle Ave. operates with a v/c ratio of 1.05. As the queue extends off the ramp, the available deceleration length is diminished, posing a potential safety concern for motorists along and exiting westbound I-64.
- I-64 Eastbound off ramp and Grand Blvd.
  - ♦ The queue extends around the loop ramp diminishing the available deceleration length and posing a potential safety concern for motorists exiting eastbound I-64.

PM PEAK HOUR

- I-64 and Kingshighway Blvd.
  - ♦ As the eastbound and westbound queues extends down the respective ramps the available deceleration length is diminished, posing a potential safety concern for motorists exiting I-64.
- I-64 Westbound on ramp and Grand Blvd.
  - ♦ The westbound approach operates with a failing LOS. It should be noted that this approach is an implied stop with minimal volume and the v/c ratio of 0.61.
- I-64 Eastbound off ramp and Grand Blvd.
  - ♦ The queue extends around the loop ramp diminishing the available deceleration length and posing a potential safety concern for motorists exiting eastbound I-64.

4.1.1.5. Correlation of VISSIM and Synchro Results

It is not uncommon for the VISSIM results to deviate slightly from the Synchro and Sidra results due to the difference in programs and the level of detail included in the inputs and parameters. However, it is still expected that the results should be comparable regardless of the program utilized.

When the results from the various analytical tools used for the traffic analysis are compared, the Year 2050 No Build (Maintenance Only) traffic operations for the overall intersection MOEs as well as the individual approaches are generally comparable to one another. The only differences observed between the various outputs were due to the manner in which a particular program handled the right-turn movement at intersections (VISSIM provides a more detailed analysis of the right-turn movement than Synchro).

4.1.2. Tier 2 Limits: Arterials and Major Collectors

Tier 2 includes the areas outside of Tier 1, but within the study area as defined by Forest Park Ave. and Market St. to the north and Route 100 to the south. Tier 2 encompasses several arterials and major collectors that cross or run parallel to I-64.

4.1.2.1. Synchro Results

The traffic operations conditions within the Tier 2 limits were completed using the same methodology used for the Tier 1 traffic operations but were analyzed using only Synchro. **Figure 37** and **Figure 38** show the Year 2050 No Build (Maintenance Only) operating conditions as modeled by Synchro for the Tier 2 limits. Per the approved scope, only overall intersection LOS is provided for intersections within the Tier 2 limits. Detailed operating conditions are provided in Appendix A. Event traffic for Grand Center or Midtown entertainment venues was not considered in the analysis.

As shown, each of the intersections has an overall LOS of E or better, except for two intersections during both peak periods:

- Kingshighway Blvd. at Route 100
- Clayton Ave. at Boyle Ave.

The existing lane configuration and traffic control struggles to accommodate the 2050 No Build (Maintenance Only) traffic volumes at those two intersections.

The following intersections have at least one approach with a LOS F or a v/c ratio in excess of 0.95 during either the AM or PM peak period:

AM PEAK HOUR

- Kingshighway Blvd. and Manchester Ave. (Route 100)
    - ♦ The eastbound and northbound approaches have a failing during the AM peak period. The eastbound approach has a v/c of 1.18, the northbound approach has a v/c ratio of 1.28, and the southbound approach has a v/c ratio of 1.16.
- Forest Park Ave. and Grand Blvd.
    - ♦ The westbound approach has a LOS E. While acceptable, it should be noted that Synchro is unable to model this intersection as it truly functions. Field observations revealed that due to the geometry of this intersection, many cars stop in the middle. This degrades the operating conditions as vehicles must maneuver around each other, decreasing the amount of usable green time. However, Synchro is unable to accurately replicate this. Therefore, the operating conditions at this intersection are likely understated.
- Clayton Ave. and Newstead Ave.
    - ♦ The westbound approach has a v/c ratio of 1.06.

- Clayton Ave. and Tower Grove Ave.
  - The northbound approach has a v/c ratio of 0.98.
- Clayton Ave. and Boyle Ave.
  - The eastbound, westbound, and southbound approaches fail. The v/c ratio for the eastbound approach is expected to be 1.32 and the v/c ratio for the southbound approach is expected to be 1.71.
- Manchester Ave. and Taylor Ave.
  - The eastbound approach has a v/c ratio of 1.11, the westbound approach has a v/c ratio of 0.95, and the southbound approach has a v/c ratio of 0.99.
- Chouteau Ave. and Jefferson Ave.
  - The northbound approach has a v/c ratio of 1.06 and the southbound left-turn has a v/c ratio of 0.96.

PM PEAK HOUR

- Kingshighway Blvd. and Forest Park Ave.
  - The westbound through movement has a v/c ratio of 1.06 during the PM peak period.
- Kingshighway Blvd. and Manchester Ave. (Route 100)
  - The eastbound and westbound approaches of Manchester Road fail. The eastbound approach has a v/c ratio of 1.10 and the westbound approach has a v/c ratio of 1.37. Additionally, the southbound approach of Kingshighway has a v/c ratio of 1.03, indicating it is over capacity.
- Forest Park Ave. and Grand Blvd.
  - The westbound approach has a LOS E. While acceptable, it should be noted that Synchro is unable to model this intersection as it truly functions. Field observations revealed that due to the geometry of this intersection, many cars stop in the middle. This degrades the operating conditions as vehicles must maneuver around each other, decreasing the amount of usable green time. However, Synchro is unable to accurately replicate this. Therefore, the operating conditions at this intersection are likely understated.
- Clayton Ave. and Newstead Ave.
  - The southbound approach has a v/c ratio of 1.07.
- Clayton Ave. and Boyle Ave.
  - The eastbound, westbound, and southbound approaches fail. The v/c ratio for the eastbound approach is expected to be 1.62, the v/c ratio for the westbound

approach is expected to be 2.09, and the v/c ratio for the southbound approach is expected to be 1.18.

- Manchester Ave. and Taylor Ave.
    - ♦ The southbound approach has a v/c ratio of 1.07.
- Compton Ave. and Spruce St.
    - ♦ The eastbound approach has a failing LOS.
- Chouteau Ave. and Jefferson Ave.
    - ♦ The eastbound approach has a failing LOS with a v/c ratio of 1.04. The westbound approach has a v/c ratio of 1.02 and the southbound approach has a v/c ratio of 1.12.

As stated above, many of the movements that experience a LOS F or v/c ratio's approaching capacity are either side-street movements at unsignalized intersections where the traffic is unable to find a gap in the free-flowing traffic or where the traffic must wait through a long signal length, causing delays. Similar to the existing conditions, there are lane changes which impact traffic operations such as Chouteau Ave., east of Grand Blvd., where it decreases from two through lanes to one through lane in each direction thereby diminishing the available capacity. More importantly, there are critical movements, most notably at Kingshighway Blvd. at Forest Park Ave., Kingshighway Blvd. at Manchester Ave., and Clayton Ave. at Boyle Ave., which are over capacity. These intersections would require improvements to accommodate the anticipated 2050 No Build (Maintenance Only) traffic volumes.

Figure 37. No Build (Maintenance Only) Alternative: Year 2050 Conditions - AM Tier 2 Synchro Analysis

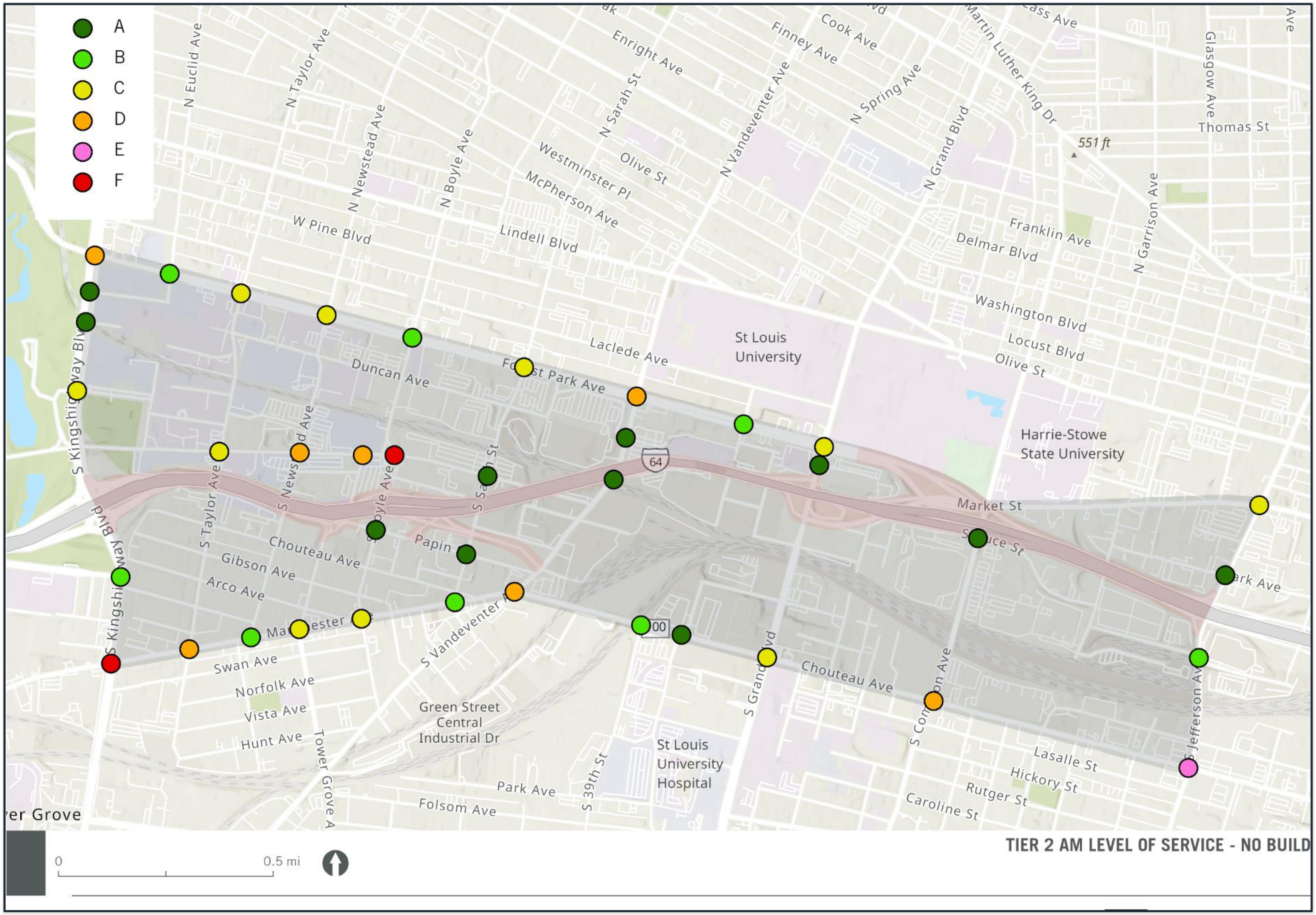
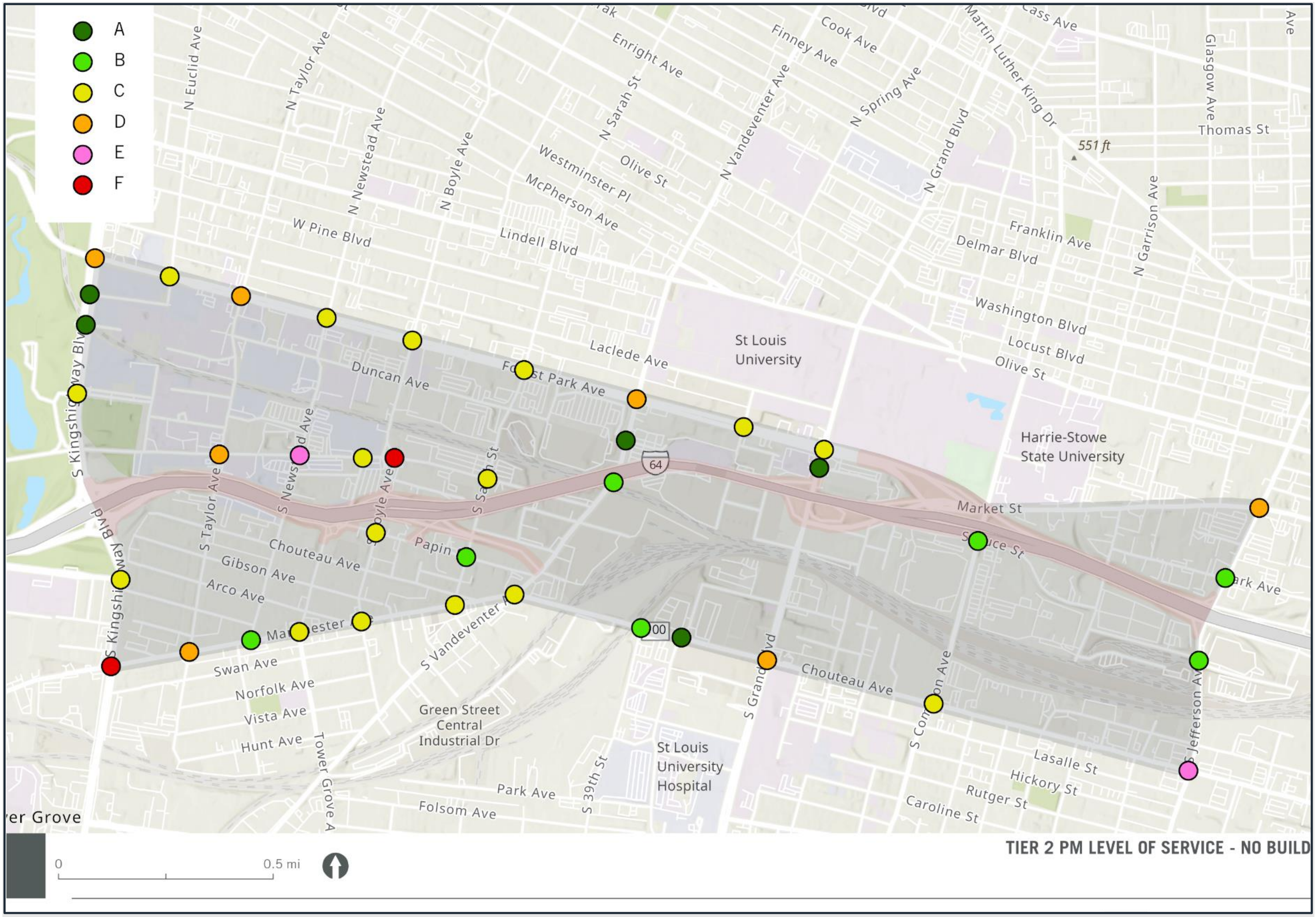


Figure 38. No Build (Maintenance Only) Alternative: Year 2050 Conditions - PM Tier 2 Synchro Analysis



4.2. SAFETY

From a safety perspective, the No Build (Maintenance Only) alternative assumes no measurable changes to the roadway network throughout the study area beyond the committed and likely bike/pedway facilities planned by MoDOT, City of St. Louis and Great Rivers Greenway. Consequently, the following metrics and qualitative assessments of the No Build (Maintenance Only) alternative essentially mirror that of the existing conditions.

4.2.1. No Build (Maintenance Only) Alternative: Interchange Spacing, Ramp Lengths & Access Points

For the No Build (Maintenance Only) scenario within the Tier 1 area, the close interchange spacing from Kingshighway Blvd. to Tower Grove Ave., Grand Ave. to Market St./Compton Ave., and Market St./Compton Ave. to Jefferson Ave. would remain. Similarly, the distances between ramp gore points and each ramp length would not change, meaning any dimensions that do not meet current design standards would continue to be noncompliant. Table 6, Table 7, and Table 8 summarize the interchange and gore spacing for the No Build (Maintenance Only) alternative as well as the ramp lengths. Figure 39 graphically presents the gore distances between I-64 ramps within the study area.

It should be noted that the unique interchange configurations in the No Build (Maintenance Only) alternative generates a need to identify which specific cross streets are to be used for interchange spacing measurement. For the Tower Grove Ave./ Boyle Ave./ Papin St. interchange, a midpoint between Tower Grove and Boyle Avenues crossing I-64 was used as the point to determine distance to adjacent interchanges. Similarly, Compton Ave. was used as the cross-street reference relative to the No Build (Maintenance Only) access ramp currently noted as Bernard St./Market St. This leads to incongruity with respect to Grand Blvd., given the eastbound exit to Bernard St./Market St. is west of Grand Blvd., but more accurately represents how interchange spacing is traditionally measured.

Table 6. No Build (Maintenance Only) Alternative: Interchange Spacing

Interchange	Existing/No Build (Maintenance Only)	Design Standard[1/]
S. Kingshighway Blvd. to Tower Grove Ave. / Boyle Ave. / Papin St.*	3,440’	5,280’
Tower Grove Ave. / Boyle Ave. / Papin St.* to Vandeventer Ave.	3,100’	5,280’
Vandeventer Ave. to Grand Blvd.	2,440’	5,280’
Grand Blvd. to Market St. / Compton Ave.	2,125’	5,280’
Market St. / Compton Ave. to Jefferson Ave.	2,985’	5,280’
Jefferson Ave. to 22nd St.	1,200’	5,280’

Note: Distance represent centerline of cross street to centerline of adjacent cross street
** Distance based on a center point between the Tower Grove Ave. and Boyle Ave. overpasses*
1/: Table 1, Publication No. FHWA-HRT-07-031 Safety Assessment of Interchange Spacing on Urban Freeways

Table 7. No Build (Maintenance Only) Alternative: Gore Spacing

Interchange	Existing/No Build (Maintenance Only)	Design Standard
I-64 Eastbound Direction		
I-64 EB On Ramp from S. Kingshighway Blvd. I-64 EB Off Ramp to Tower Grove Ave.	874’	1,600’
I-64 EB Off Ramp to Tower Grove Ave. I-64 EB Off Ramp to Vandeventer Ave.	1,429’	1,000’
I-64 EB Off Ramp to Vandeventer Ave. I-64 EB On Ramp from Papin St.	1,191’	500’
I-64 EB On Ramp from Papin St. I-64 EB Off Ramp to Market St.	3,903’	1,600’
I-64 EB Off Ramp to Market St. I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	828’	1,000’

Interchange	Existing/No Build (Maintenance Only)	Design Standard
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Existing/No Build (Maintenance Only) Grand Blvd.) I-64 EB On Ramp from Forest Park Ave.	Existing/No Build (Maintenance Only)1,755’	500’
I-64 EB On Ramp from Forest Park Ave. I-64 EB Off Ramp to Jefferson Ave.	2,204’	1,600’
I-64 Westbound Direction		
I-64 WB Off Ramp to S. Kingshighway Blvd. I-64 WB On Ramp from Boyle Ave.	1,881’	1,600’
I-64 WB On Ramp from Boyle Ave. I-64 WB On Ramp from Vandeventer Ave.	977’	1,000’
I-64 WB On Ramp from Vandeventer Ave. I-64 WB Off Ramp to Boyle Ave.	755’	500’
I-64 WB Off Ramp to Boyle Ave. I-64 WB On Ramp from Grand Blvd.	3,618’	1,600’
I-64 WB On Ramp from Grand Blvd. I-64 WB On Ramp from Market St.	1,497’	1,000’
I-64 WB On Ramp from Market St. I-64 WB Off Ramp to Forest Park Ave.	2,468’	500’
I-64 WB Off Ramp to Forest Park Ave. I-64 WB On Ramp from Jefferson Ave.	1,144’	1,600’

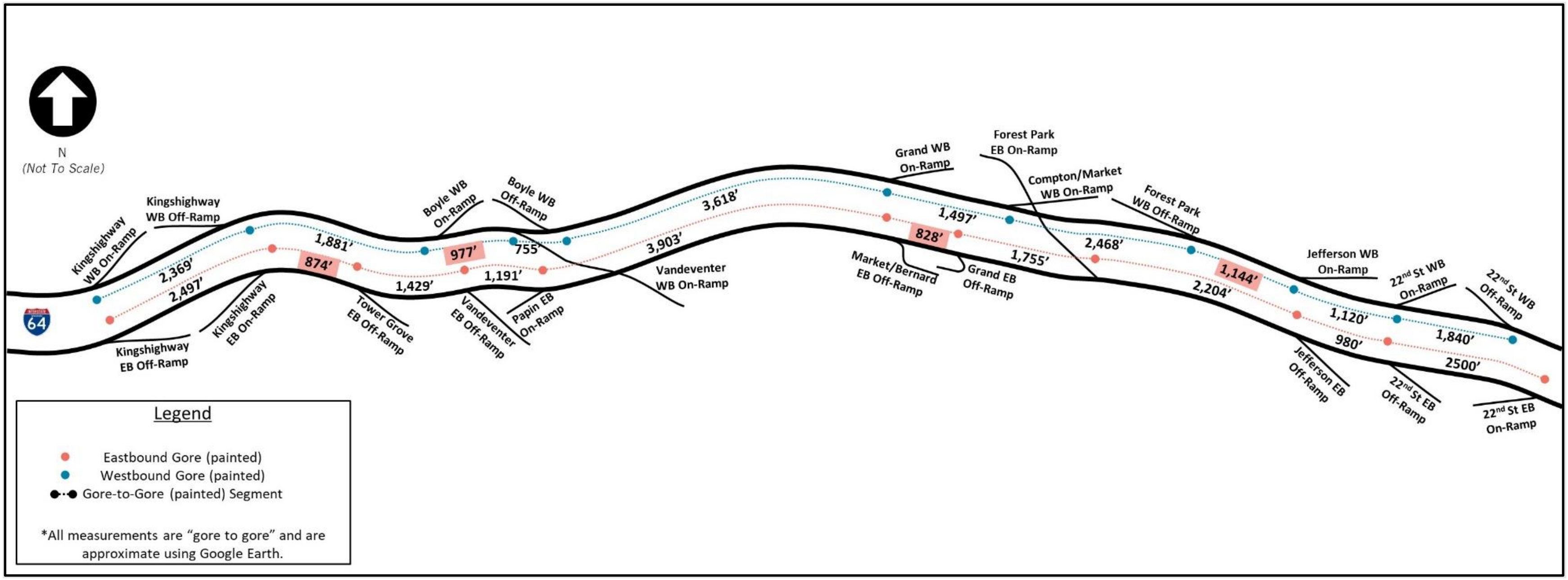
Note: Gore spacing that is non-compliant has been highlighted.

Table 8. No Build (Maintenance Only) Alternative: Ramp Lengths

Ramp	Existing/No Build (Maintenance Only)
Tower Grove Ave.	
I-64 EB Off Ramp to Tower Grove Ave.	1,010’
Boyle Ave. / Papin St.	
I-64 WB On Ramp from Boyle Ave.	840'
I-64 WB Off Ramp to Boyle Ave.	830'
I-64 EB On Ramp from Papin St.	710'
Vandeventer Ave.	
I-64 EB Off Ramp to Vandeventer Ave.	2,220'
I-64 WB On Ramp from Vandeventer Ave.	1,970'
Grand Blvd.	
I-64 WB On Ramp from Grand Blvd.	830'
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	660'
Market St.	
I-64 WB On Ramp from Market St.	1,500'
I-64 EB Off Ramp to Market St..	2,850'
Forest Park Ave.	
Forest Park Ave. Off Ramp to Market St.	2,140'
I-64 WB Off Ramp to Forest Park Ave.	3,100'
I-64 EB On Ramp to Forest Park Ave.	2,150'

Note: Ramp length is considered to be the distance between the painted gore and the curb line of the cross street at the ramp terminal.

Figure 39. No Build (Maintenance Only) Alternative: I-64 Corridor Gore-to-Gore Measurements



The total access points to I-64 also would not change in the No Build (Maintenance Only) alternative and would continue to provide six interchanges with access points that connect I-64 to 12 local and regional roadways. **Table 9** summarizes the number of access points to and from I-64 for the No Build (Maintenance Only) alternative per cross street.

Table 9. No Build (Maintenance Only) Alternative: I-64 Access Locations

Location	Existing/No Build (Maintenance Only)	
	On Ramps	Off Ramps
Kingshighway Blvd.	2	2
Tower Grove Ave.	0	1
Boyle St.	1	1
Papin St.	1	0
Vandeventer Ave.	1	1
Grand Blvd.	1	1
Market St./Bernard St./Compton Ave.	1	1
Forest Park Ave.	1	1
Jefferson Ave./22nd St.	3	3
Total	22	

4.2.2. Potential Crash Reduction

It should be noted that HSM, ISATe and/or IHSDM was not utilized for the I-64 PEL, as outlined in the approved Methods & Assumptions Report. Rather, existing crashes were categorized by contributing factors and severity for the Existing Conditions. The safety analysis of the No Build (Maintenance Only) alternative, as well as the three corridor alternatives, is *qualitatively* based upon how each alternative addresses the safety deficiencies and needs identified in the Existing Conditions.

4.2.2.1. Tier 1 & Tier 2 Limits

Given the lack of infrastructure improvements considered along the I-64 corridor for the No Build (Maintenance Only) alternative, the discussion for Tiers 1 and 2 in terms of potential crash reductions was combined. Furthermore, crash modifications factors were not considered since corrective measures were not considered.

Locations that experience high numbers of crashes based on the analysis of existing conditions were assumed to worsen by 2050 in the No Build (Maintenance Only) alternative given that no corrective measures are currently planned. Existing high crash locations were determined using ESRI GIS statistical models incorporating kernel density geoprocessing methodology to find relative density of crashes within the study area as shown in the Existing Conditions report.

High crash frequencies were identified in the Existing Conditions along major corridors, including Jefferson Ave., Grand Blvd., Vandeventer Ave., Kingshighway Blvd., and I-64 ramp intersections. Along the section of I-64 between Vandeventer Ave. and Grand Blvd., where the westbound direction is on structure above eastbound traffic, crash frequency skewed more heavily toward the eastbound direction, with approximately 67% of all crashes on I-64 in the Grand Blvd. interchange area. Near the Vandeventer Ave. interchange, the share of crashes is more evenly split by direction.

In the No Build (Maintenance Only) alternative, the pattern of crashes summarized in the Existing Conditions would remain unaddressed and would likely be exacerbated by increases in vehicular, bicycle and pedestrian traffic over time. Furthermore, based upon the results of the traffic operations for the No Build (Maintenance Only) alternative, it is evident that additional locations would likely become safety concerns by the Year 2050 due to increased congestion, etc. Therefore, within both tiers, comparatively high crash frequency locations anticipated for the No Build (Maintenance Only) alternative include those listed below and shown graphically in **Figure 40**. The areas of concern are overlaid on existing crash hot spots, for all crashes, for reference to identify locations where new hot spots may be generated in a No-Build scenario.

- Tier 1 Limits
    - I-64 & Jefferson Ave. (inclusion of this location is based upon crash data from 2017 thru 2020, prior to the reconstruction of this interchange)
    - I-64 & Grand Blvd.
    - I-64 over Vandeventer Ave. in the area west of the double-decker section with horizontal and vertical curvature
    - I-64 & Boyle Ave., especially the westbound off ramp
    - I-64 EB between Kingshighway Blvd. and Tower Grove Ave.
    - I-64 & Kingshighway Blvd., especially the eastbound off ramp
- Tier 2 Limits
    - Chouteau Ave. & Jefferson Ave.
    - Forest Park Ave. & Grand Blvd.
    - Grand Blvd. & Chouteau Ave.
    - Chouteau Ave. & Vandeventer Ave.
    - Clayton Ave. & Boyle Ave.
    - Kingshighway Blvd. & Forest Park Ave.
    - Kingshighway Blvd. & Hospital Dr.
    - Chouteau Ave. & Kingshighway Blvd.

Figure 40. No Build (Maintenance Only) Alternative: Safety Areas of Concern

As new developments occur in the study area driving economic activity and vehicular traffic, additional locations may become high frequency locations. For example, significant new developments planned in the Chouteau Ave. and Forest Park Ave. corridors may increase the flow of traffic in those areas creating opportunities for more crashes.

4.2.2.2. Safety Enhancements for Bicyclists and Pedestrians

Crashes involving bicyclists and pedestrians are much more likely to result in an injury or fatality because the relationship between vehicle speed at impact and the severity of the crash is non-linear as speeds increase. The Existing Conditions reported that approximately 90% of crashes involving a bicyclist or pedestrian resulted in an injury or fatality.

As planned developments bring more residents and employees to and through the study area, and as walking and biking trips are expected to increase (by 78% and 57% respectively), the number of bicycle and pedestrian involved crashes would also be expected to increase by Year 2050. Existing and forecasted high-crash locations for bicyclists and pedestrians include:

- Along Kingshighway Blvd. adjacent to the WUMC campus/Forest Park.
- Kingshighway Blvd. at the interchange with I-64.
- Along Forest Park Ave. at critical intersections with Grand Blvd., Sarah St., and Taylor Ave.
- Along Grand Blvd. between Forest Park Ave. and Chouteau Ave., in the vicinity of the Metro transit station.
- Clayton Ave. between Tower Grove Ave. and Boyle Ave.

Bicycle and pedestrian infrastructure assumed in the No Build (Maintenance Only) alternative include the Brickline Greenway along Clayton Ave. and parallel to MetroLink from Sarah St. to Grand Blvd, Spring St. crossing I-64, and Prospect Ave. crossing north-south over MetroLink and the adjacent rail corridor. These new connections would provide dedicated pedestrian and bicycle facilities that are safer than existing on-street routes shared with vehicles. Where these facilities overlap with forecasted high-crash locations for bicyclists and pedestrians listed above, such as Clayton Ave. And Grand Blvd., they could help to reduce future crashes in the No Build (Maintenance Only) alternative. As these committed and likely projects are pursued in coming years, detailed design should consider crash countermeasures to address pedestrian and bicycle safety at these high-crash locations.

4.3. MULTIMODAL MOBILITY

As the study area experiences continued growth and development in the coming years, multimodal transportation will become increasing essential to the movement of residents, employees, and visitors to the area. Based on assumptions regarding investments in active transportation and transit facilities and operations expected to occur by 2050, the surface transportation network would be a safer, more connected, and more comfortable place to walk, bike, and access transit even in the No Build (Maintenance Only) alternative. This section of the report documents No Build (Maintenance Only) conditions in Year 2050, including committed and likely active transportation projects, bicycle and pedestrian comfort and connectivity, anticipated transit investments, and future transit ridership and access.

4.3.1. Pedestrian & Bicycle Activity

This section discusses the pedestrian and bicycle operations anticipated for the No Build (Maintenance Only) alternative. Each element is discussed independently in terms of operation and connectivity. However, many of the facilities anticipated to serve these modes would likely involve adding multiuse paths.

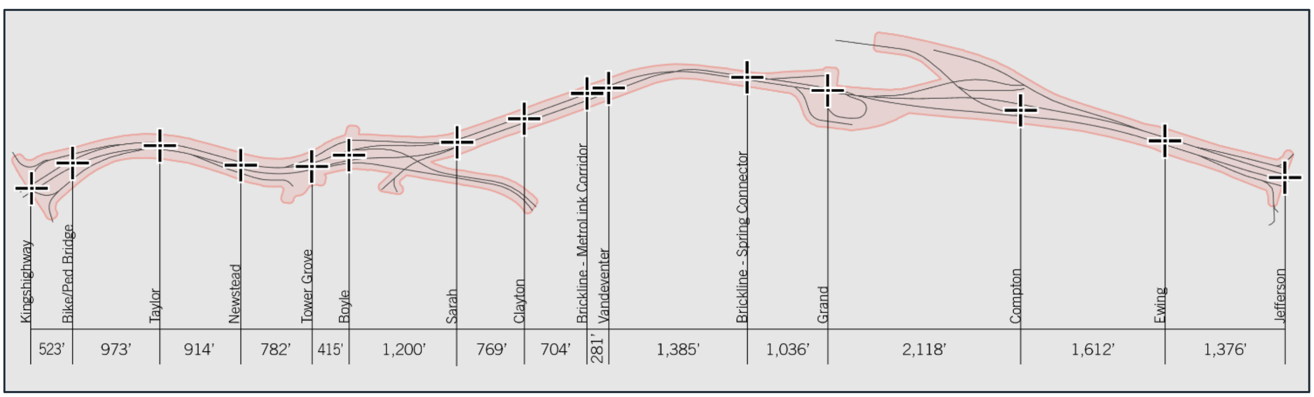
4.3.1.1. Pedestrian Facilities

4.3.1.1.1. Committed and Likely Projects

There are few committed or likely pedestrian-specific infrastructure projects within the study area. Those that may occur are most likely sidewalk infill or replacement associated with development of adjacent parcels. However, changes to the pedestrian network in the study area would be afforded via numerous multiuse paths; primarily Brickline Greenway facilities proposed along Clayton Ave., the MetroLink corridor, Market St., Spring Ave., and yet-to-be-determined alignments connecting southward from the future I-64 bicycle and pedestrian bridge and Grand MetroLink station to Saint Louis University Hospital and South Campus (see Figure 3, Figure 4, and Figure 5 in Section 2.1 and/or Table 10 in Section 4.3.1.2.1 for a complete listing).

The pedestrian network improvements described above have a noticeable impact on the barrier effect of I-64. These improvements would effectively add two new I-64 crossings, an east-west crossing on the Brickline Greenway parallel to the MetroLink, and a north-south crossing at 39th Street. The No Build (Maintenance Only) alternative provides a total 15 interstates crossings supporting active transportation, three of which are pedestrian- and bicycle-only bridges. There is an average of 1,006 feet between crossings. These crossings are displayed below in **Figure 41.**

Figure 41. Year 2050 No Build (Maintenance Only) Alternative: I-64 Pedestrian & Bicycle Crossings of I-64



4.3.1.1.2. Pedestrian Level of Service (PLOS)

PLOS provides an objective measure of the perceived pedestrian experience based on sidewalk and roadway geometry and motor vehicle travel speeds. The underlying premise of the HCM's PLOS still drives the scoring in the simplified methodology: pedestrian comfort increases with fewer travel lanes, lower vehicle speeds, and greater separation from motor vehicle traffic. Scores range from PLOS 1 (lowest stress) to PLOS 5 (highest stress). The results of the PLOS analysis, which are displayed in Figure 42, highlight the impact that likely and committed investments in pedestrian mobility would have within the study area. It is important to note that multiuse paths and other pedestrian pathways located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

As noted in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, there are limitations to the PLOS methodology's ability to reflect real-world conditions and the pedestrian experience on many streets within the study area. These limitations include the lack of readily available data to assess intersections, the difference between posted speed limits and actual travel speeds, and the mode's omission of average daily traffic volumes as a criterion for scoring. To address these limitations, particularly at interstate ramps where there is greater potential modal conflicts and points of tension or stress for people walking, the PLOS methodology has been calibrated to reduce PLOS scores by one point for roadway segments that intersection an interstate ramp. This calibration does not apply to interstate crossings that do not intersect an interstate ramp such as Taylor Ave. or Sarah St.

Figure 43 displays the percentage of roadway network miles by level of traffic stress for the No Build (Maintenance Only) scenario as compared to the existing conditions. The decrease in PLOS 1 (higher comfort) pedestrian facilities is largely a result of the changes to the methodology to address higher-stress intersections at interstate ramps as described above. The 10% increase in PLOS 2 roadways reflects the benefit of likely and committed multiuse path projects on the pedestrian environment. Potential high-stress conflict points remain at interstate interchanges, as indicated in Figure 42. Mitigation of these conflict points through design interventions that reduce pedestrian exposure to motor vehicle traffic should be considered in project development and detailed design.

Figure 42. Year 2050 No Build (Maintenance Only) Alternative: Pedestrian Level of Service

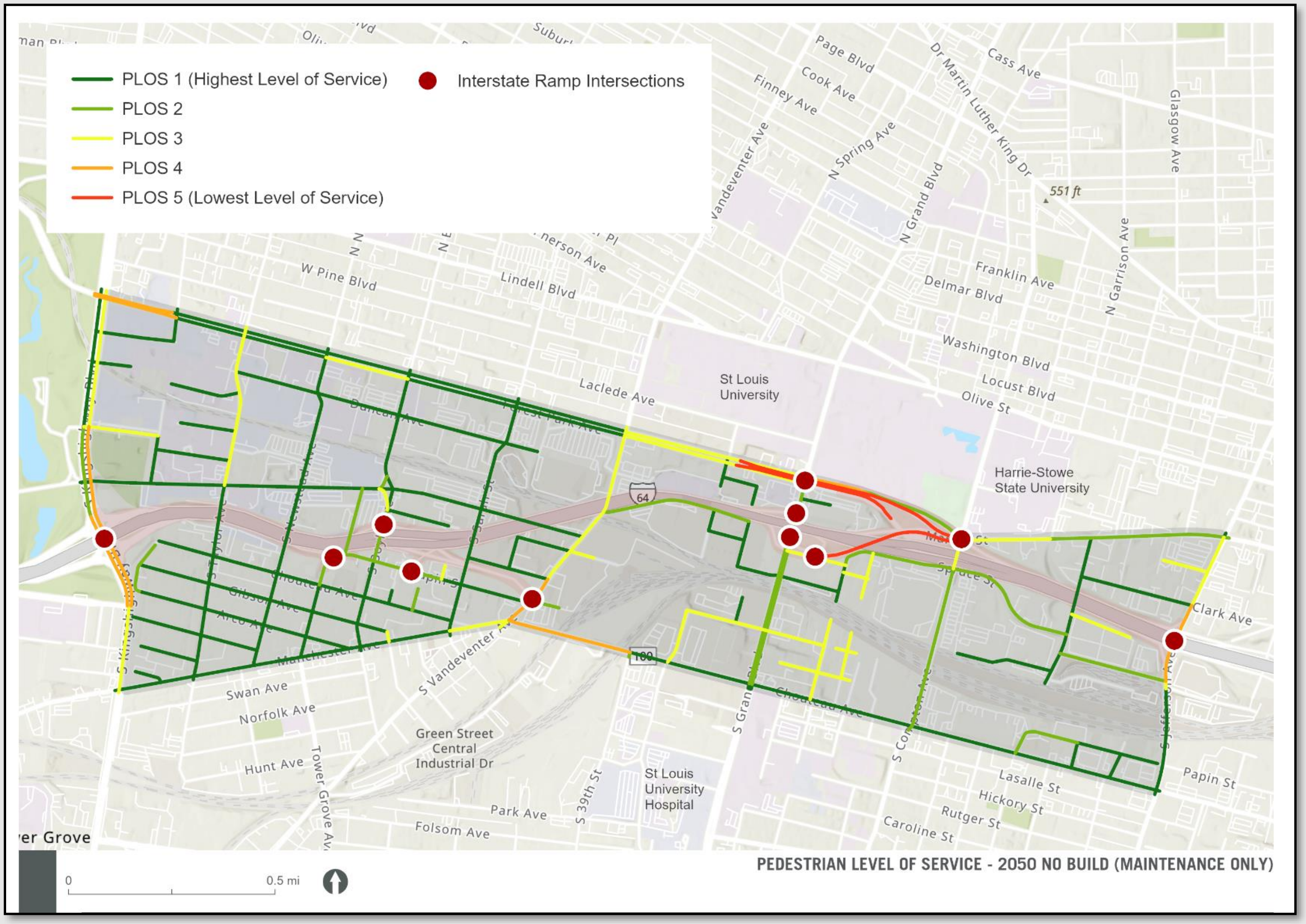
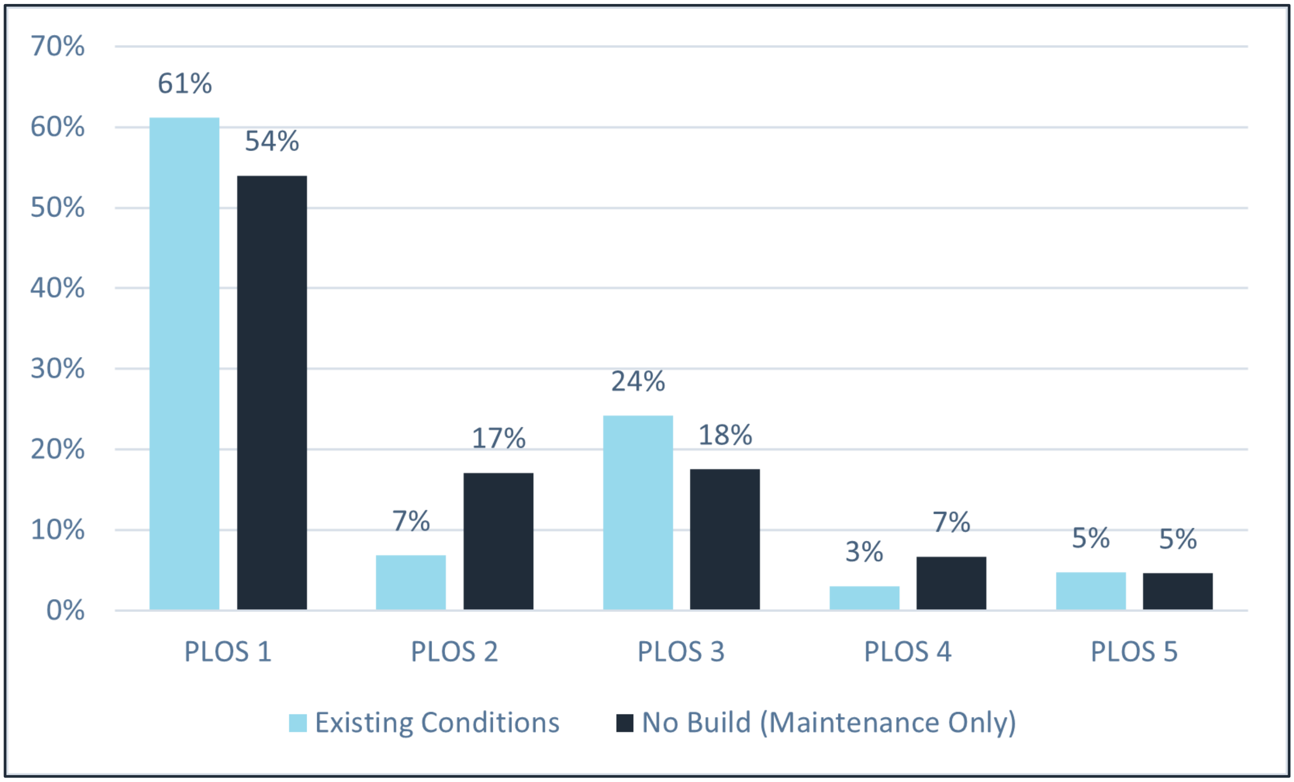


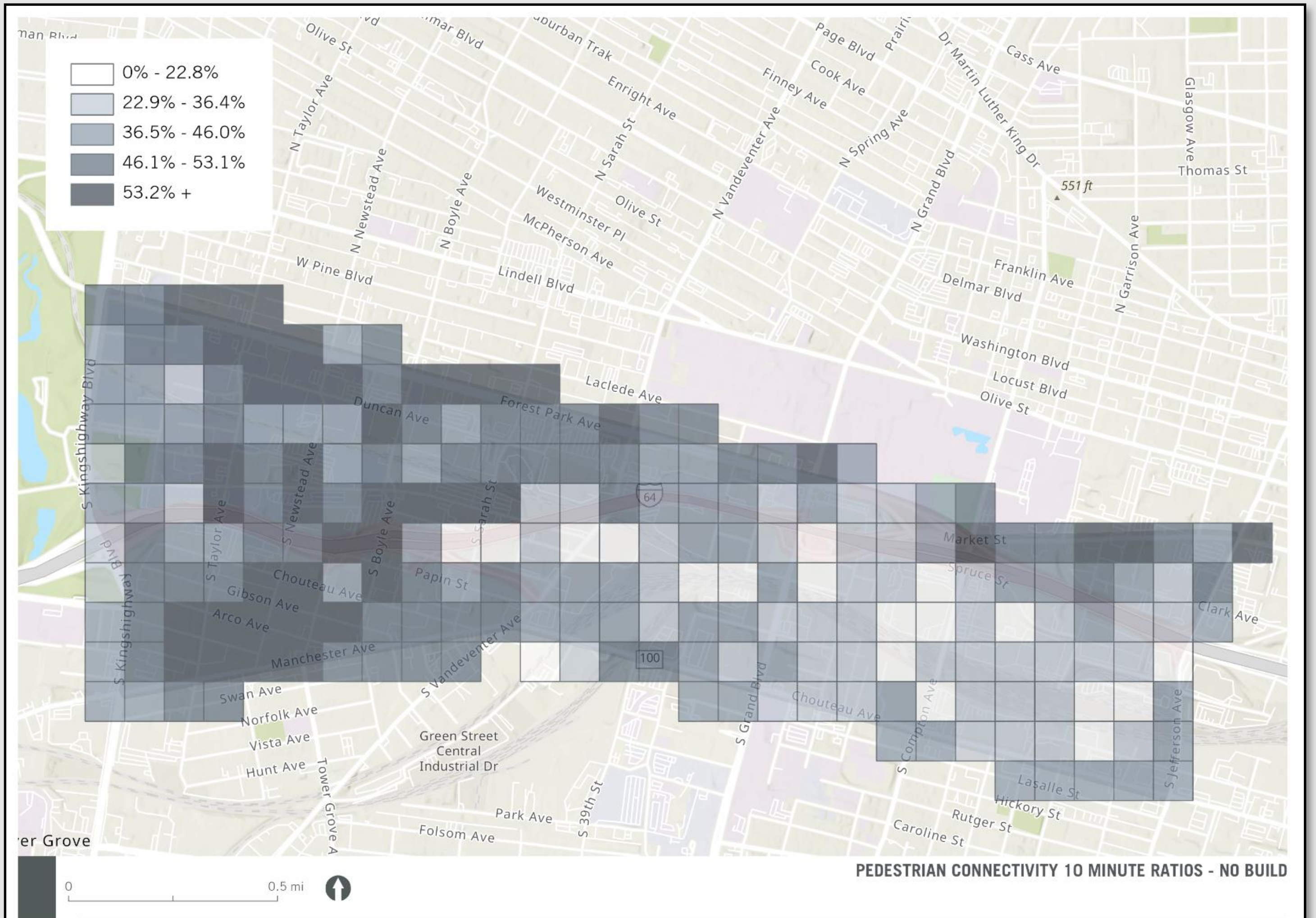
Figure 43. Year 2050 No Build (Maintenance Only) Alternative: Percent of Roadway Network by Pedestrian Level of Service



4.3.1.1.3. Pedestrian Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, pedestrian network connectivity was analyzed for the No Build (Maintenance Only) alternative based on ten-minute/half-mile pedestrian travelsheds. Pedestrian connectivity ratios vary widely throughout the study area, from a low of 0.09 to a high of 0.63, with lower ratios representing poorer connectivity and higher ratios representing greater connectivity. These ratios are displayed in **Figure 44.** The average (mean) pedestrian connectivity ratio is 0.42, which indicates that roughly 42% of the land area within walking distance can be reached based on the characteristics of the pedestrian network. This is a slight increase over the existing conditions mean pedestrian connectivity ratio of 0.41 (41%).

Figure 44. Year 2050 No Build (Maintenance Only) Alternative: Pedestrian Connectivity Analysis Results



4.3.1.2. Bicycle Facilities

4.3.1.2.1. Committed and Likely Projects

The bicycle network would be significantly altered by transformative capital projects like the Brickline Greenway, the Tower Grove-Cortex Connector, and Compton Ave. Cycle Track. These projects add significant mileage to the active transportation network and increase low-stress connectivity to key destinations and neighborhoods in and around the study area, including Forest Park, Harris-Stowe State University, Saint Louis University, Barnes Jewish Hospital, Washington University Medical Center, the Central West End, the Grove, Cortex Innovation Community, and Tower Grove Park. Twelve miles of bicycle and multiuse path projects have been committed or are likely to be completed by Year 2050 as listed in **Table 10** and previously presented in Section 2.1, Figure 3, Figure 4, and Figure 5.

Table 10. Committed and Likely Bicycle and Shared Use Path Projects

Project/Corridor Name	Limit From	Limit To	Facility Type
Boyle Ave.	Brickline Greenway	Clayton Ave.	Shared Use Path
Brickline Greenway – City Foundry Connector	City Foundry	Brickline MetroLink Corridor	Shared Use Path
Brickline Greenway – MetroLink Corridor	Sarah St.	Grand MetroLink Station	Shared Use Path
Brickline Greenway – Scott. St. / Theresa Ave. / Spruce Corridor (Exact Alignment TBD)	Grant MetroLink Station	S Compton Ave. / Market St.	Shared Use Path
Brickline Greenway – Vandeventer Corridor (Alignment TBD)	Forest Park Ave.	Brickline MetroLink Corridor	Shared Use Path
Brickline Greenway – Spring Ave. / Prospect Ave. Corridor	Forest Park Ave.	Grand Blvd. at Gratiot St.	Shared Use Path
Chouteau Ave.	Sarah St.	I-64 Bike/Ped Bridge	Bike Lane
Clayton Ave.	Boyle Ave.	Forest Park	Shared Use Path
Compton Blvd.	Market St.	Chouteau Ave.	Separated Bike Lane
Compton Blvd.	Laclede Ave.	Market St.	Separated Bike Lane
Grand Blvd.	Forest Park Ave.	Gratiot Ave.	Separated Bike Lane
Grand Blvd.	Gratiot Ave.	Lafayette Ave.	Shared Use Path
Kingshighway Blvd.	Oakland Ave. (W)	Oakland Ave. (E)	Separated Bike Lane

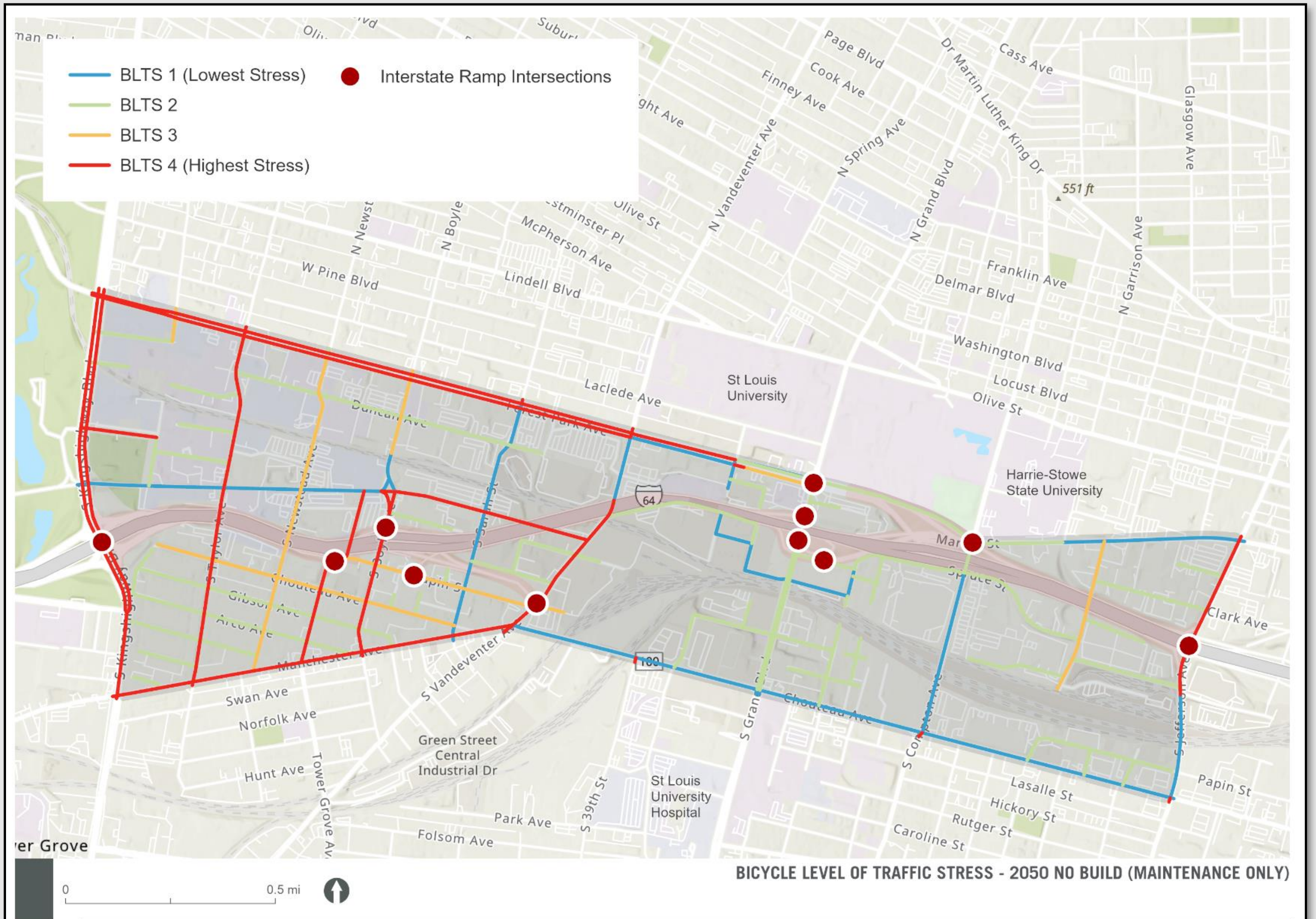
Project/Corridor Name	Limit From	Limit To	Facility Type
Market St.	Compton Ave.	Jefferson Ave.	Shared Use Path
Oakland Ave.	Taylor Ave.	Kingshighway Blvd.	Shared Lane Markings
Sarah St.	Manchester Ave.	Forest Park Ae.	Separated Bike Lane
Sarah St.	Forest Park Ave.	Ashland Ave.	Buffered Bike Lane

4.3.1.2.2. Bicycle Level of Traffic Stress (BLTS)

Bicycle Level of Traffic Stress (BLTS) provides an intuitive framework to categorize roadways based on the level of stress, or conversely level of comfort, for people bicycling. The BLTS methodology was adapted from the 2012 Mineta Transportation Institute (MTI) *Report 11-19: Low-Stress Bicycling and Network Connectivity* and the City of Boston's 2020 Level of Traffic Stress methodology, considering the limits and reliability of available data. The analysis incorporates motor vehicle volumes, posted speed limits, the presence of parking, and the presence of bike lanes as key determinants of level of traffic stress. Scores range from BLTS 1 (lowest stress) to BLTS 4 (highest stress). Likely and committed bikeway projects listed in Table 10 and displacyed in Figure 3 (page 7), Figure 4, and Figure 5 have been factored into this analysis.

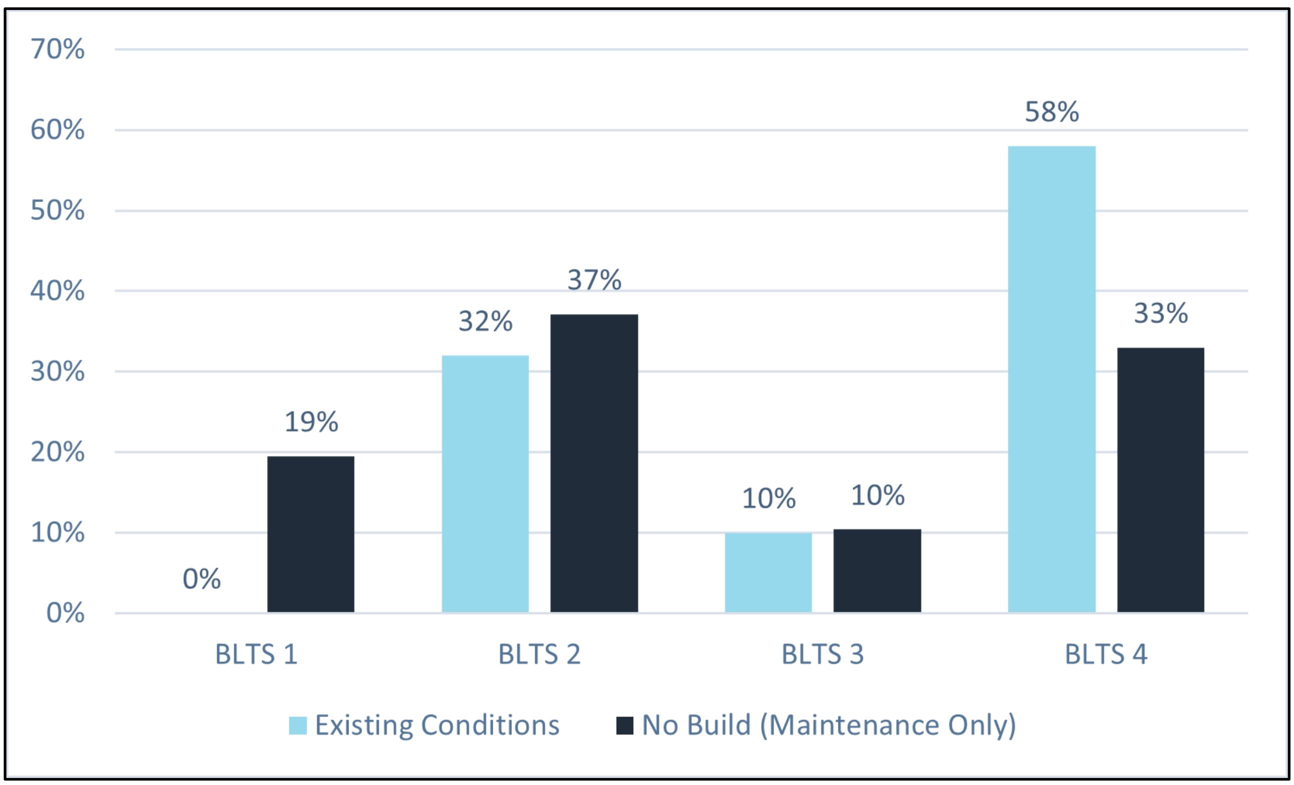
The results of the BLTS analysis, which are displayed in **Figure 45** on the next page, highlight the impact of investments in active transportation compared to current conditions. It is important to note that multiuse paths located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings. It should be noted that bicycle level of traffic stress model is limited in its ability to reflect real-world conditions due to data availability and analysis methodology. These limitations are most acute at locations where the roadway network intersects with interstate ramps and within the wide variation of roadways within the lowest level of stress category (BLTS 4). For example, the bicycling experience on Kingshighway Blvd. and Taylor Ave. are quite different, but both are categorized as BLTS 4, highlighting the breadth of roadway types and characteristics that offer a high level of traffic stress for people bicycling. To address this limitation, particularly at interstate ramps where there is greater potential modal conflicts and points of tension or stress for people bicycling, the BLTS methodology has been calibrated to reduce BLTS scores by one point for roadway segments that intersection an interstate ramp. This calibration does not apply to interstate crossings that do not intersect an interstate ramp such as Taylor Ave. or Sarah St.

Figure 45. Year 2050 No Build (Maintenance Only) Alternative: Bicycle Level of Traffic Stress



As a result of investments in separated bikeways and multiuse paths, particularly along arterial roadways, the No Build (Maintenance Only) shows a substantial decrease in levels of traffic stress over current conditions. **Figure 46** shows the percentage of roadway network miles by level of traffic stress for the No Build (Maintenance Only) alternative as compared to existing conditions. BLTS 1 segments increase from zero under current conditions to 19% in the No Build (Maintenance Only) scenario, while BLTS 4 segments decrease from 58% to 33%. The western half of the study area from Vandeventer Ave. to Kingshighway Blvd. remains largely unchanged in terms of level of traffic stress, as major arterials like Forest Park Ave., Kingshighway Blvd., Manchester Ave., and Vandeventer Ave. are not expected to see investments in low-stress bicycle facilities. Regardless, future study is needed to address the high stress nature for bicyclists and pedestrians along Kingshighway, Forest Park Avenue, Chouteau Avenue, and/or Clayton Avenue.

Figure 46. Year 2050 No Build (Maintenance Only) Alternative: Percent of Roadway Network Mileage by Level of Traffic Stress

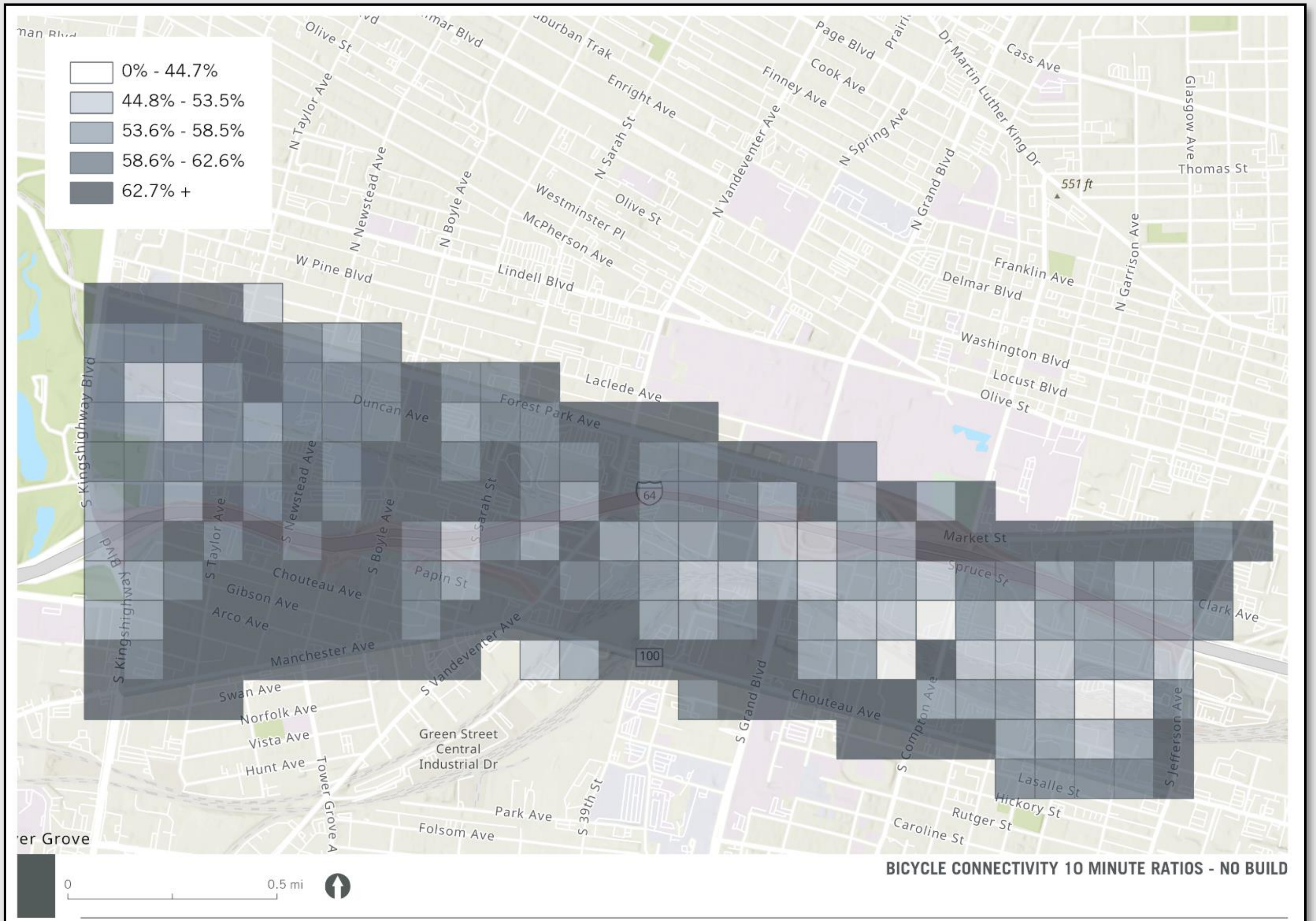


4.3.1.2.3. Bicycle Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, bicycle network connectivity was analyzed for the No Build (Maintenance Only) alternative based on a ten-minute/1.67-mile bicycle travelshed. Bicycle connectivity ratios vary widely throughout the study area, from a low of 0.39 to a high of 0.69, with lower ratios representing poorer connectivity and higher ratios representing greater connectivity. These ratios are depicted in **Figure 47**. The average (mean) bicycle connectivity ratio is 0.60, which indicates that, on average, roughly 60% of the land area within bicycling distance can be reached based on the characteristics of the bicycle network. This represents a marginal increase over the existing conditions mean bicycle connectivity ratio of 0.59 (59%).

Because the bicycle network connectivity analysis is based on all roadway links open to bicycling (and not only on dedicated or low-stress facilities), the sole factor impacting connectivity ratios is the addition of new roadways or bicycle facilities within independent rights of way. Examples of committed and likely projects from the No Build (Maintenance Only) scenario that increase network connectivity include the Brickline Corridor along the MetroLink light rail line and the bicycle and pedestrian bridge crossing I-64 at Spring Ave.

Figure 47. Year 2050 No Build (Maintenance Only) Alternative: Bicycle Connectivity Analysis Results



4.3.2. Transit

This section discusses the transit accommodations anticipated for the No Build (Maintenance Only) alternative.

4.3.2.1. Year 2050 Transit System

Per discussions with Metro, it is anticipated that by Year 2050, the Metro Reimagined Plan would be fully implemented and many hindrances due to labor shortages, etc. would no longer be influencing the system as much as they do now. No additional transit service enhancements are currently planned for the study area. Therefore, the existing MetroLink and MetroBus routes are assumed to be in operation per Metro Reimagined. This would consist of the following MetroBus services and peak period headways:

- 1 Gold – Local (30 minutes)
- 8 Shaw-Cherokee – Local (30 minutes)
- 10 Gravois-Lindell – Local (30 minutes)
- 13 Union – Local (30 minutes)
- 18 Taylor – Local (30 minutes)
- 31 Chouteau – Local (30 minutes)
- 42 Sarah – Local (30 minutes)
- 57X – Express
- 58X – Express
- 59 Oakland – Local (30 minutes)
- 70 Grand – Frequent (at least 15 minutes)
- 95 Kingshighway – Frequent (at least 15 minutes)
- 410X – Express

It should be noted that as congestion and traffic volumes increase by the year 2050, there will be an impact to transit due to slowing bus speeds and degrading transit operations and on-time performance.

The MetroLink Red Line and MetroLink Blue Line would continue to serve the study area with stops at Central West End, Cortex, and Grand. In addition, it is assumed that the Central West End Transit Center located on Taylor Ave. on the Washington University Medical Campus would continue to be an important transit hub, offering connections between MetroLink and 11 different MetroBus routes.

Furthermore, Metro and the City of St. Louis have endorsed a Northside-Southside light rail alignment on Jefferson Ave. along the eastern periphery of the study area. However, planning for the light rail line remains ongoing and funding to advance the project beyond the current planning phase has not yet been secured. Therefore, the Northside-Southside light rail corridor was not included as a Year 2050 completed project given the level of uncertainty associated with the ultimate configuration and timing of implementation. If Northside-Southside light rail becomes operational in the future, it can be assumed that the resulting improvement in transit connectivity and reduction in travel times for certain trips would provide overall benefits to transit riders in the study area.

4.3.2.2. Transit Ridership in Year 2050

While the current outlook for future transit service in the study area is relatively stable, expectations for future ridership are unclear. The COVID-19 pandemic has had a significant impact on transit ridership, which remains suppressed relative to pre-pandemic levels. The effect on traditional work-related commuting trips has been particularly significant. Labor shortages and supply chain issues have simultaneously degraded the quality of transit service being offered, compounding the challenges. With remote work trends expected to persist indefinitely, the timing of when transit ridership levels will recover to pre-pandemic levels is uncertain.

That said, transit ridership nationally continues to rebound. According to the American Public Transit Association (APTA), transit ridership nationally in September 2022 reached 72 percent of pre-pandemic levels, which is the highest level since the pandemic[1]. To further the ridership recovery, the APTA recommends investments in communities of low income and otherwise vulnerable people, investments in transit service and stations such as expanded service to support hourly, late night, and early morning workers, development of affordable and market-priced housing in proximity to transit, and community outreach programs to understand how agencies can best serve their customers and communities.

Against a backdrop of evolving work habits, transit service offerings, and travel patterns, any forecast of transit ridership for 2050 would be uncertain and highly speculative. However, the regional travel demand model maintained by EWG was utilized to identify how planned growth and future developments in the study area could affect transit ridership, acknowledging that the outcome should be viewed with caution, as the model is indexed to pre-pandemic travel behaviors.

A comparison of total transit trips beginning or ending within the study area based on output from the TDM is summarized in **Table 11** for the model base year (2019) and the model horizon year (2045). As shown, the TDM forecasts a 3 percent increase in ridership over this period, which is driven primarily by planned higher density and mixed-use developments in the study area.

Table 11. Forecasted Changes in Transit Ridership within PEL Study Area (per EWG TDM)

Mode	Year		% Change (2019-2045)
	2019	2045	
Transit	1,404	1,446	3%

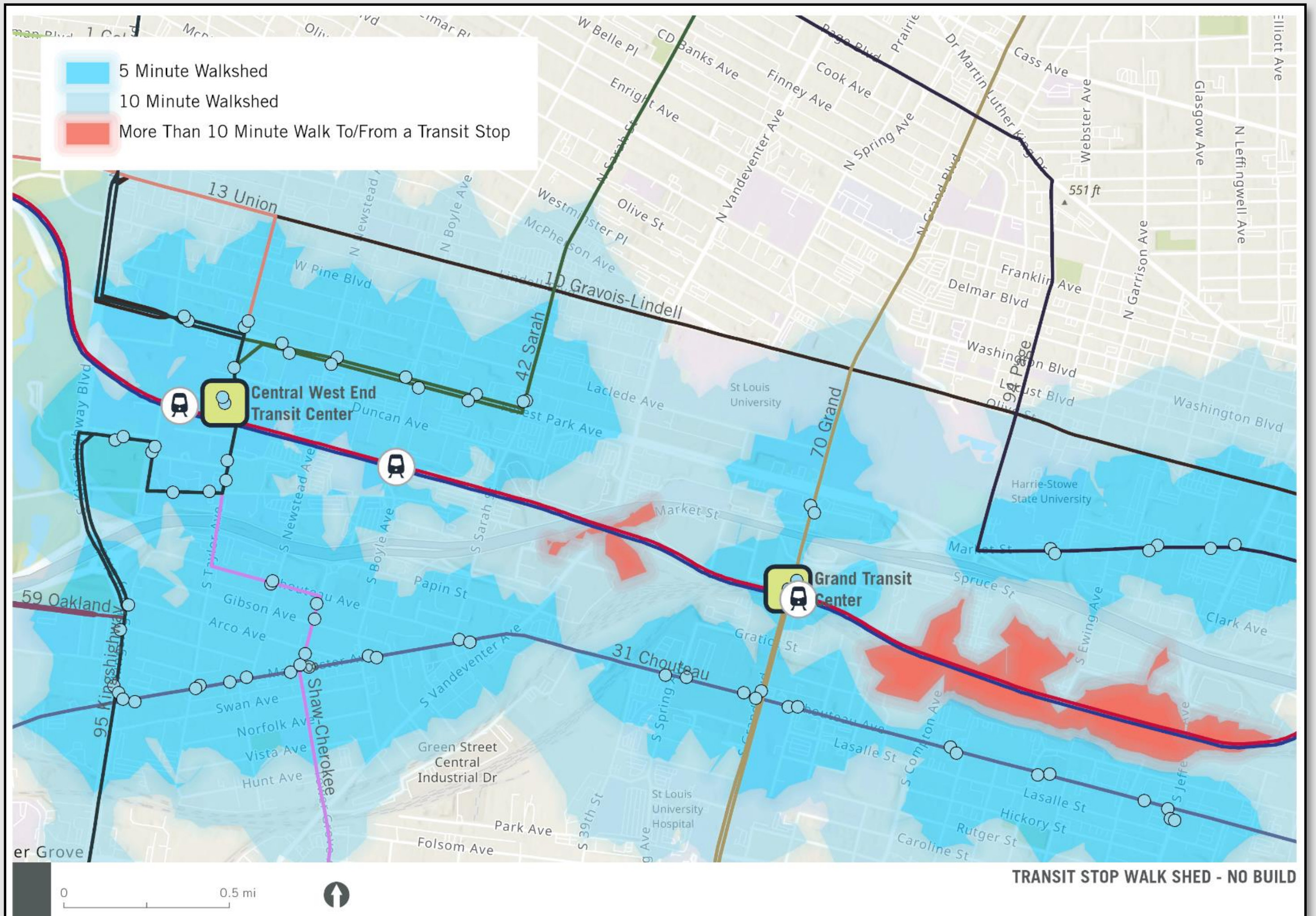
[1] APWA Public Transit Ridership Update 9-28-2022 https://www.apta.com/wp-content/uploads/APTA-POLICY-BRIEF-Transit-Ridership-09.28.2022.pdf

4.3.2.3. Transit Needs Addressed

Since many, if not all transit trips begin and/or end with a non-motorized trip (i.e., walking), it is important to examine walksheds as they relate to the transit stops within the study area. Additional pedestrian connections assumed for the No Build (Maintenance Only) alternative include the Brickline Greenway along MetroLink from Sarah St. to Spring St., Spring St. crossing I-64, and Prospect Ave. crossing over MetroLink and the adjacent rail lines to Gratiot St. **Figure 48** illustrates the 5- and 10- minute walksheds, as well as the area beyond a 10-minute walk, from each transit stop in the study area. The additional connections of the Brickline Greenway would provide enhanced east-west connectivity in the central portion of the study area, between the Grand MetroLink and Cortex MetroLink stations. Despite these enhancements, gaps requiring more than a 10-minute walk to a transit system remain in areas south of I-64 and around the Grand MetroLink Station. To fully leverage the existing transit investments in the area, providing safer, more convenient, and more comfortable access to MetroBus and MetroLink is needed.

The number of transit-dependent residents estimated for the Year 2050 was used as an indicator of the need for transit service in and around the study area. Forecasts of transit-dependent residents were based upon total population derived from the EWG regional TDM for the Year 2045 and then extrapolated to represent the Year 2050. The number of transit-dependent residents within the study area was estimated to be 3,831 persons by the Year 2050 (as compared to 3,647 persons as presented in the Existing Conditions Technical Report). To measure the impact of new pedestrian connections on transit access, the transit-dependent population within the 10-minute walkshed area was also estimated. The transit-dependent population within a 10-minute walk of a transit stop in the study area was estimated to be 7,765 persons.

Figure 48. No Build (Maintenance Only) Alternative: 5- and 10-Minute Walksheds as Related to Transit Routes



4.4. YEAR 2050 NO BUILD (MAINTENANCE ONLY) ALTERNATIVE CONCLUSIONS

The following represents the conclusion drawn from the traffic operations, safety and multimodal analysis of the Year 2050 No Build (Maintenance Only) alternative:

4.4.1. Traffic Conclusions

- Under the No Build (Maintenance Only) alternative, interchange spacing would continue to generally not satisfy national or state standard guidelines for access. However, given the urban context, it is questionable whether those guidelines are attainable under any circumstances.
- By Year 2050, without infrastructure improvements to the corridor, I-64 is expected to experience poor levels of service at many locations during the peak hours, particularly in the westbound direction in the morning when traffic exiting to Boyle Ave. tends to cause ripples of congestion downstream.
- Further exacerbating conditions is the intersection of Clayton Ave. and Boyle Ave., which if left unaddressed would result in excessive vehicular backups along both roadways that would, in turn, impact conditions at the Boyle Ave. interchange with I-64
- Within Tier 2, most of the intersections are expected to operate at LOS E or better, with two signalized intersections operating at LOS F (Kingshighway at Route 100 and Clayton at Boyle). There are individual movements at intersections that experience a LOS E or F; however, there are often side-street movements at unsignalized intersections or where the traffic must wait through a long signal length, causing delays.

4.4.2. Safety Conclusions

- For the No Build (Maintenance Only) scenario, where it is assumed all existing interchange spacing, gore spacing, and acceleration/deceleration lengths at ramps would remain the same as existing, the safety issues noted in the existing conditions report would continue to be experienced by users.
- Additional volume due to background growth and new developments along the corridor would further aggravate the existing safety issues and crash hot spots.
- A known correlation that congestion on freeways leads to higher crash frequencies, with typically lower severity, allows for the assumption that new congestion in the No Build (Maintenance Only) alternative would lead to additional areas of concern from a safety standpoint. Similarly, increased congestion at intersections correlates with more frequency instances of high severity crashes, would lead to new areas of concern at ramp terminals and intersections within Tier 2 limits.

4.4.3. Multimodal Conclusions

- MoDOT, the City of St. Louis, Great Rivers Greenway, and other partners are investing substantially in active transportation improvements in the coming years, focusing on low-stress separated bikeways and multiuse paths, from major on-street facilities like the Compton

Ave. Cycle Track and the Tower Grove Connector (along Vandeventer Ave. and Sarah St.) to the Brickline Greenway, a system of urban greenways supporting active travel and recreational activity.

- Committed and likely projects would have a significant impact on the quality and comfort of walking and bicycling within the study area. While new greenway facilities, both within existing roadway rights-of-way and along independent corridors, would create attractive, comfortable, and experiential environments for active travel, new separated on-street bikeways would drastically lower levels of traffic stress across the network, decreasing LTS 4 (highest-stress) roadways by 25% and increasing LTS 1 (lowest-stress) from 0% to 19%.
- While pedestrian and bicycle network connectivity (as measured through the potential mobility index ratios) see only a marginal increase resulting from committed and likely reflected in the No Build (Maintenance Only), new key network links in the form of the Brickline Greenway and two Brickline Greenway crossings over I-64 (at Vandeventer Ave. and Spring Ave.) increase access via a safe and comfortable connection to retail, employment, transit, educational facilities, and other existing and planned developments along the corridor.
- With the assumption that Metro Reimagined is fully operational, the current outlook for future transit service in the study area is relatively stable. Note that the Northside-Southside light rail corridor was not included as a Year 2050 project, given the uncertainty associated with the funding and timing of implementation.
- Given ongoing work from home trends and reductions in transit ridership, any forecast of future ridership for 2050 would be uncertain and highly speculative. The regional TDM forecasts a 3 percent increase in transit ridership between 2019 and 2045, driven primarily by planned higher density and mixed-use developments in the study area.
- The number of transit-dependent residents was used as an indicator of the need for transit service in and around the study area. Planned projects to improve pedestrian connectivity would help connect transit stops with transit-dependent populations.

5. CORRIDOR ALTERNATIVE #1

The following subsections present the findings of the traffic operations, safety, and multimodal analysis as it pertains to the Year 2050 for Corridor Alternative #1, which assumes reconstruction along the I-64 corridor as outlined in Section 2.2 and reflected in Figure 6 and Figure 7. The Tower Grove/Boyle/Papin interchange would remain essentially the same as today in terms of configuration, although the ramps to and from westbound I-64 at Boyle Ave. would be enhanced. The Vandeventer ramps to I-64 would also remain in place, including the left-sided entrance to westbound I-64. There would be some modifications at the east end of the corridor in terms of reconfiguring the Grand Blvd. ramps to and from I-64, adding a westbound off ramp to Grand Blvd. and removing the partial interchange at Market St./Bernard St./Compton Ave. as well as the eastbound on ramp from Forest Park Ave.

It is important to note that the transportation modifications represented in Alternative #1 are not *commitments*, but rather recommendations to develop this alternative for analysis purposes only. Additional study and engagement are needed through the decision-making process before MoDOT, the City of St. Louis and/or other partners commit to design and construction of the elements presented in Alternative #1.

As with the No Build (Maintenance Only) analysis, it was assumed that the constraint to the west of the Study Area for westbound I-64 at Hampton was resolved, as agreed upon by MoDOT in July 2022.

5.1. TRAFFIC OPERATIONS

The methodology, and associated assumptions, for the PEL were summarized in the Methods and Assumptions Report, as required by Section 905.3.7.1 of MoDOT's EPG which provides guidance for MoDOT reviewed Transportation Impact Analysis. The reader is reminded that special event traffic for Grand Center or Midtown entertainment venues was not evaluated as part of the PEL. In accordance with Sections 905.3.2 and 905.3.5 in MoDOT's EPG, VISSIM and Synchro were the primary and predominant tools used for the traffic operations analysis. Using the calibrated VISSIM model from the Existing Conditions, the Year 2050 traffic conditions along I-64 within Tier 1 limits were evaluated, including its ramp terminals, assuming the corridor is reconfigured as envisioned for Corridor Alternative #1. Synchro and Sidra were used to evaluate the surrounding road network within the Tier 2 limits (signalized/unsignalized intersections and roundabouts) for the Year 2050 AM and PM peak hours assuming the configuration depicted for Corridor Alternative #1. The HCM guidelines were used to evaluate merge, diverge, and weaving operations as a supplement to the VISSIM model.

The development of transportation improvement options for Alternative #1 followed MoDOT's policy for level of service E for auto traffic in urban areas, as outlined in the approved Methods & Assumptions Report. Although local roadways are not the authority of MoDOT, the MoDOT policy was also applied to local roadways to assess the vehicle capacity recommended for minimizing vehicle delay during peak traffic hours.

5.1.1. Tier 1 Limits: I-64

The primary focus of the PEL study is on the I-64 infrastructure within MoDOT's right-of-way and how it can be improved to meet the goals of the study. The Tier 1 limits include the I-64 mainline and MoDOT right-of-way, from the western gore points of the ramps to and from Kingshighway Blvd. to the eastern gore points of the ramps at 22nd St. (which operates as a split diamond interchange with Jefferson Ave.). The limits include I-64, inclusive of all merge, diverge, and weave sections, as well as the ramp terminals at each of the interchanges. However, note that modifications to the interchange configurations at Kingshighway Blvd. and Jefferson Ave./22nd St. were not contemplated as part of this PEL given the relatively recent and/or ongoing reconstruction at these locations.

5.1.1.1. Access to I-64

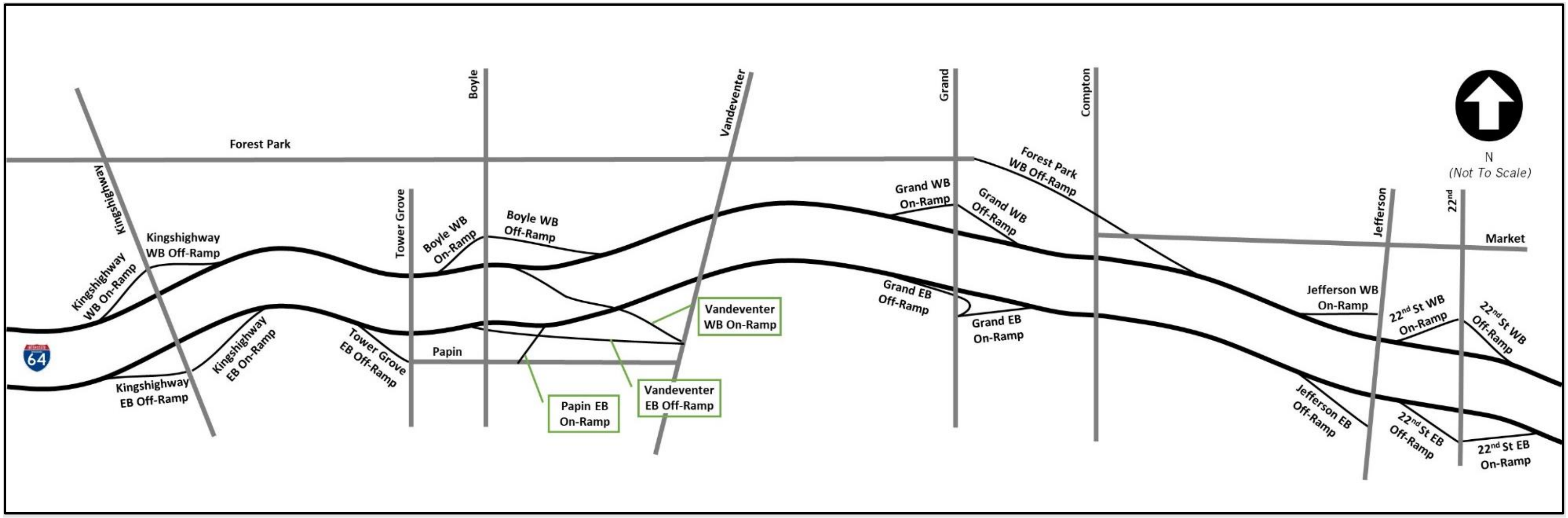
Under Corridor Alternative #1 scenario, the Tier 1 limits would be reduced to five interchanges with I-64 and access points that connect I-64 to nine local and regional roadways. Figure 49 schematically depicts the locations of access to and from I-64 and the distances between these access points.

5.1.1.2. Validation of Year 2050 Corridor Alternative #1 Traffic Models

The traffic simulation model calibration process was achieved during the evaluation of the existing conditions with the development of a base model that replicated existing conditions. The future year models (Year 2050) cannot be "validated" with respect to delays or queues since they are projections of forecasted conditions rather than replications of existing. Therefore, the same calibration parameters from the validated existing condition models form the basis for the Year 2050 Corridor Alternative #1 scenario; of which the traffic forecasts presented in Section 3.3.2 were used to update the model's origin-destination matrix.

Due to the inherent stochastic nature of simulation (imposed by random seeds), multiple simulation runs using different seed numbers were required for each time period, and the reported model results were averaged across runs. Based on the characteristics of this model network, the planning-level effort associated with the PEL study and the agreed-upon level of effort during scoping, it was determined that 10 simulation runs were sufficient to obtain an appropriate level of confidence in the results.

Figure 49. Alternative #1: I-64 Access to Road Network (Schematic)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

5.1.1.3. VISSIM Results

A summary of the following Measures of Effectiveness (MOE) along the I-64 corridor and at its ramp terminals (by approach) are provided for the Year 2050 Corridor Alternative #1 conditions analysis:

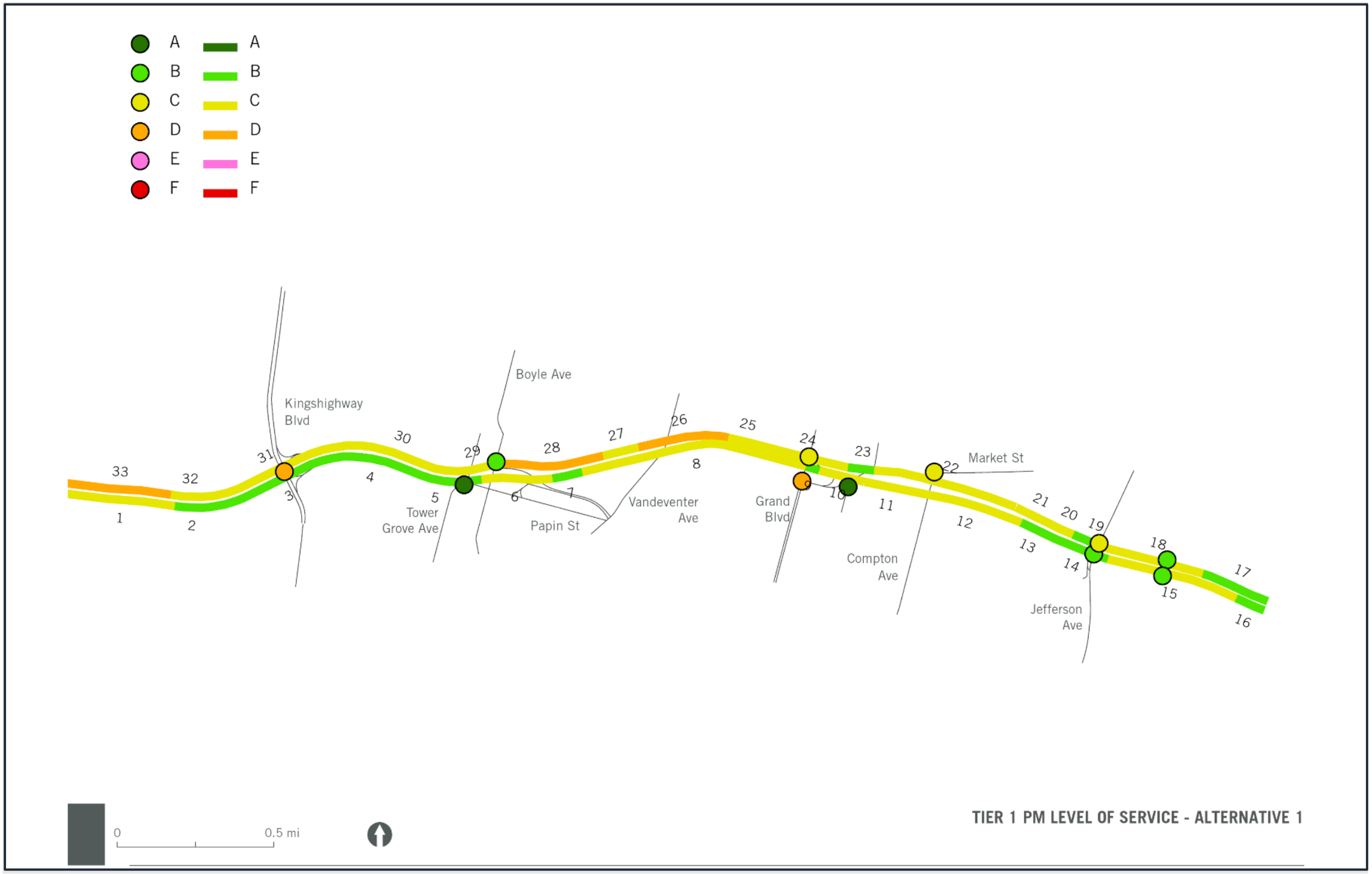
- Speed (I-64)
- Density (I-64)
- Throughput (I-64)
- Vehicular delay (ramp terminals)
- Vehicular queue lengths (ramp terminals)
- Volume/capacity ratio (ramp terminals)
- LOS (I-64 and ramp terminals)

This report presents, graphically, the overall conditions for the Year 2050 Corridor Alternative #1. Detailed operating results from the VISSIM and Synchro models are provided in Appendix B. **Figure 50** and **Figure 51** illustrate the Year 2050 Corridor Alternative #1 operating conditions, as modeled. **Figure 52** and **Figure 53** represent the assumed lane configurations and associated geometrics necessary to achieve the operating conditions represented. The lane configurations and associated geometrics presented were what was required to achieve the minimum levels of service and mobility targets as presented in the Approved Methods and Assumptions Report (LOS E, etc.). However, it was not always feasible to achieve the proposed minimum level of service and mobility targets. In such cases, a reasonable level of lanes and geometric improvements was assumed (multiple turn or through lanes, etc.)

Figure 50. Alternative #1: Year 2050 Conditions - AM Tier 1 VISSIM Analysis

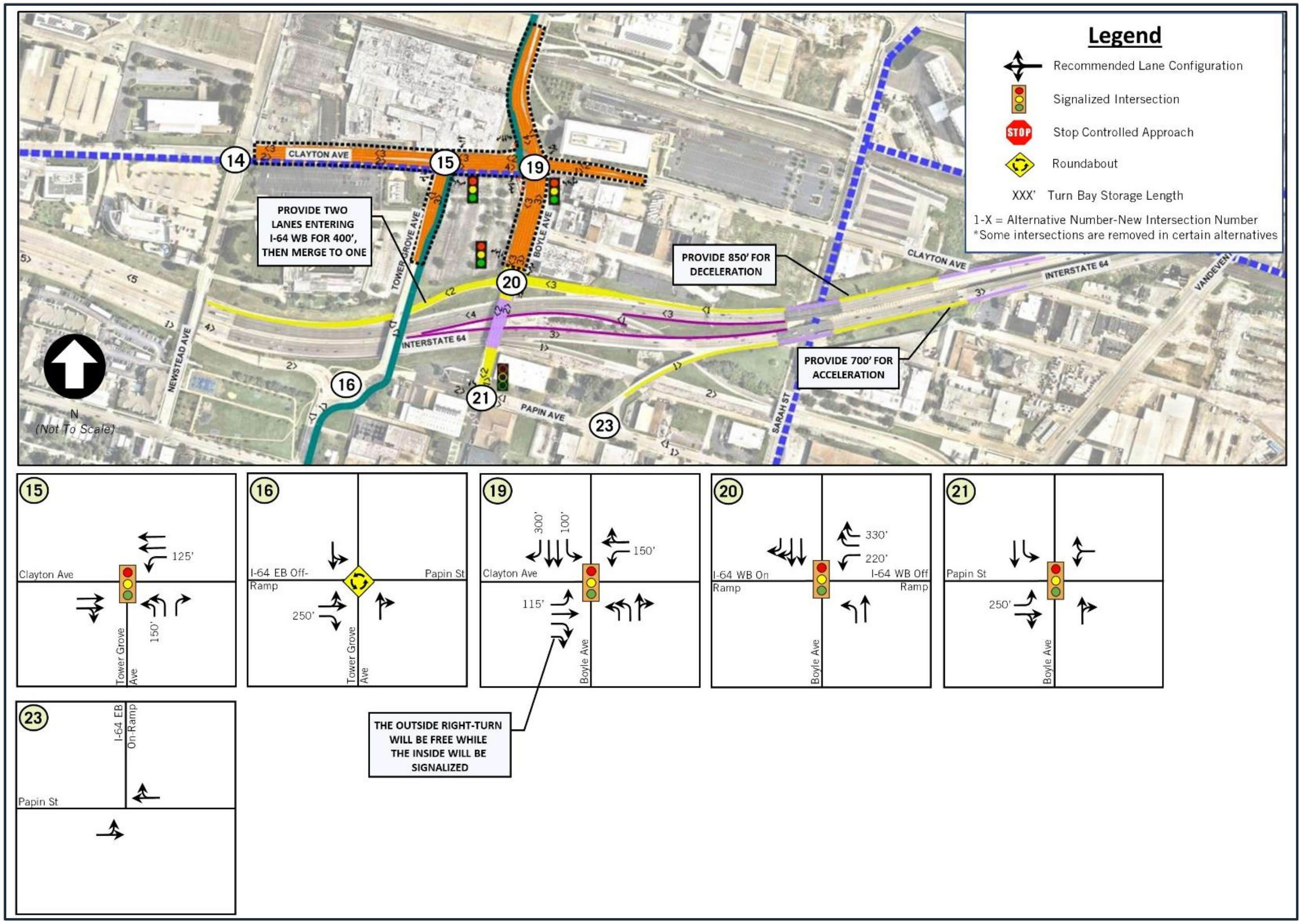
Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 51. Alternative #1: Year 2050 Corridor Conditions - PM Tier 1 VISSIM Analysis



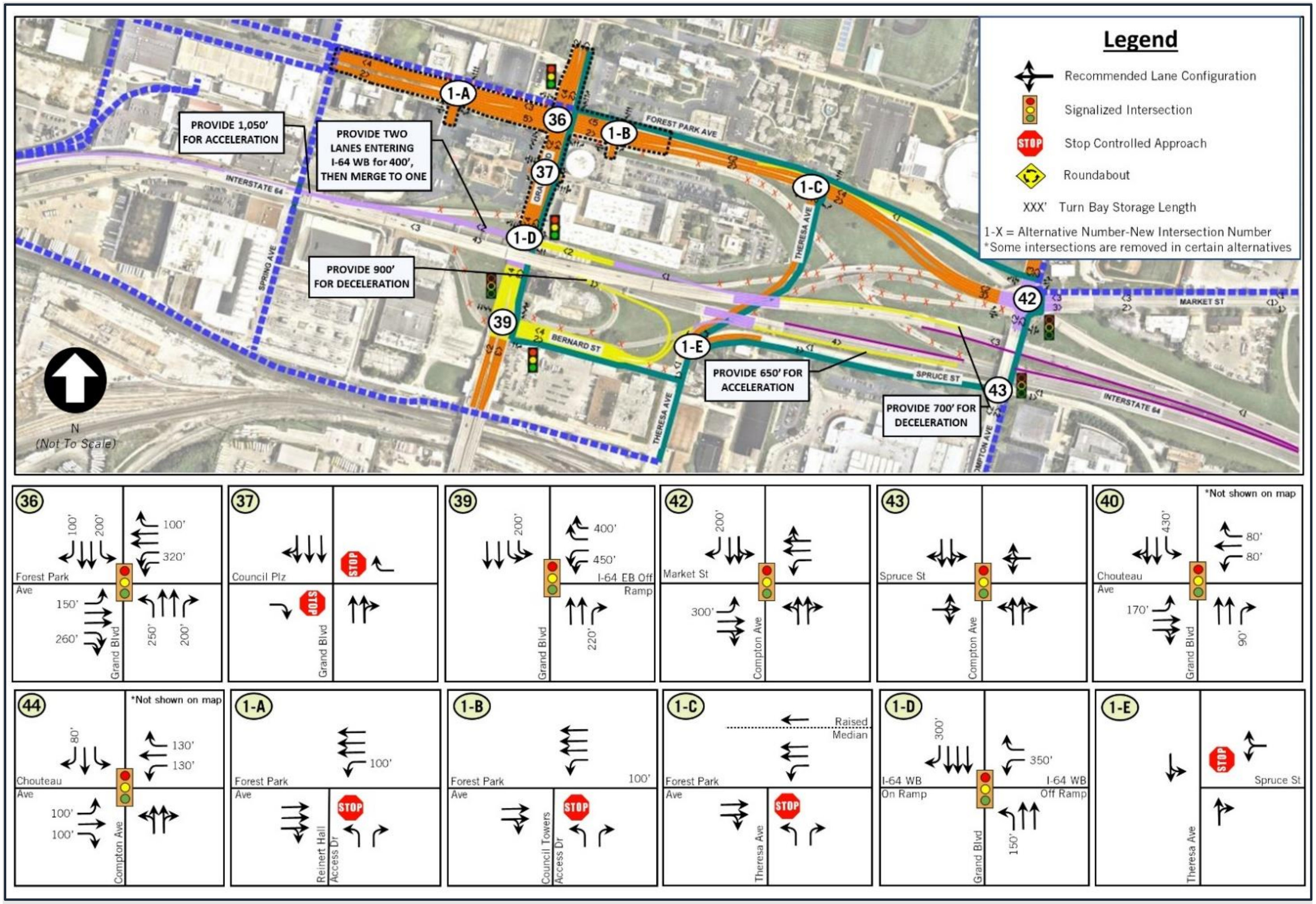
Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 52. Alternative #1: Year 2050 Assumed Geometrics/Traffic Control (Tower Grove/Boyle/Papin & Vandeventer Interchanges)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 53. Alternative #1: Year 2050 Assumed Geometrics/Traffic Control (Grand Blvd./Forest Park Ave. Interchange)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Overall conditions for the Alternative #1 VISSIM network were summarized with regards to average delay, average stops, total delay, and throughput. It should be noted that total delay includes the latent delay associated with vehicles unable to enter the network and throughput volumes include traffic traveling through critical intersections immediately adjacent to the interstate that were included due to their potential to influence I-64 operations (such as Clayton at Boyle or Forest Park at Grand). **Table 12** compares these network parameters to those associated with the No Build (Maintenance Only) alternative.

Table 12. Alternative #1: Overall Network Performance Comparison to No Build (Maintenance Only)

Time Period/Variable	No Build (Maintenance Only) Alternative	Alternative #1
AM Peak Hour		
Average Delay	133 sec/veh	102 sec/veh
Average Stops	6.3 stops/veh	3.4 stops/veh
Throughput	27,588 veh	28,404 veh
PM Peak Hour		
Average Delay	86 sec/veh	122 sec/veh
Average Stops	2.5 stops/veh	3.3 stops/veh
Throughput	29,856 veh	29,821 veh

As shown, in the Tier 1 limits the interstate experiences reasonable levels of service at many locations during the peak hours. As can be seen from Figure 50 and Figure 51, all segments in the study area experience level of service D or better. Additionally, many of the intersection approaches operate at an overall LOS D or better.

However, the VISSIM model does indicate congestion at the following locations:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
  - ♦ I-64 eastbound off ramp at Kingshighway Blvd. endures queues which extend back almost to the gore point of the off ramp. However, the maximum queue length is more than four times the average queue length indicating that the occurrence of lengthy queues is low. It is important to note that persistence of these congested conditions can cause safety concerns.

PM PEAK HOUR

- The I-64 westbound and eastbound off ramps both experience considerable congestion. Clayton Ave. and Boyle Ave. This intersection is discussed in this section due to its proximity to the Tier 1 zone. Please refer to the Tier 2 Synchro Analysis exhibits for the intersection LOS results

    - The intersection at Clayton Ave. and Boyle Ave. would continue to experience congestion, although the proposed improvements at the intersection do provide additional capacity towards accommodating the congestion as compared to the No Build (Maintenance Only) scenario. However, the eastbound queue on Clayton Ave. could extend past Tower Grove Ave. during the peak hour. It should be noted that operations at this intersection are being impacted due to the 1,000 eastbound right turns from Clayton Ave. to Boyle Ave.

- Forest Park Ave. and Grand Blvd. - This intersection is discussed in this section due to its proximity to the Tier 1 zone. Please refer to the Tier 2 Synchro Analysis exhibits for the intersection LOS results.

    - This intersection fails in Alternative #1 despite the addition of numerous turn and travel lanes. Given the high levels of traffic traveling through the intersection on both Grand Blvd. and Forest Park Ave., coupled with the removal of the eastbound on ramp to I-64 from Forest Park Ave. (which results in the rerouting of traffic through this intersection to the on ramp from Grand Blvd.), it is not feasible to reconstruct the intersection at grade in a manner that would be conducive to managing vehicular traffic let alone bicycle and pedestrian traffic. For an at grade intersection at this location to function coupled with the other improvements presented in Alternative #1, an alternate north south corridor to Grand (such as the extension of Theresa Ave) and/or additional access to I-64 eastbound other than from Grand Boulevard is needed.

5.1.1.4. Synchro Results

The Year 2050 Corridor Alternative #1 operating conditions at the intersections within Tier 1 limits were evaluated using Synchro 11, which is a traffic flow model based on the HCM. The Synchro analysis was completed in accordance with Section 905.3.5.2.3 of MoDOT's EPG. The roundabout at the intersection of the I-64 eastbound off ramp at Tower Grove Ave. was analyzed using Sidra 8, which is based upon methodologies used by the HCM. The Sidra analysis was completed in accordance with Section 905.3.5.2.2 of MoDOT's EPG.

Detailed operating conditions for Tier 1 limits are provided in Appendix B as modeled by Synchro and Sidra. The intersections within the Tier 1 limits operate reasonably with some exceptions. While not in Tier 1, the intersection of Forest Park Ave. and Grand Blvd. greatly impacts the operations of Tier 1 intersections, especially with the proposed changes along Grand Blvd. Therefore, the intersection of Forest Park Ave. and Grand Blvd. was referenced in the Tier 1 intersections. In Alternative #1, this intersection fails in the PM peak hour. It should be noted that modest signal timings adjustments were made for the Alternative #1 analysis to better accommodate the future volumes.

In addition to LOS, the volume to capacity (v/c) ratios were analyzed. Several ramp terminals experience high v/c ratios with particular movements. While the intersections overall appear to currently operate well, some individual movements experience borderline operating conditions.

The following intersections have individual movements that operate at a LOS F or have a v/c ratio above 0.90 for an off ramp from I-64 or 0.95 for all other movements:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - ♦ The southbound left-turn has a failing LOS with a v/c ratio of 1.17. The eastbound queue extends down the ramp diminishing the available deceleration length, thereby posing a potential safety concern for motorists exiting I-64.

PM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - ♦ The eastbound and westbound queues extend down the respective ramps diminishing the available deceleration length, thereby posing a potential safety concern for motorists exiting I-64.
- I-64 Eastbound off ramp and Grand Blvd.
    - ♦ The loop ramp's intersection with Grand Blvd. operates with a v/c ratio of 1.05. As the queue extends around the ramp, the available deceleration length is diminished, posing a potential safety concern for motorists exiting eastbound I-64 unless up to 900 feet of deceleration length is provided.
    - ♦ In addition, the northbound approach operates with a v/c ratio of 1.03.

5.1.1.5. Correlation of VISSIM and Synchro Results

It is not uncommon for the VISSIM results to deviate slightly from the Synchro and Sidra results due to the difference in programs and the level of detail included in the inputs and parameters. However, it is still expected that the results should be comparable regardless of the program utilized.

When the results from the various analytical tools used for the traffic analysis are compared, the Year 2050 Corridor Alternative #1 traffic operations for the overall intersection MOEs as well as the individual approaches are generally comparable to one another. The only differences observed between the various outputs were due to the manner in which a particular program handled the right-turn movement at intersections (VISSIM provides a more detailed analysis of the right-turn movement than Synchro). In addition, the intersection of Forest Park Ave. and Grand Blvd. shows some discrepancies between the VISSIM and Synchro model. These discrepancies are due to the manner in which the programs handled traffic progression and right-turn movements along the I-64 ramps south of the intersection.

It is worth noting that there are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities. Bringing this intersection to-grade could potentially reduce traffic volumes at this intersection as compared to the straight growth assumed in this study, which in turn would potentially reduce the number of lanes necessary to maintain a LOS E. Similar intersections, such as Kingshighway Blvd. at Forest Park Ave., which have been brought to grade have experienced a reduction between 20-30% in traffic volumes once the intersection was brought to grade. However, the removal of traffic at this intersection could be a result of either the diversion of traffic to other intersections, which was beyond the scope of this study, or the dissipation of traffic due to reduction in trip making and/or modal shifts.

5.1.2. Tier 2 Limits: Arterials and Major Collectors

Tier 2 includes the areas outside of Tier 1, but within the study area as defined by Forest Park Ave. and Market St. to the north and Route 100 to the south. Tier 2 encompasses several arterials and major collectors that cross or run parallel to I-64.

5.1.2.1. Synchro Results

The traffic operations conditions within the Tier 2 limits were completed using the same methodology used for the Tier 1 traffic operations but were analyzed using only Synchro. **Figure 54** and **Figure 55** show the Year 2050 Corridor Alternative #1 operating conditions as modeled by Synchro for the Tier 2 limits. Only overall intersection LOS is provided for intersections within the Tier 2 limits; detailed operating conditions are provided in Appendix B. Event traffic for Grand Center or Midtown entertainment venues was not considered in the analysis.

As shown, each of the intersections has an overall LOS of D or better, with the exception of two intersections. Similar to the 2050 No Build (Maintenance Only) scenario, Kingshighway Blvd. at Route 100 operates at a failing LOS during both peak periods. Forest Park Ave. at Grand Blvd. fails during the PM peak hour.

As mentioned above, the at-grade intersection of Forest Park Ave. and Grand Blvd. fails during the PM peak hour. It is clear that the additional traffic along Grand Blvd. due to the traffic diversions as a result of Alternative #1 cannot be accommodated with an at-grade intersection configuration. There are significant queues at this intersection, despite the lane additions. Furthermore, it is acknowledged that there are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities.

Many intersections experience the same operating conditions as the No Build (Maintenance Only) scenario. This is because no lane configuration or traffic volumes changes were expected at those intersections, due to the proposed changes in Alternative #1. The following intersections have at least one approach with a LOS F during either the AM or PM peak period:

AM PEAK HOUR

- Kingshighway Blvd. and Manchester Ave. (Route 100)
    - ♦ The eastbound and northbound approaches have a failing LOS during the AM peak period. The eastbound approach has a v/c of 1.18, the northbound approach has a v/c ratio of 1.28, and the southbound approach has a v/c ratio of 1.16.

- Forest Park Ave. and Grand Blvd.
  - The westbound approach has a v/c ratio of 0.95. It should be noted that this intersection has been brought to grade in this alternative and would require numerous travel and turn lanes to achieve a LOS E.
- Manchester Ave. and Taylor Ave.
  - The eastbound approach has a v/c ratio of 1.11, the westbound approach has a v/c ratio of 0.95, and the southbound approach has a v/c ratio of 0.99.
- Chouteau Ave. and Grand Blvd.
  - The southbound left-turn has a v/c ratio of 0.96.
- Chouteau Ave. and Jefferson Ave.
  - The northbound approach has a v/c ratio of 1.06 and the southbound left-turn has a v/c ratio of 0.96.

PM PEAK HOUR

- Kingshighway Blvd. and Forest Park Ave.
  - The westbound through movement has a v/c ratio of 1.06 during the PM peak period.
- Kingshighway Blvd. and Manchester Ave. (Route 100)
  - The eastbound and westbound approaches of Manchester Road fail. The eastbound approach has a v/c ratio of 1.10 and the westbound approach has a v/c ratio of 1.37. Additionally, the southbound approach of Kingshighway has a v/c ratio of 1.03, indicating it is over capacity.
- Forest Park Ave. and Grand Blvd.
  - Assuming the intersection is brought to grade, the northbound and southbound approaches have a failing LOS. The v/c ratio for the westbound approach is 1.07, the v/c ratio for the northbound approach is 1.06, and the v/c ratio for the southbound approach is 1.06. Overall, the intersection has a failing LOS in the PM peak hour. It is evident that when brought to grade, the intersection cannot accommodate the PM peak volumes for Alternative #1, despite the introduction of additional lanes.
- Clayton Ave. and Boyle Ave.
  - The eastbound approach has a failing LOS with a v/c ratio of 1.17.
- Manchester Ave. and Taylor Ave.
  - The southbound approach has a v/c ratio of 1.07.

- Chouteau Ave. and Compton Ave.
    - The northbound approach has a v/c ratio of 0.97.
- Chouteau Ave. and Jefferson Ave.
    - The eastbound approach has a failing LOS. In addition, the eastbound approach has a v/c ratio of 1.04, the westbound approach has a v/c ratio of 1.02, and the southbound approach has a v/c ratio of 1.12.

As stated above, many of the movements that experience a LOS F or a v/c ratio of 0.95 or more are either side-street movements at unsignalized intersections where the traffic is unable to find a gap in the free-flowing traffic or where the traffic must wait through a long signal length, causing delays. More importantly, there are critical movements, most notably at Kingshighway Blvd. at Forest Park Ave., Forest Park Ave. at Grand Blvd. and Kingshighway Blvd. at Manchester Ave. that are over capacity. Specifically, as shown under Alterative #1, the traffic volumes along Grand Boulevard at an at grade intersection with Forest Park Ave. cannot be accommodated despite the addition of lanes. It is possible that conditions would improve at this at grade intersection if either an alternate north-south corridor, such as the extension of Theresa Ave. between Chouteau Ave. and Forest Park Ave. and/or additional I-64 eastbound access beyond Grand Blvd. is provided to help alleviate traffic at this intersection.

Figure 54. Alternative #1: Year 2050 Conditions - AM Tier 2 Synchro Analysis

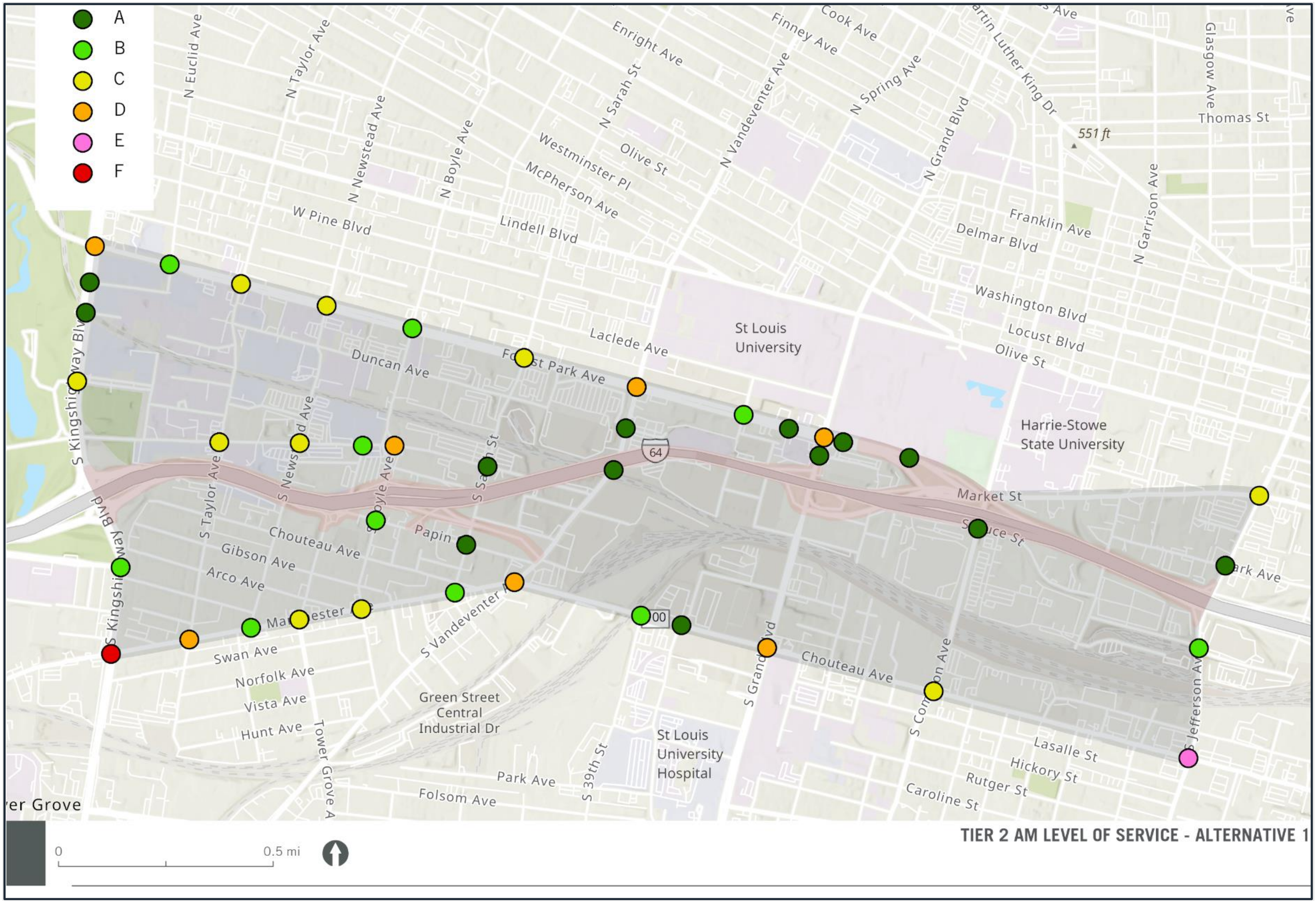
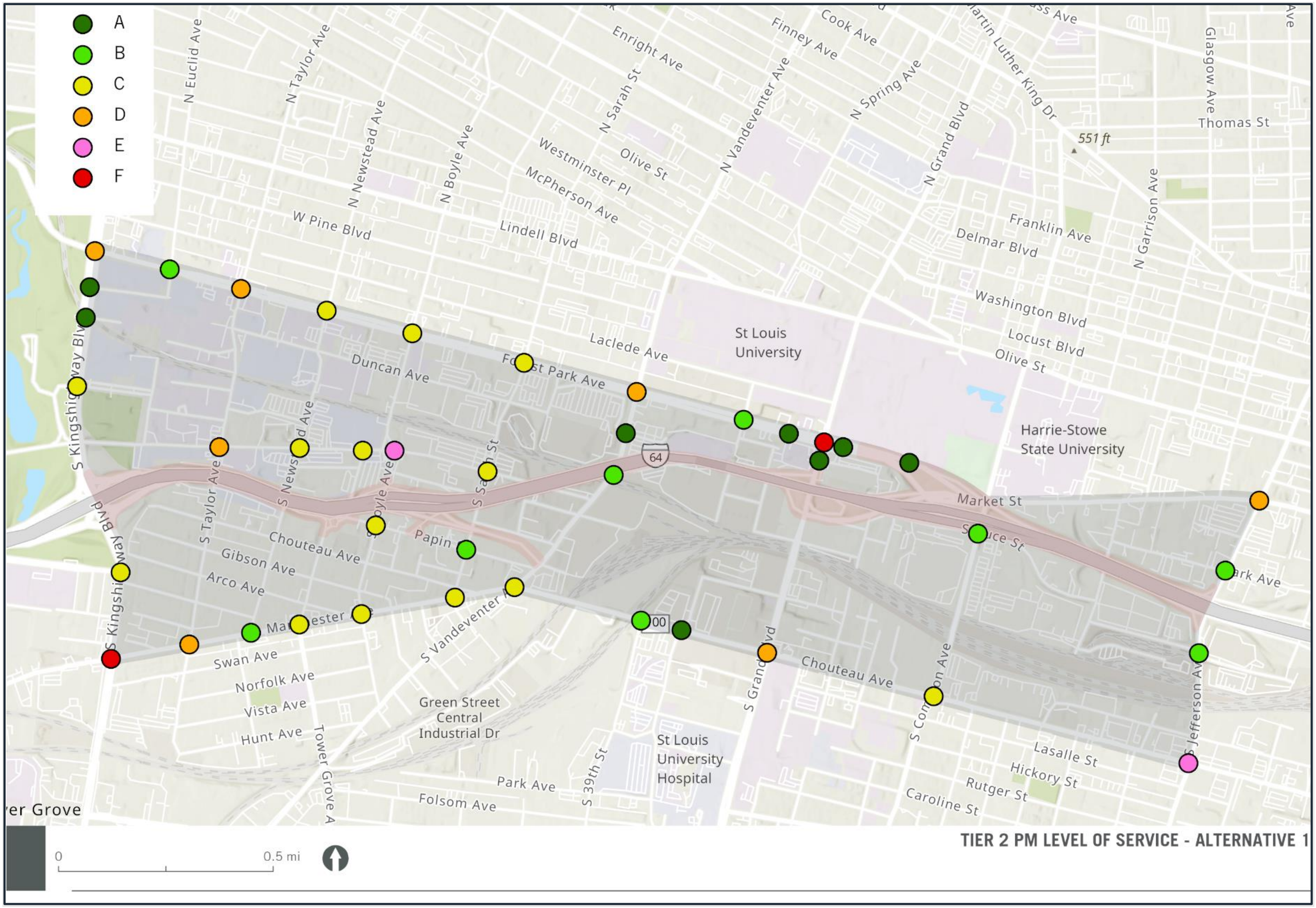


Figure 55. Alternative #1: Year 2050 Conditions - PM Tier 2 Synchro Analysis



5.2. SAFETY

The intent of the improvements presented in Alternative #1 were to addresses several existing safety issues from a vehicular perspective within the Tier 1 area, including the following:

- Extension of substandard deceleration and ramp length for the westbound I-64 off ramp to Boyle Ave.
- Improvements to Clayton Ave. and Boyle Ave. to better facilitate the flow of traffic to and from the Washington University Medical Campus and Cortex Commons.
- Improvement of the geometry of the eastbound off ramp to Grand Blvd.
- Removal of the left-hand eastbound entrance from Forest Park Ave. to I-64.

5.2.1. Corridor Alternative #1 Interchange Spacing, Ramp Lengths & Access Points

Table 13, Table 14, and **Table 15** summarize the interchange and gore spacing for Alternative #1 as well as the anticipated ramp lengths. The spacing between each painted gore along the I-64 corridor for Alternative #1 is shown in **Figure 56.** As can be seen, Alternative #1 provides safety enhancements within Tier 1 by removing the eastbound off ramp to Market St., the westbound on ramp from Market St./Compton Ave., and the eastbound on ramp from Forest Park Ave., thereby provides for significantly improved gore spacing between Grand Blvd. and the nearest upstream and downstream access points.

Table 13. Alternative #1: Interchange Spacing

Interchange	Existing/No Build (Maintenance Only)	Design Standard1/	Alternative #1
S. Kingshighway Blvd. to Tower Grove Ave. / Boyle Ave. / Papin St.*	3,440’	5,280’	3,440’
Tower Grove Ave. / Boyle Ave. / Papin St.* to Vandeventer Ave.	3,100’	5,280’	3,100’
Vandeventer Ave. to Grand Blvd.	2,440’	5,280’	2,440’
Grand Blvd. to WB Forest Park Ave. off ramp	2,125’	5,280’	2,125’
WB Forest Park Ave. off ramp to Jefferson Ave.	2,985’	5,280’	2,985’
Jefferson Ave. to 22nd St.	1,200’	5,280’	1,200’

Note: Distance represent centerline of cross street to centerline of adjacent cross street
** Distance based on a center point between the Tower Grove Ave. and Boyle Ave. overpasses*
1/: Table 1, Publication No. FHWA-HRT-07-031 Safety Assessment of Interchange Spacing on Urban Freeways

Table 14. Alternative #1: Gore Spacing

Interchange	Existing/No Build (Maintenance Only)	Design Standard	Alternative #1
I-64 Eastbound Direction			
I-64 EB On Ramp from S. Kingshighway Blvd. I-64 EB Off Ramp to Tower Grove Ave.	874’	1,600’	874’
I-64 EB Off Ramp to Tower Grove Ave. I-64 EB Off Ramp to Vandeventer Ave.	1,429’	1,000’	1,429’
I-64 EB Off Ramp to Vandeventer Ave. I-64 EB On Ramp from Papin St.	1,191’	500’	1,191’
I-64 EB On Ramp from Papin St. I-64 EB Off Ramp to Market St.	3,903’	1,600’	Market St. Removed
I-64 EB On Ramp from Papin St. I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	n/a	1,600’	4,670’
I-64 EB Off Ramp to Market St. I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	828’	1,000’	Market St. Removed
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.) I-64 EB On Ramp from Forest Park Ave.	1,755’	500’	Forest Park Ave. Removed
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.) I-64 EB On Ramp from Grand Blvd.	n/a	500’	725’
I-64 EB On Ramp from Forest Park Ave. I-64 EB Off Ramp to Jefferson Ave.	2,204’	1,600’	Forest Park Ave. Removed
I-64 EB On Ramp from Grand Blvd. I-64 EB Off Ramp to Jefferson Ave.	n/a	1,600’	3,260’
I-64 Westbound Direction			
I-64 WB Off Ramp to S. Kingshighway Blvd. I-64 WB On Ramp from Boyle Ave.	1,881’	1,600’	1,881’
I-64 WB On Ramp from Boyle Ave. I-64 WB On Ramp from Vandeventer Ave.	977’	1,000’	977’
I-64 WB On Ramp from Vandeventer Ave. I-64 WB Off Ramp to Boyle Ave.	755’	500’	1,525’
I-64 WB Off Ramp to Boyle Ave. I-64 WB On Ramp from Grand Blvd.	3,618’	1,600’	2,848’

Interchange	Existing/No Build (Maintenance Only)	Design Standard	Alternative #1
I-64 WB On Ramp from Grand Blvd. I-64 WB On Ramp from Market St.	1,497’	1,000’	Market St. Removed
I-64 WB On Ramp from Grand Blvd. I-64 WB Off Ramp to Grand Blvd.	n/a	1,600’	1,790’
I-64 WB On Ramp from Market St. I-64 WB Off Ramp to Forest Park Ave.	2,468’	500’	Market St. Removed
I-64 WB Off Ramp to Forest Park Ave. I-64 WB Off Ramp to Grand Blvd..	n/a	1,000’	2,175’
I-64 WB Off Ramp to Forest Park Ave. I-64 WB On Ramp from Jefferson Ave.	1,144’	1,600’	1,144’

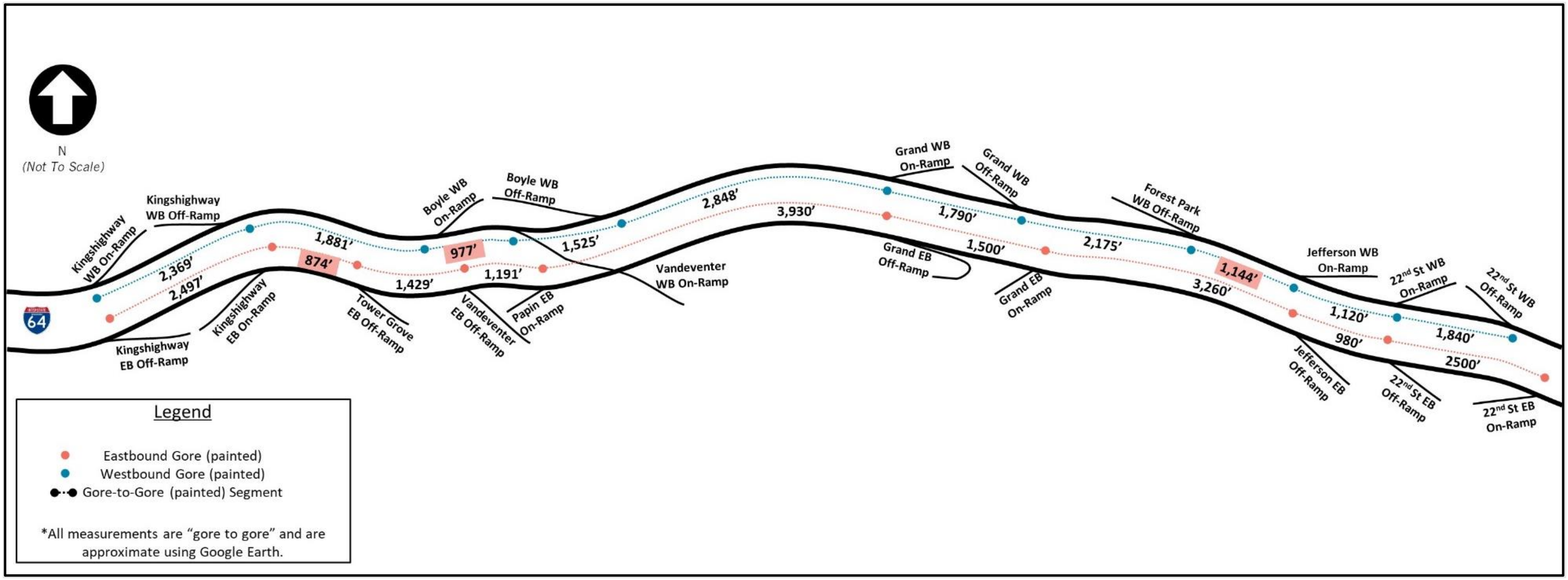
Note: Gore spacing that is non-compliant has been highlighted. Blue text indicates differences between existing and Alt #1 where gore spacing is improved by removal of existing access, or new access meeting the design standard. Red text indicates differences between existing and Alt #1 where the change reduces gore spacing.

Table 15. Alternative #1: Ramp Lengths

Ramp	Existing/No Build (Maintenance Only)	Alternative #1
Tower Grove Ave.		
I-64 EB Off Ramp to Tower Grove Ave.	1,010’	1,010’
Boyle Ave. / Papin St.		
I-64 WB On Ramp from Boyle Ave.	840'	840'
I-64 WB Off Ramp to Boyle Ave.	830'	830'
I-64 EB On Ramp from Papin St.	710'	710'
Vandeventer Ave.		
I-64 EB Off Ramp to Vandeventer Ave.	2,220'	2,220'
I-64 WB On Ramp from Vandeventer Ave.	1,970'	1,970'
Grand Blvd.		
I-64 WB On Ramp from Grand Blvd.	830'	820'
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	660'	810'
Market St.		
I-64 WB On Ramp from Market St.	1,500'	Removed
I-64 EB Off Ramp to Market St..	2,850'	Removed
Forest Park Ave.		
Forest Park Ave. Off Ramp to Market St.	2,140'	Removed
I-64 WB Off Ramp to Forest Park Ave. (Theresa Ave. in Alt #1)	3,100'	2,000’
I-64 EB On Ramp to Forest Park Ave.	2,150'	Removed

Note: Ramp length is considered to be the distance between the painted gore and the curb line of the cross street at the ramp terminal.

Figure 56. Alternative #1: I-64 Corridor Gore-to-Gore Measurements



As shown below in **Table 16**, Alternative #1 results in a net reduction in on ramps and off ramps to/from I-64. The number of interchanges would be reduced to five with I-64 and access points that connect I-64 to nine local and regional roadways. Noting the improved ramp lengths above, along with increased deceleration and acceleration lengths, in conjunction with increased gore spacing, there would be an overall positive impact to vehicular safety in the Tier 1 area along the I-64 corridor.

Table 16. Alternative #1: I-64 Access Locations

Location	Existing/No Build (Maintenance Only)		Alternative #1	
	On Ramps	Off Ramps	On Ramps	Off Ramps
Kingshighway Blvd.	2	2	2	2
Tower Grove Ave.	0	1	0	1
Boyle St.	1	1	1	1
Papin St.	1	0	1	0
Vandeventer Ave.	1	1	1	1
Grand Blvd.	1	1	2	2
Market St./Bernard St.	1	1	0	0
Forest Park Ave.	1	1	0	1
Jefferson Ave./22nd St.	3	3	3	3
Total	22		21	

Note: Highlighted cells denote a change in ramp number from No Build (Maintenance Only) to Alternative #1.

5.2.2. Potential Crash Reduction

It should be noted that HSM, ISATe and/or IHSDM was not utilized for the I-64 PEL, as outlined in the approved Methods & Assumptions Report. Rather, existing crashes were categorized by contributing factors and severity for the Existing Conditions. The safety analysis of the three corridor alternatives is *qualitatively* based upon how each alternative addresses the safety deficiencies and needs identified in the Existing Conditions, with limited quantitative analysis based on feasibly applicable Crash Modification Factors (CMFs) that have at least a 3-star quality rating in the national CMF Clearinghouse.

5.2.2.1. Tier 1 Limits: I-64

5.2.2.1.1. Applicable Crash Modification Factors

The following measurable elements can be determined in the No Build (Maintenance Only) and Alternative #1 scenarios, allowing for a comparison of the change in frequency of all crash types and severities.

-Acceleration Lane Length – CMF ID 5216

$$CMF = e^{-4.55(L_{accelNew}-L_{accelExist})}$$

Where:

$L_{accelNew}$ = new (or proposed) length of acceleration lane in miles

$L_{accelExist}$ = existing length of acceleration lane in miles

Clearinghouse Reference - https://www.cmfclearinghouse.org/detail.cfm?facid=5216

-Deceleration Lane Length – CMF ID 3042

$$CMF = e^{2.198\ (Y - X)}$$

Where:

Y = new deceleration lane length in miles (length between 265' – 900')

Y = existing deceleration lane length in miles (length between 265' – 900')

Clearinghouse Reference - https://www.cmfclearinghouse.org/detail.cfm?facid=3042

Table 17, **Table 18**, and **Table 19** summarize the acceleration lane lengths, deceleration lane lengths, shoulder lane widths, and their associated CMFs for Alternative #1.

Table 17. Alternative #1: Freeway Acceleration Lane Lengths & CMFs

Acceleration Lane	Existing/No Build (Maintenance Only)	Design Standard	Alternative #1	CMF*
I-64 WB On Ramp from Boyle Ave.	1880'	1326'	1880'	No Change
I-64 EB On Ramp from Papin St.	415'	780'	780'	0.73
I-64 WB On Ramp from Vandeventer Ave.	Adds Lane	n/a	Adds Lane	No Change
I-64 WB On Ramp from Grand Blvd.	540'	1050'	1050'	0.64
I-64 WB On Ramp from Market St.	550'	670'	Removed	N/A
I-64 EB On Ramp from Forest Park Ave.	1290'	670'	Removed	N/A

** CMF Calculated is based on CMF ID 5216 in the CMF Clearinghouse*

Table 18. Alternative #1: Deceleration Lane Lengths & CMFs

Deceleration Lane	Existing/No Build (Maintenance Only)	Design Standard	Alternative #1	CMF*
I-64 EB Off Ramp to Tower Grove Ave	872’	352’	872’	No Change
I-64 WB Off Ramp to Boyle Ave..	275’	256’	960’	0.75
I-64 EB Off Ramp to Vandeventer Ave	782’	285’	782’	No Change
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	285’	410’	950’	0.73
I-64 EB Off Ramp to Market St.	200’	342’	Removed	N/A
Forest Park Ave. Off Ramp to Market St.	627’	266’	Removed	N/A

** CMF Calculated is based on CMF ID 3042 in the CMF Clearinghouse*

Table 19. Alternative #1: Ramp Shoulder Widths & CMFs

Location	Existing/No Build (Maintenance Only)		Alternative #1		CMF*
	Inside	Outside	Inside	Outside	% Change
I-64 EB Off Ramp to Tower Grove Ave.	4’	8’	4’	8’	0
I-64 EB Off Ramp to Vandeventer Ave.	5.5’	5.5’	5.5’	5.5’	0
I-64 EB On Ramp from Papin St.	4’	4’	4’	8’	FI: 43% PDO: 21%
I-64 EB Off Ramp to Market St.	2’	3’	Removed		N/A
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	2’	2’	4’	8’	FI: 38% PDO: 17%
I-64 WB Off Ramp to Forest Park Ave.	4’	8’	4’	8’	0
I-64 WB On Ramp from Grand Blvd.	4’	4’	4’	8’	FI: 24% PDO: 11%
I-64 WB Off Ramp to Boyle Ave.	4’	4’	4’	8’	FI: 24% PDO: 11%
I-64 WB On Ramp from Boyle Ave.	4’	8’	4’	8’	0

**Assumed that if a ramp is new or modified, then shoulders would meet base requirements of 4’ inside and 8’ outside. The CMF column is a percent reduction of all crashes, utilizing equations 19-35 and 19-36 of the current HSM.*

As shown in **Table 20**, Alternative #1 would also include improved inside shoulder widths on the mainline between Tower Grove Ave. and Sarah St. on the west end, and between Theresa Ave. (extended) and Ewing Ave. on the east end. These widened inside shoulder segments are improvements not tied to any adjacent mainline realignments but would allow for standard 10' inside shoulders.

Table 20. Alternative #1: Freeway Shoulder Widths & CMFs

Location	Existing/No Build (Maintenance Only)		Alternative #1		CMF*
	Inside	Outside	Inside	Outside	% Change
I-64 EB/WB between Newstead Ave. and Sarah St.	5.5'	10'	10'	10'	FI: 7% PDO: 8%
I-64 EB/WB between Theresa Ave. and Ewing Ave.	4'	10'	10'	10'	FI: 10% PDO: 9%

** CMFs based on HSM equations 18-25 and 18-26*

5.2.2.1.2. Qualitative Safety Summary

High crash frequencies were previously identified in the Existing Conditions report along I-64 and several of the major corridors within the study area, including Jefferson Ave., Grand Blvd., Vandeventer Ave., Kingshighway Blvd., and I-64 ramp intersections. However, the improvements associated with Alternative #1 would address some of these concerns, such as the westbound off ramp at Boyle Ave. or the concerns associated with the eastbound loop ramp to Grand Blvd. However, Alternative #1 does not address the following existing safety concerns (note that modifications to the interchange configurations at Kingshighway Blvd. and Jefferson Ave./22nd St. were not contemplated as part of this PEL given the relatively recent and/or ongoing reconstruction at these locations):

- I-64 & Jefferson Ave. (inclusion of this location is based upon crash data from 2017 thru 2020, prior to the reconstruction of this interchange)
- I-64 over Vandeventer Ave. (Directional share is ~50/50, slightly higher EB)
- I-64 EB between Kingshighway Blvd. and Tower Grove Ave.
- I-64 & Kingshighway Blvd.

The removal of several ramps between the existing Market St./Bernard St. eastbound off ramp and Jefferson Ave. provides for relatively significant safety improvements, due to the reduction of ramp lane-miles and merge/diverge conflict areas. Elimination of the left-hand entrance from Forest Park Ave. to eastbound I-64 also serves to reduce weaving movements for vehicles entering at the existing point attempting to access the downstream ramps to the east, while reinforcing driver expectations of vehicles entering and exiting the freeway from the right.

A quantitative safety analysis investigating the impact of improvements presented In Alternative #1, in addition to other countermeasures found to be feasible during subsequent detailed design efforts, will inform the decision-making process when selecting preferred transportation improvements.

5.2.2.2. Tier 2 Limits: Arterials & Major Collectors

5.2.2.2.1. Applicable Crash Modification Factors

Given the complexity of the proposed modifications, few CMFs are directly applicable to the arterials and major collectors. The CMFs identified in **Table 21** would apply to improvements proposed as part of Alternative #1.

Table 21. Alternative #1: Tier 2 CMFs

Safety Improvement	CMF*	Crash Reduction (%)	Applicable Location
Conversion of intersection to right-in right-out only	0.49	51%	Grand Blvd. at Council Plaza
Change spacing distance between two ramp terminals at a diamond interchange from X to Y	$100*(1-e^{0.014308(Y-X)})$		Grand Blvd. at I-64
Change number of lanes on cross-road at diamond interchange from X to Y	$100*(1-e^{0.551(Y-X)})$		Grand Blvd. at I-64

** CMF based on "Analysis of Right-In, Right-Out Commercial Driveway Safety, Operations and Use of Channelization as Compliance Countermeasure", May 2017 Clemson University. CMF ID: 3060 equation for Change in Spacing Distance*

5.2.2.2.2. Qualitative Safety Summary

The safety of the broader study area network would improve as a result of the following improvements proposed by Alternative #1:

- Removal of the existing traffic signal at Grand Blvd. and Council Plaza. Less than 150 feet of vehicle stacking distance exists between this signal and the adjacent signal at Forest Park Ave. Removing this signal and converting the side street approaches to right-in right-out only would reduce conflict points and increase intersection spacing along Grand Blvd. to separate decision points and aid in wayfinding.

- Increasing traffic capacity at Boyle Ave. and Clayton Ave. Morning peak period congestion on northbound Boyle Ave. originates at the signal at Clayton Ave. Providing increased capacity by widening the northbound approach and expanding the intersection overall would reduce backups, thereby alleviating congestion exiting westbound I-64 at Boyle Ave. in the morning peak periods.

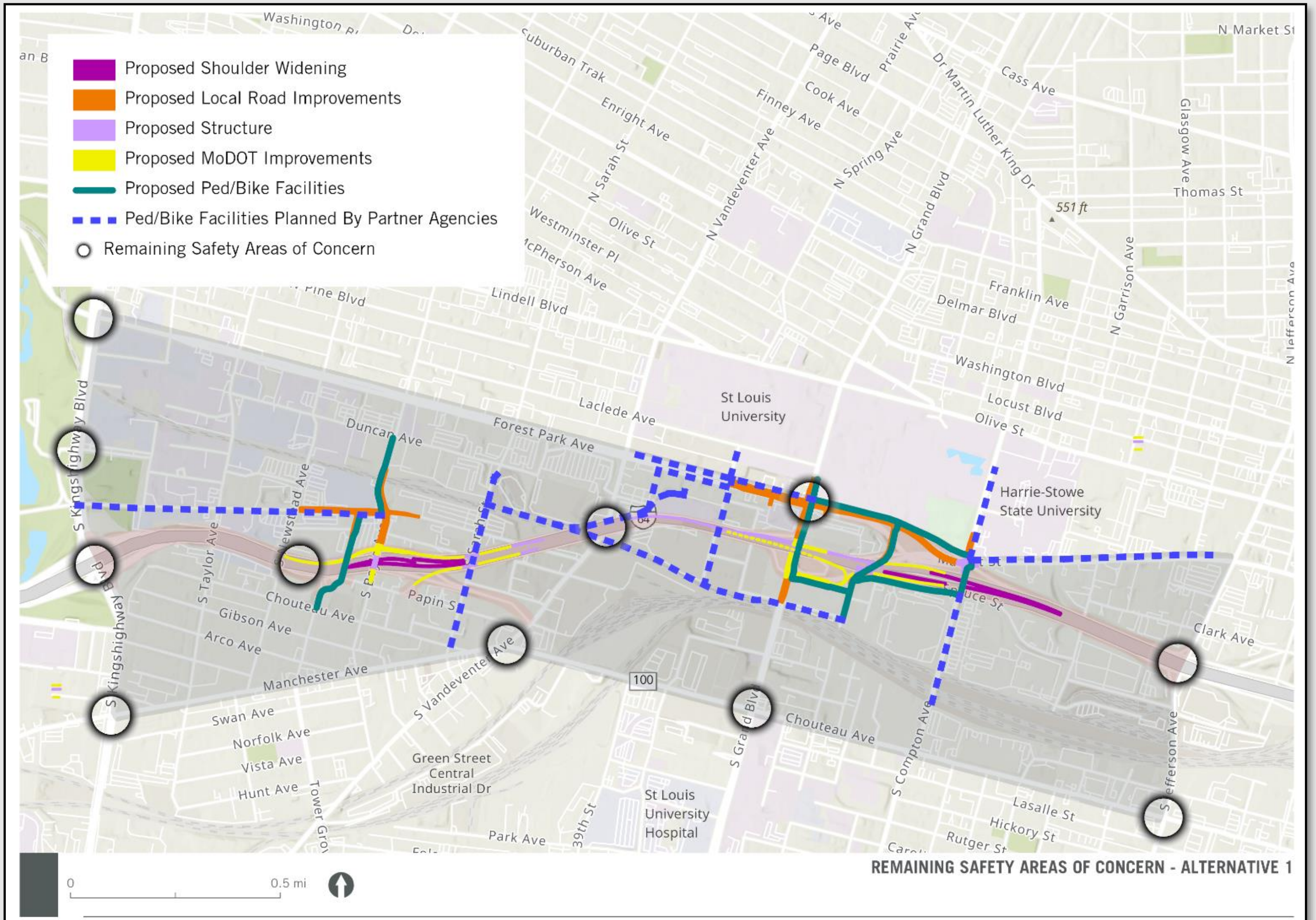
- Directly connecting Market St. and Forest Park Ave. Establishing this connection and reducing the confusing system of ramps at the existing Forest Park Ave./Compton Ave. interchange would be expected to improve safety. Ease of navigation would be improved; access to/from I-64 would be shifted to a traditional interchange at Grand Blvd.; and short-distance lane changes and merging associated with the existing system of ramps would be eliminated.

Despite these improvements, some areas of concern within Tier 2 would remain, as follows:

- Chouteau Ave. & Jefferson Ave.
- Forest Park Ave. & Grand Blvd. (whether grade separated or at grade)
- Grand Blvd. & Chouteau Ave.
- Chouteau Ave. & Vandeventer Ave.
- Kingshighway Blvd. & Forest Park Ave.
- Kingshighway Blvd. & Hospital Dr.
- Manchester Ave. & Kingshighway Blvd.

Figure 57 depicts the locations of likely safety concerns (based upon locations identified in the Existing Conditions Report that are not directly addressed from a safety perspective by this alternative) assuming Alternative #1 is in place. However, as new developments occur in the study area driving economic activity and vehicular traffic, additional locations may become high frequency locations. For example, significant new developments planned in the Chouteau Ave. and Forest Park Ave. corridors may increase the flow of traffic in those areas creating opportunities for more crashes. However, it should be noted that the responsible agencies would request proven safety countermeasures be implemented with any significant development, with considerations given to the context of the adjacent corridor(s) potentially changing mode share and user population. Concurrently, each agency would continuously incorporate safety countermeasures as part of maintenance activities and capital improvement projects in an effort to address needs for users of all ages and abilities.

Figure 57. Alternative #1: Safety Areas of Concern



5.2.2.3. Safety Enhancements for Bicyclists and Pedestrians

Crashes involving bicyclists and pedestrians are much more likely to result in an injury or fatality because the relationship between vehicle speed at impact and the severity of the crash is non-linear as speeds increase. Additional bicycle and pedestrian facilities in Alternative #1 include the following:

- Upgrade of Tower Grove Ave. across I-64 via a separate parallel structure
- A new parallel multiuse path along Theresa Ave. crossing I-64
- A new shared use multiuse path along Forest Park Ave. from Market St./Compton Ave. to Spring Ave.

Not only do these facilities effectively separate bicyclists and pedestrians from vehicles to improve safety but also create safer opportunities for crossing I-64. Additionally, the Forest Park Ave. and Theresa Ave. multiuse paths allow users to travel south to the Grand transit center without relying upon Grand Blvd. itself. Later phases of project development and design should consider specific pedestrian and bicyclist safety countermeasures and design treatments such as illuminated refuge islands, curb extensions, high-visibility crosswalks, rectangular rapid flashing beacons, and separated intersections for bicyclists.

5.3. MULTIMODAL MOBILITY

As the study area experiences continued growth and development in the coming years, multimodal transportation will become increasing essential to the movement of residents, employees, and visitors to the area. Based on assumptions regarding investments in active transportation reflected in Alternative #1, it is evident that the surface transportation network would be a safer, more connected, and more comfortable place to walk, bike, and access transit. This section of the report documents conditions in Year 2050 assuming the infrastructure represented in Alternative #1 is in place, including committed and likely active transportation projects, bicycle and pedestrian comfort and connectivity, anticipated transit investments, and future transit ridership and access.

5.3.1. Pedestrian & Bicycle Activity

This section discusses the pedestrian and bicycle operations anticipated for Alternative #1. Each element is discussed independently in terms of operation and connectivity. However, many of the facilities anticipated to serve these modes would be would likely involve adding multiuse paths.

5.3.1.1. Pedestrian Facilities

5.3.1.1.1. Proposed Pedestrian Improvements

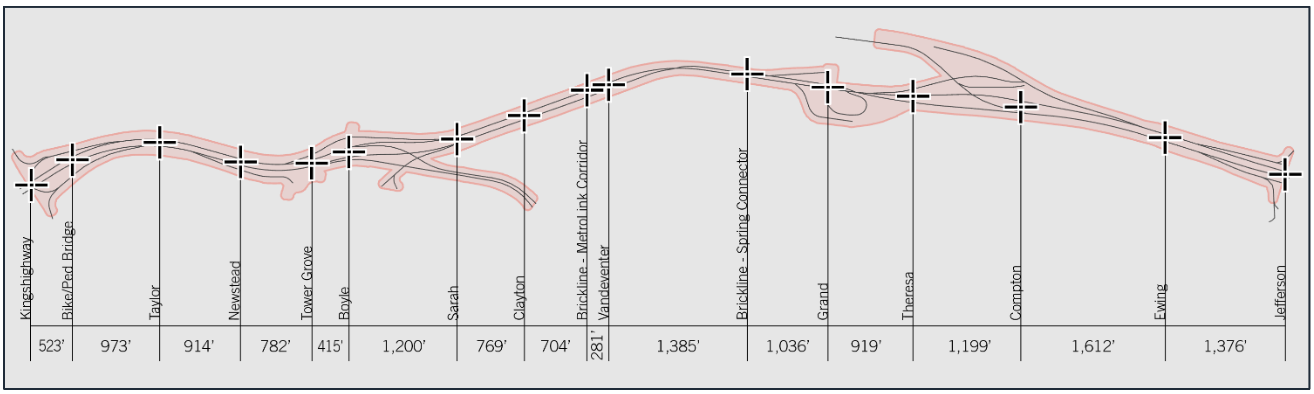
In addition to the committed and likely projects described in the No Build (Maintenance Only) scenario in Section 4.3.1, Alternative #1 includes the following pedestrian facilities:

- Parallel multiuse path on Forest Park Ave. between Grand Blvd. And Market St./Compton Ave.
- Parallel multiuse path on Theresa Ave. between Scott Ave. and Forest Park Ave.

- Parallel multiuse path on Bernard St. Between Grand Blvd. and Theresa Ave.

These improvements are located within or adjacent to the Tier 1 study area, enhancing existing I-64 crossings and within the interchange improvement alternatives areas of influence while creating new low-stress crossings for pedestrians. Combined with the committed and likely pedestrian network additions, Alternative #1 pedestrian improvements would reduce the barrier effect of I-64 as compared to the No Build (Maintenance Only) alternative. New crossings along the Brickline Greenway parallel to the MetroLink at Vandeventer Ave., at 39th St., and at Theresa Ave. would reduce distances between interstate crossings and increase network connectivity to destinations along the corridor. It should be noted that while the No Build (Maintenance Only) scenario identifies Spruce St. to Compton Ave. to Market St. as the current path option, this alternative offers Theresa Ave. to Forest Park Ave. as an alternative option. Alternative #1 provides a total of 16 crossings (compared to 15 in the No Build (Maintenance Only) scenario) supporting active transportation, three of which are pedestrian- and bicycle-only bridges. These crossings are displayed below in **Figure 58.**

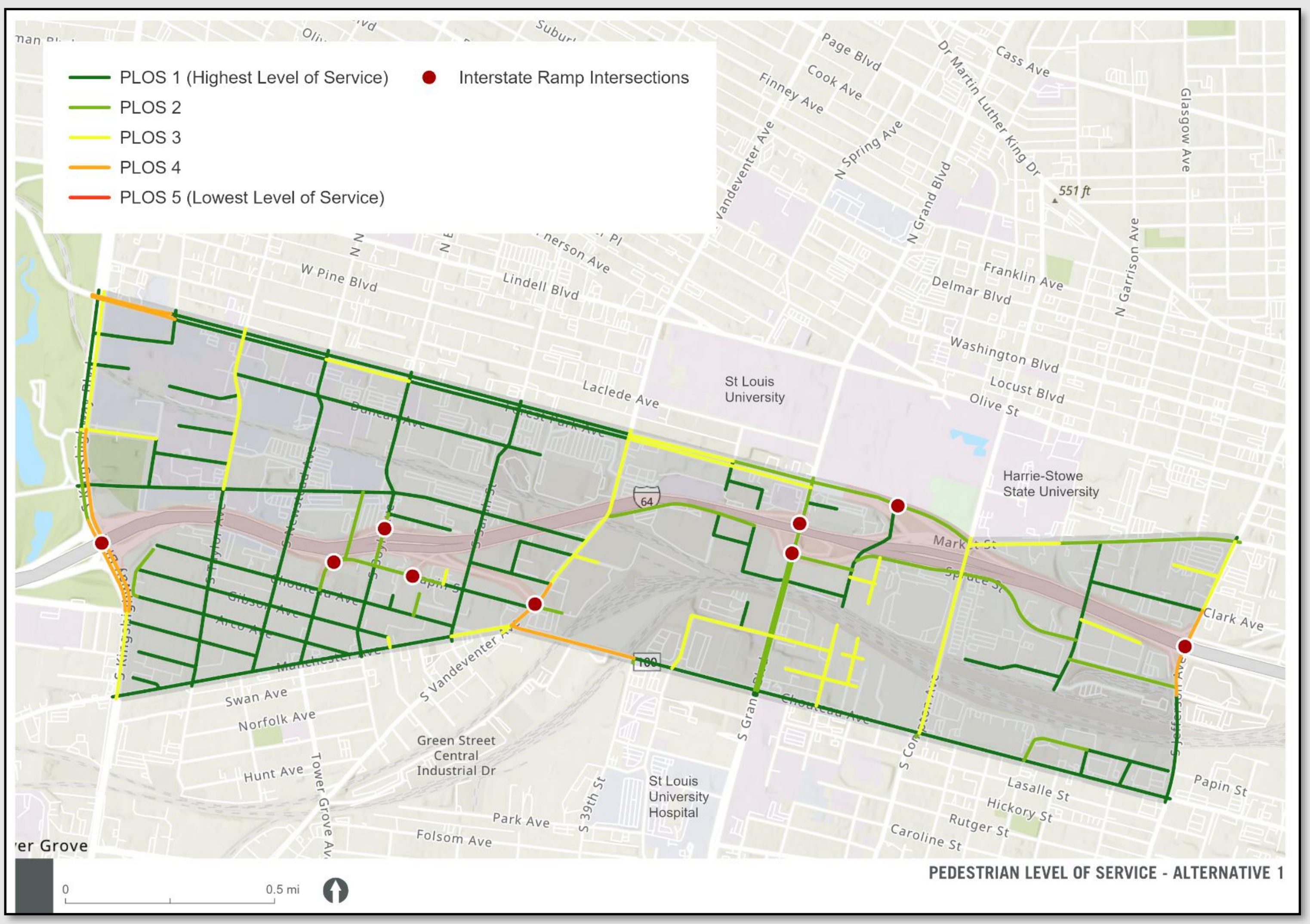
Figure 58. Alternative #1: I-64 Pedestrian & Bicycle Crossings of I-64



5.3.1.1.2. Pedestrian Level of Service (PLOS)

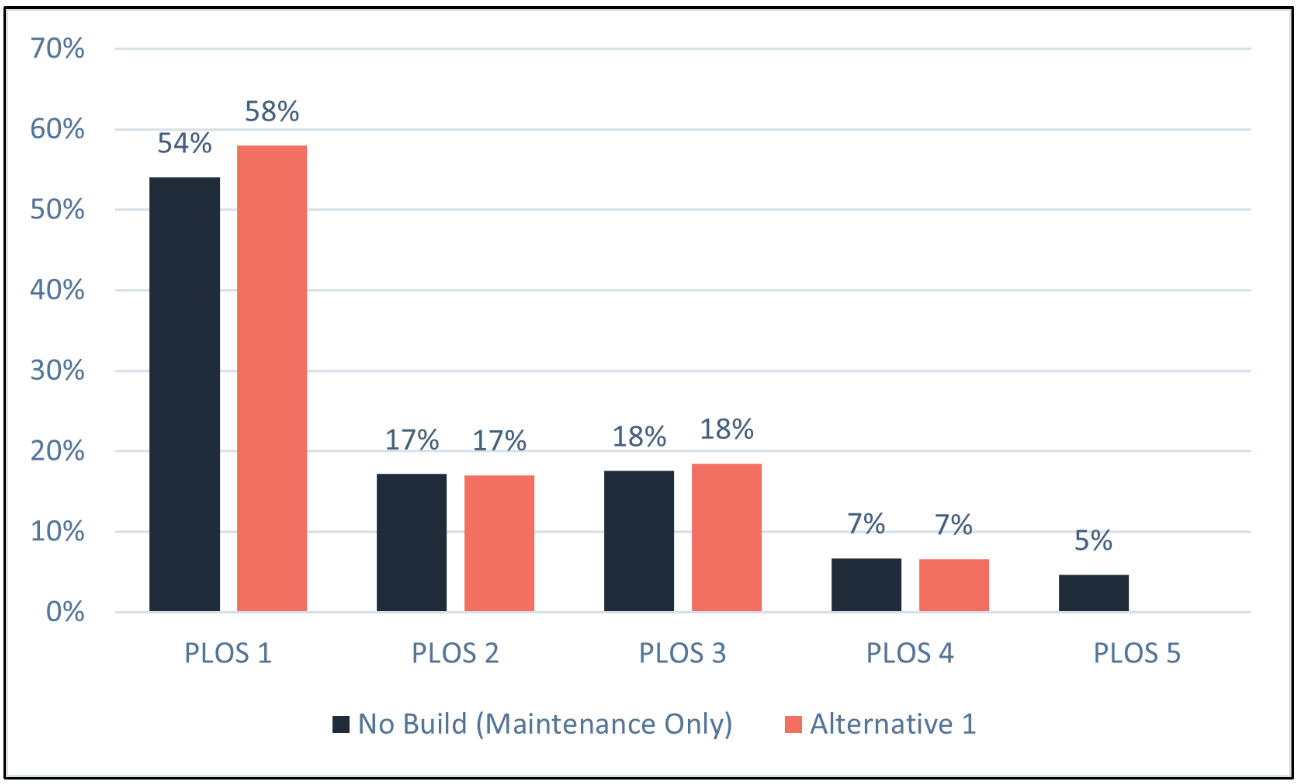
PLOS provides an objective measure of the perceived pedestrian experience based on sidewalk and roadway geometry and motor vehicle travel speeds. The underlying premise of the HCM's PLOS still drives the scoring in the simplified methodology: pedestrian comfort increases with fewer travel lanes, lower vehicle speeds, and greater separation from motor vehicle traffic. Scores range from PLOS 1 (lowest stress) to PLOS 5 (highest stress). As described in the No Build (Maintenance Only) section, the methodology has been adjusted to account for the impact of interstate ramp intersections on pedestrian level of service. The results of the PLOS analysis, which are displayed in **Figure 59**, highlight the impact that continued investments in active transportation would have within the study area. It is important to note that multiuse paths and other pedestrian pathways located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

Figure 59. Alternative #1: Pedestrian Level of Service



Alternative #1 provides moderate improvements in pedestrian levels of service over the No Build (Maintenance Only) scenario. **Figure 60** displays the percentage of roadway network miles by level of traffic stress for the Alternative #1 and No Build (Maintenance Only) scenarios. Most notable are a 4% increase in PLOS 1 network miles and a decrease of 5% in PLOS 5 resulting from multiuse path and sidewalk installations along existing and new roadway segments. Potential high-stress conflict points remain at interstate interchanges, as indicated in Figure 59. Mitigation of these conflict points through design interventions that reduce pedestrian exposure to motor vehicle traffic should be considered in project development and detailed design. As described in the Existing Traffic, Safety, and Multimodal Conditions Report, it is likely that the PLOS results do not accurately reflect the pedestrian experience and present level of service in a more favorable light, reasons for which were presented in that report. Regardless of those potential shortcomings, the changes in level of service scores between the No Build (Maintenance Only) scenario and Alternative #1 are measurable and reflect the benefit to pedestrian comfort afforded by Alternative #1 multimodal improvements

Figure 60. Alternative #1: Percent of Roadway Network by Pedestrian Level of Service



5.3.1.1.3. Pedestrian Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, pedestrian network connectivity was analyzed for Alternative #1 based on ten-minute/half-mile pedestrian travelsheds. Pedestrian connectivity ratios vary widely throughout the study area, from a low of 0.08 to a high of 0.82, with lower ratios representing poorer connectivity and higher ratios representing greater connectivity. Note that even small network changes can have large effects on individual scores. These ratios are displayed in Figure 61. The average (mean) pedestrian connectivity ratio is 0.45, which indicates that roughly 45% of the land area within walking distance can be reached based on the characteristics of the pedestrian network. This represents a modest increase over the No Build (Maintenance Only) scenario mean pedestrian connectivity ratio of 0.42 (42%).

Figure 62 displays Alternative #1 improvements in pedestrian connectivity ratios over the No Build (Maintenance Only) scenario. The results show how increased local links in the roadway network associated with Alternative #1 impact people's ability to walk to nearby destinations. High levels of improvement are evident along the I-64 corridor from Vandeventer Ave. to Compton Ave., reflecting the impact of Theresa Ave. and other new links in the network.

Figure 61. Alternative #1: Pedestrian Connectivity Analysis Results

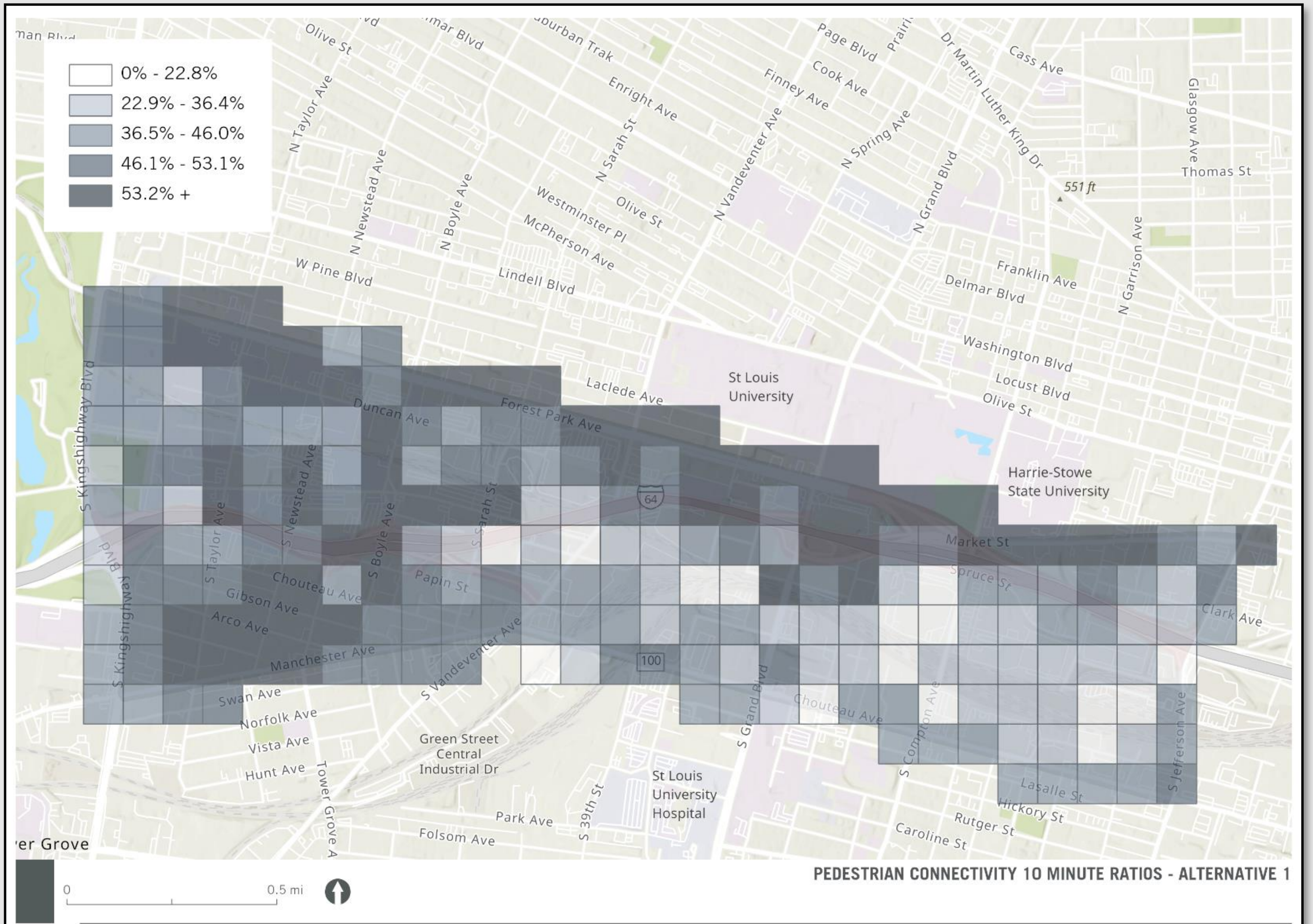
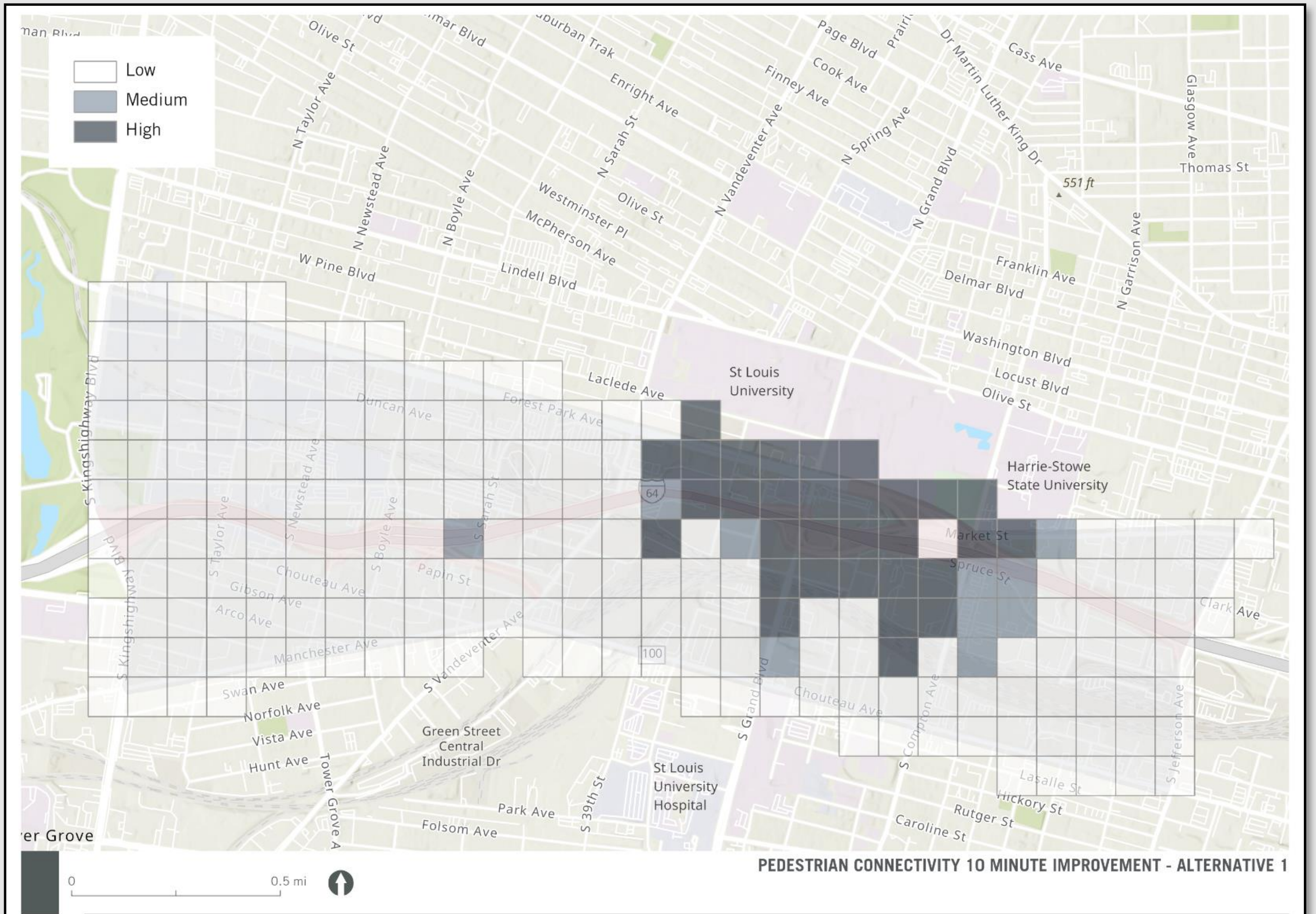


Figure 62. Alternative #1: Pedestrian Connectivity Ratio Improvements



5.3.1.2. Bicycle Facilities

5.3.1.2.1. Proposed Bicycle Improvements

In addition to the committed and likely projects described in the No Build (Maintenance Only) scenario in Section 4.3.1., Corridor Alternative #1 includes the following bicycle facilities:

- Separated bicycle lanes via a parallel structure adjacent to Tower Grove Ave. across I-64, extending north of Clayton Ave. via Boyle Ave.
- Separated bike lanes Grand Blvd. to north of Forest Park Ave.
- Parallel multiuse path on Forest Park Ave. between Grand Blvd. And Market St./Compton Ave.
- Parallel multiuse path on Theresa Ave. between Scott Ave. and Forest Park Ave.
- Parallel multiuse path on Bernard St. Between Grand Blvd. and Theresa Ave.

Parallel multiuse path on Theresa Avenue between Scott Ave. and Forest Park Ave. These improvements are located within or adjacent to the Tier 1 study area, enhancing existing I-64 crossings and within the interchange improvement alternatives areas of influence creating new low-stress crossings for people traveling by bicycle.

5.3.1.2.2. Bicycle Level of Traffic Stress (BLTS)

Bicycle Level of Traffic Stress (BLTS) provides an intuitive framework to categorize roadways based on the level of stress, or conversely level of comfort, for people bicycling. The analysis incorporates motor vehicle volumes, posted speed limits, the presence of parking, and the presence of bike lanes as key determinants of level of traffic stress. Scores range from BLTS 1 (lowest stress) to BLTS 4 (highest stress). As described in the No Build (Maintenance Only) section, the BLTS methodology has been adjusted to account for the negative impact of interstate ramp intersections on level of stress for people bicycling.

The results of the BLTS analysis, which are displayed in Figure 63, highlight the impact of investments in active transportation. It is important to note that multiuse paths located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

While low-stress network additions related to Alternative #1 do add valuable connections across and adjacent to I-64, there are minimal changes to overall levels of traffic stress for bicycling in the study area. Figure 64 shows the percentage of roadway network miles by level of traffic stress for the No Build (Maintenance Only) and Alternative #1 scenarios. There is a slight increase in the percentage of low-stress BLTS 1 roadways from 19% to 22%, and a minor decreases in of a percentage point or less in all other categories. The increase in low-stress roadways can be attributed in large part to the addition of new roadways like Theresa Ave. and the Bernard St. connection to Grand Blvd., both of which include separated multiuse paths. Much like the No Build (Maintenance Only) scenario, the western half of the study area from Vandeventer Ave. to Kingshighway Blvd. remains largely unchanged in terms of level of traffic stress, as major arterials like Forest Park Ave., Kingshighway

Blvd., Manchester Ave., and Vandeventer Ave. are not expected to see investments in low-stress bicycle facilities.

Figure 63. Alternative #1: Bicycle Level of Traffic Stress

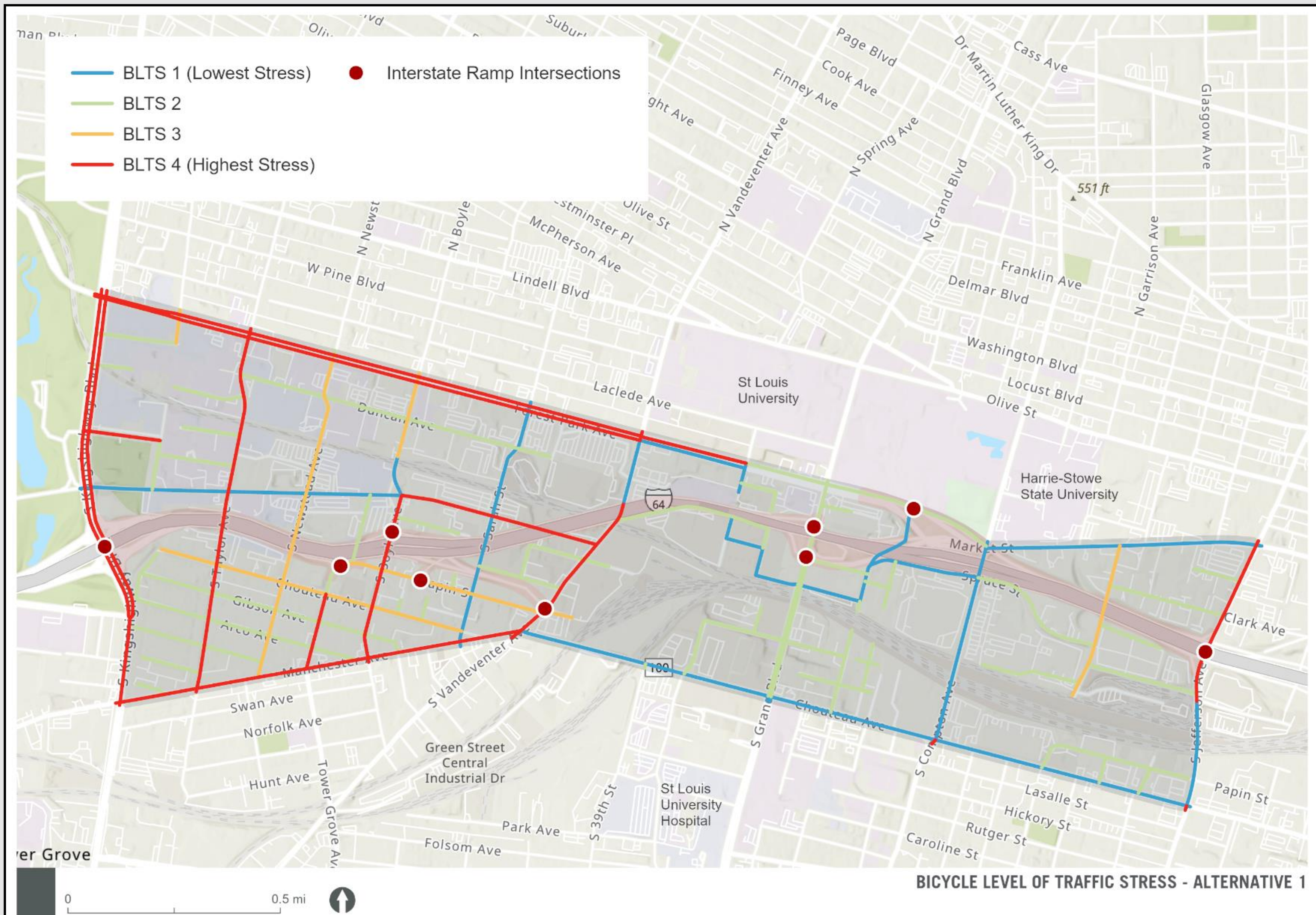
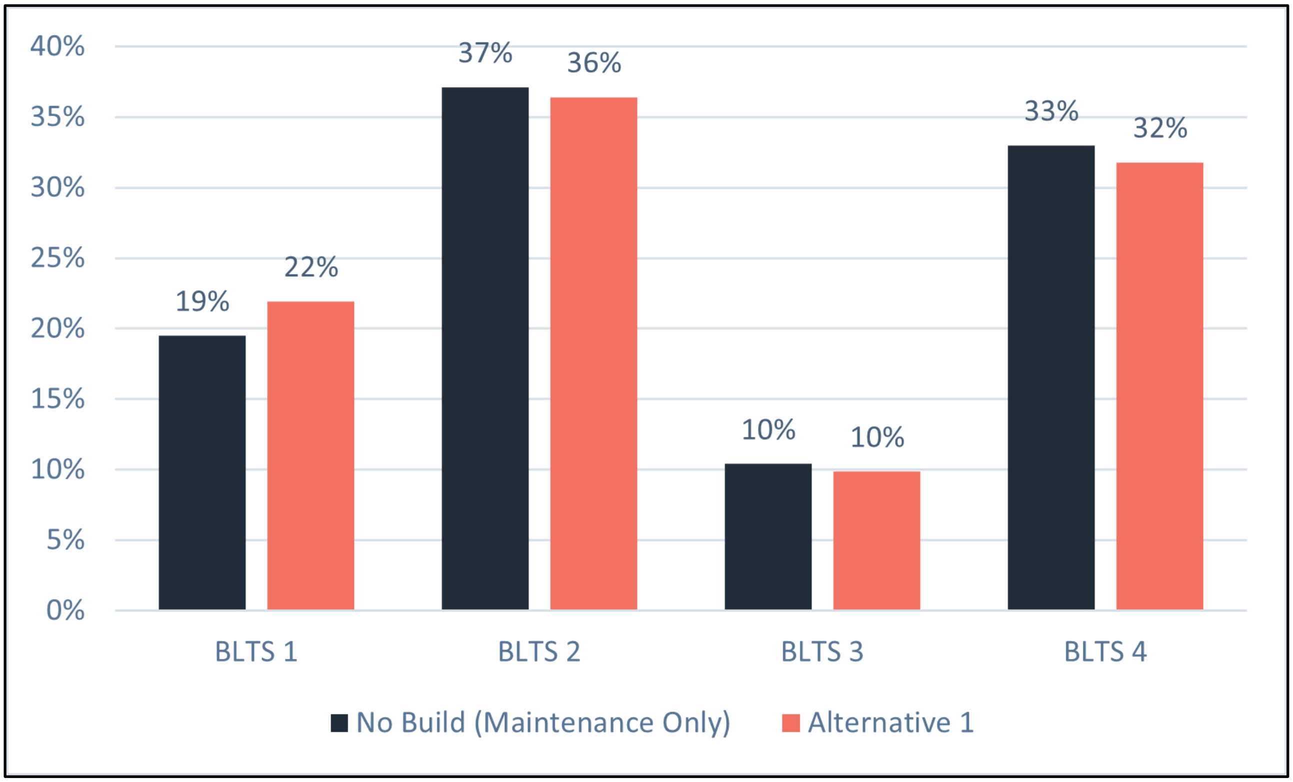


Figure 64. Alternative #1: Percent of Roadway Network by Level of Traffic Stress



5.3.1.2.3. Bicycle Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, bicycle network connectivity was analyzed for Alternative #1 based on ten-minute/1.67-mile bicycle travelsheds. While less than the 2.8-mile median bicycle trip distance, the ten-minute/1.67 travelshed, which represents a short bicycle trip at an average speed of 10 miles per hour, is a consistent unit of measurement for analyzing bicycling activity and potential and is an appropriate scale by which to analyze network changes within the Tier 2 study area. Bicycle connectivity ratios vary widely throughout the study area, from a low of 0.41 to a high of 0.75, with lower scores representing poorer connectivity and higher scores representing greater connectivity. These ratios are depicted in **Figure 65**. The average (mean) bicycle connectivity score is 0.63, which indicates that roughly 63% of the land area within bicycling distance can be reached based on the characteristics of the bicycle network. This represents a slight increase over the No Build (Maintenance Only) scenario mean bicycle connectivity of 0.60 (60%).

Figure 66 displays Alternative #1 improvements in bicycle network connectivity ratios over the No Build (Maintenance Only) scenario. Connectivity ratio improvements are minimal, concentrated along the I-64 corridor from Sarah St. to Compton Ave. The generally low levels of improvements highlight how the impact small network changes and additions may be diluted when examining bicycle connectivity through 10-minute travelsheds.

Figure 65. Alternative #1: Bicycle Connectivity Analysis Results

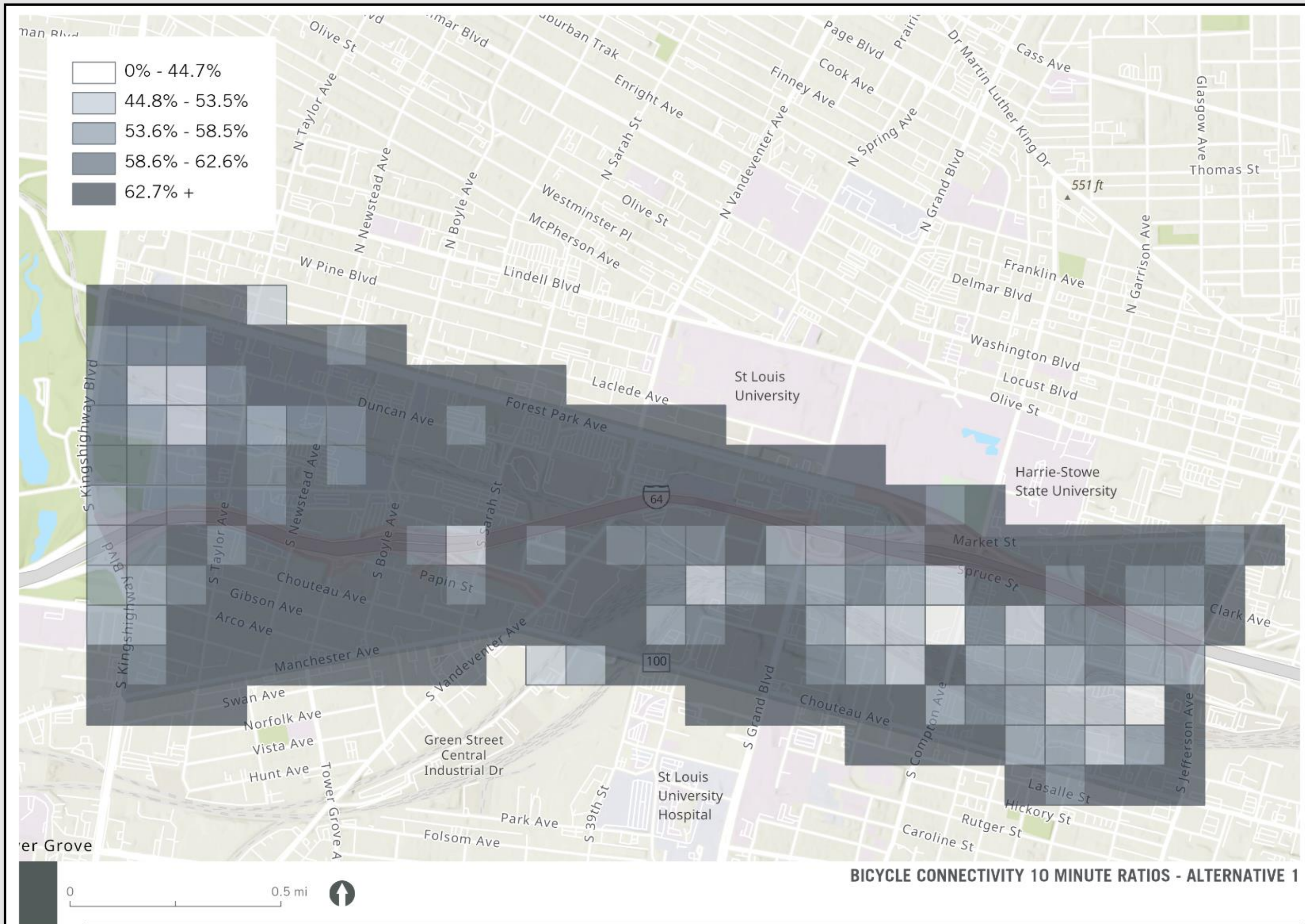
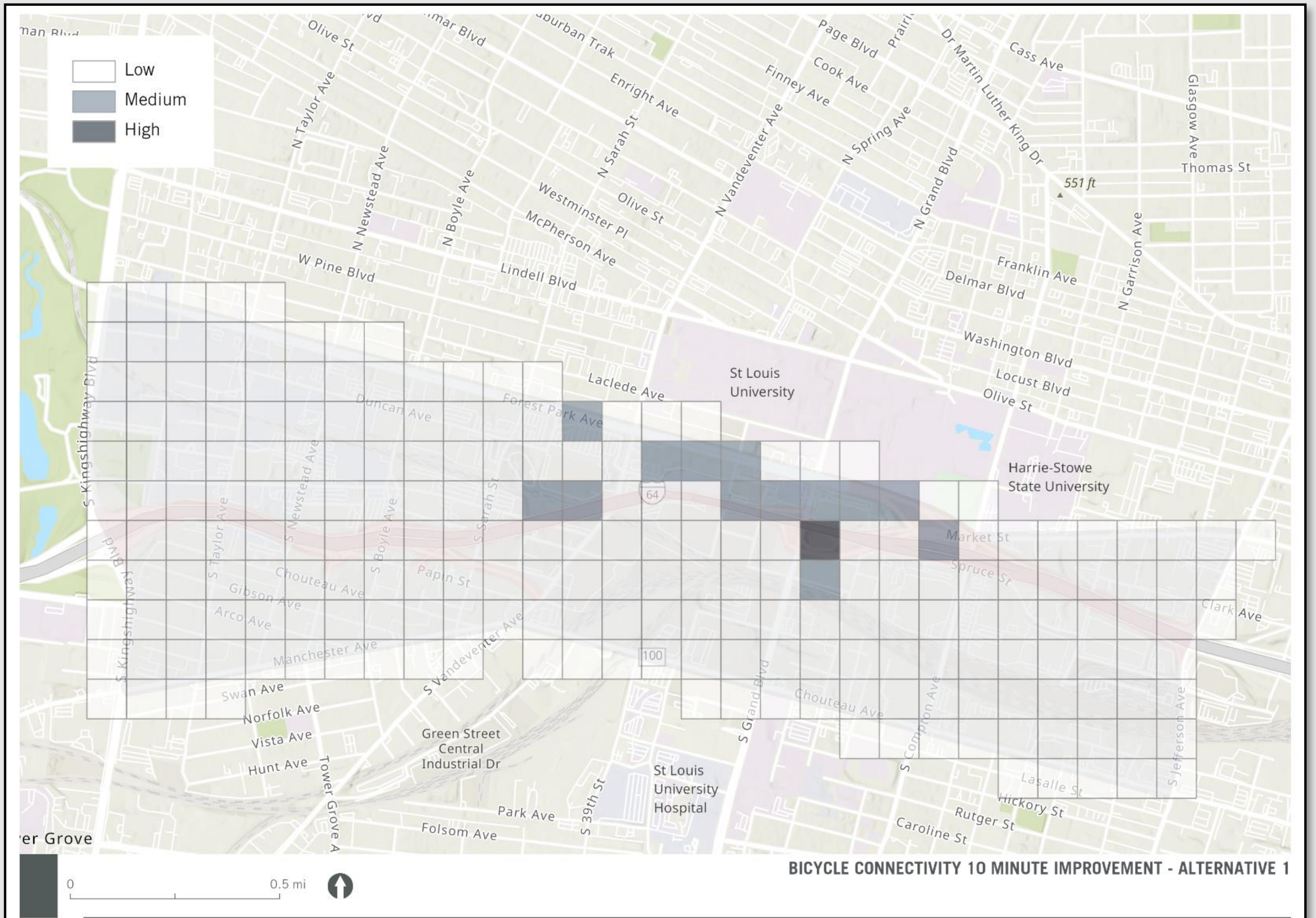


Figure 66. Alternative #1: Bicycle Connectivity Ratio Improvements



5.3.2. Transit

This section discusses the transit accommodations anticipated for Alternative #1.

5.3.2.1. Year 2050 Transit System

The Alternative #1 2050 transit system reflects the same transit service plan presented in Section 4.3.2.1, which consists of Metro Reimagined and the existing MetroLink service. However, it should be emphasized that changes to the street network and interstate ramps in Alternative #1 would result in increased traffic congestion along Grand Blvd. As summarized in **Table 22** peak hour travel times are expected to increase significantly based on data output from the VISSIM traffic simulation model. This congestion would adversely affect the on-time reliability of the #70 Grand bus route.

Table 22. Alternative #1: Forecasted Travel Times along Grand Blvd.

Direction	Travel Time (sec)			
	AM Peak Hour		PM Peak Hour	
	No Build (Maintenance Only)	Alt #1	No Build (Maintenance Only)	Alt #1
Northbound	43	74	55	127
Southbound	43	88	35	92

5.3.2.2. Transit Ridership in 2050

No changes beyond those previously presented in Section 4.3.2.1 were considered as part of Alternative #1. Hence the transit ridership in Year 2050 would remain as presented in Section 4.3.2.2.

5.3.2.3. Transit Needs Addressed

Since many, if not all, transit trips begin and/or end with a non-motorized trip (i.e., walking), walksheds help define the accessibility of transit stops within the study area. Additional pedestrian connections included in Alternative #1 would help increase transit accessibility, including the Theresa Ave. extension across I-64, a better pedestrian connection at Forest Park Ave. and Market St., and a more direct connection between Theresa Ave. and Grand Blvd. near the Grand MetroLink station. **Figure 67** shows the 5-minute and 10-minute walksheds as well as the area beyond a 10-minute walk to each transit stop in the study area.

The need for transit service in and around the study area was estimated based on the number of transit-dependent residents estimated for the Year 2050. Forecasts for transit-dependent residents were based upon total population derived from the EWG Regional TDM for the year 2045 and then extrapolated to represent the Year 2050. The estimated number of transit-dependent residents within the study area would be 3,831 persons in Year 2050 (as compared to 3,647 persons as presented in the Existing Conditions Technical Report). To measure the impact of new pedestrian connections on transit access, the transit-dependent population within a 10-minute walkshed area was also estimated, as summarized in **Table 23.**

Figure 67. Alternative #1: 5- and 10-Minute Walksheds as Related to Transit Routes

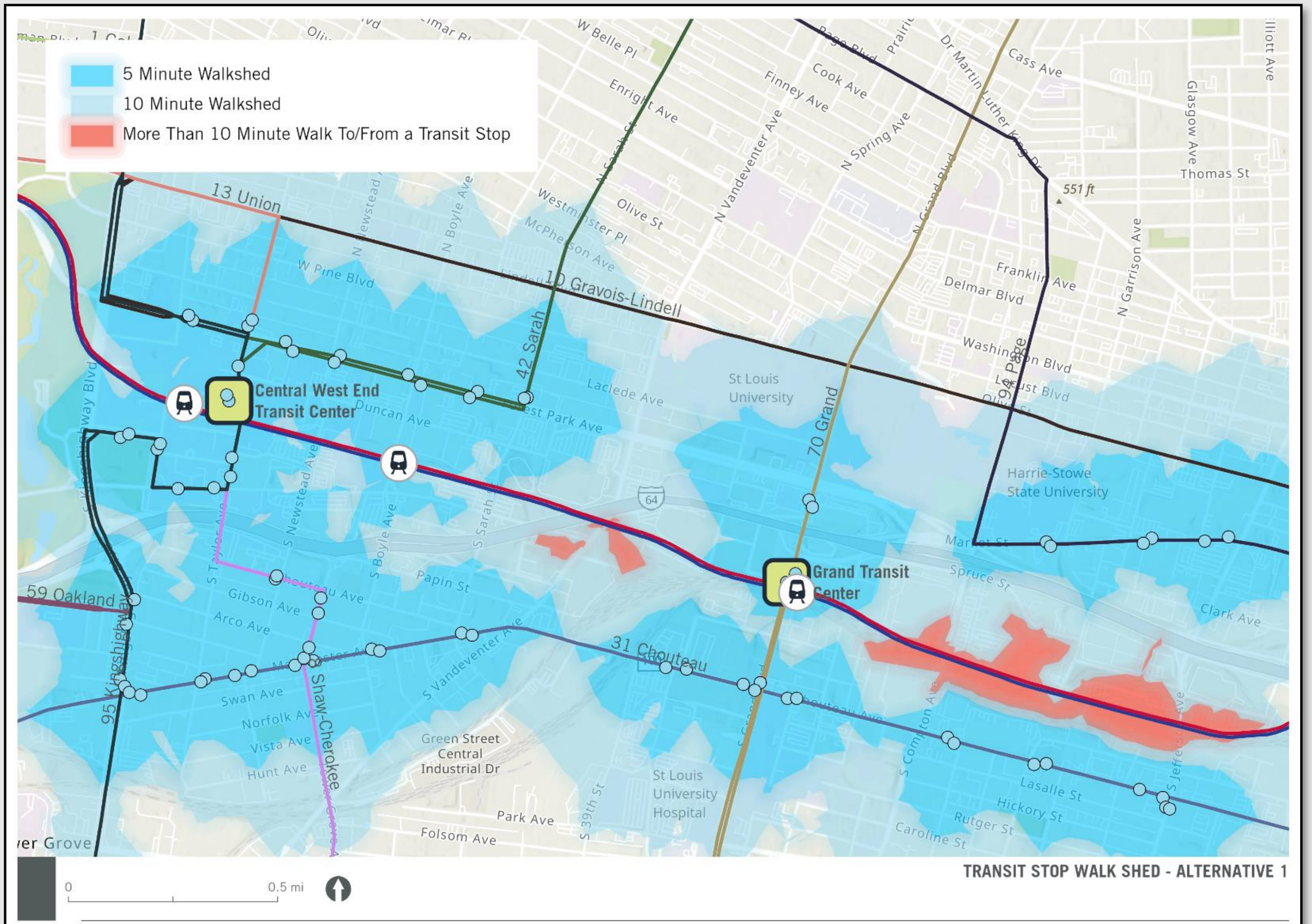


Table 23. Alternative #1: Transit-Dependent Population Near Transit Stops

	Population	
	No Build (Maintenance Only)	Alt #1
Transit Dependent Within 10-Min Walkshed	7,765	7,871

As shown, the additional pedestrian connections would improve access to/from transit stops as compared to the No Build (Maintenance Only) alternative, based on the walksheds of transit-dependent populations. The impact would be larger if not for the fact that most areas outside of the 10-minute walkshed comprise industrial areas that lack residential populations. That said, these new pedestrian connections would help transit be more accessible to major destinations in the study area, including St. Louis University and the Foundry, by providing a high-quality and comfortable walking environment, which is not captured by the walkshed distance analysis. Most of the benefit would be realized in the vicinity of the Grand MetroLink Station, as a result of improved pedestrian facilities linking north-south across I-64 and east-west to the MetroLink Station

5.4. YEAR 2050 CORRIDOR ALTERNATIVE #1 CONCLUSIONS

The following represents the conclusion drawn from the traffic operations, safety and multimodal analysis of the Year 2050 for Corridor Alternative #1:

5.4.1. Traffic Conclusions

- Under Alternative #1, interchange spacing would be improved due to the removal of the ramps to and from Market St. and Compton Ave.
- Favorable operating conditions could be provided along I-64 mainline, merge, diverge and weave segments assuming Alternative #1 is in place.
- The interchange of I-64 with Kingshighway would continue to show congestion during the peak hours due to the anticipated volume of traffic. However, modifications to this interchange were not contemplated as part of this PEL given its relatively recent reconstruction.
- The widening of the westbound I-64 off ramp and lengthening of the deceleration lane to Boyle Avenue would accommodate the anticipated Year 2050 volumes and minimize any impacts upon the I-64 corridor.
- The intersection of Clayton Ave. at Boyle Ave., as well as both Clayton Ave. and Boyle Ave. themselves, would require significant reconstruction to provide numerous turn and travel lanes to efficiently accommodate the traffic traveling between I-64 and the Washington University Medical Campus.

- The conversion of the grade separated intersection of Forest Park Ave. at Grand Blvd. is not feasible as proposed in Alternative #1. Despite the introduction of numerous travel and turn lanes, the at grade intersection would be expected to fail and result in backups that would interfere with the I-64 corridor. The removal of the eastbound I-64 on ramp from Forest Park Ave., coupled with the heavy through demand on both roadways, results in unmanageable congestion for all users. For an at grade intersection at this location to function coupled with the other improvements presented in Alternative #1, an alternate north south corridor to Grand (such as the extension of Theresa Ave) and/or additional access to I-64 eastbound other than from Grand Boulevard is needed or vehicular traffic traveling through the area would need to be diminished.

  There are concerns that if this intersection is brought to grade as proposed in Alternative #1, without the introduction of an alternate north-south corridor or additional access to I-64 eastbound, that there would be a negative impact upon safety for vehicular, bicycle and pedestrian traffic traveling through the immediate area. There are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities if the intersection is brought to grade.

5.4.2. Safety Conclusions

- Consolidation of interchange access points, and improvement of existing ramps, provides for safety enhancement within Tier 1, notably near Grand Blvd. and Boyle Ave. interchanges. The removal of the left-hand entrance to eastbound I-64 from Forest Park Ave. has positive safety impacts tied to proper driver expectation and current standards of practice.
- Within the Tier 1 limits, existing safety concerns not addressed would expectantly carry forward on I-64 near the Vandeventer Ave. overpass (both directions), as well at the I-64/Kingshighway interchange.
- The Tier 2 area would see safety benefits with the removal of the closely spaced signalized intersections along Grand Blvd. at Forest Park Ave. and at Council Plaza, which currently are a source of congestion and significant safety concerns for all users. Additionally, addressing congestion at the Clayton Ave. and Boyle Ave. signalized intersection would provide a reduction in crashes, especially higher severity types.

5.4.3. Multimodal Conclusions

- Alternative #1 offers a slight increase in active transportation facility mileage (0.8 miles) through new on-street bikeways and multiuse paths on Tower Grove Ave., Grand Blvd., Forest Park Ave., and Theresa Ave.
- While new bicycle and pedestrian facilities serve as important links in the active transportation network, they provide only modest improvements in overall levels of pedestrian level of service and bicycle level of traffic stress (5% increase in low-stress PLOS 1 roadways and 3% increase in low-stress BLTS 1 roadways).

- While the proposed active transportation improvements provide a new north-south link across I-64 between Grand Blvd. and Jefferson Ave. at Theresa Ave., overall levels of connectivity in the study area see only slight increases outside the immediate vicinity Grand Blvd. and I-64.
- The Alternative #1 2050 transit system reflects the same transit service plan presented in the No Build (Maintenance Only), which consists of Metro Reimagined and the existing MetroLink service. However, changes to the street network and interstate ramps in Alternative #1 would result in increased traffic congestion along Grand Blvd. that would likely affect the on-time reliability of the #70 Grand bus route.
- The additional pedestrian connections in Alternative #1 would only marginally improve access to/from transit stops as compared to the No Build (Maintenance Only) alternative, based on the walksheds of transit-dependent populations. That said, qualitatively these new pedestrian connections would help transit be more accessible to major destinations in the study area, particularly those benefitting from improved north-south connectivity across I-64.

6. CORRIDOR ALTERNATIVE #2

The following subsections present the findings of the traffic operations, safety, and multimodal analysis as it pertains to the Year 2050 for Corridor Alternative #2, which assumes reconstruction along the I-64 corridor as outlined in Section 2.3 and reflected in Figure 8 and Figure 9. The eastbound on ramp to I-64 from Papin St. would be relocated to Boyle Avenue and the westbound off ramp to Boyle would be widened and lengthened considerably. The Vandeventer ramps to I-64 would also remain in place, including the left-sided entrance to westbound I-64. Modifications at the east end of the corridor would involve the reconfiguration of the eastbound off ramp to Grand (removal of the tight loop), removal of the partial interchange at Market St./Bernard St./Compton Ave. as well as the eastbound I-64 on ramp from Forest Park Ave., addition of an eastbound on ramp from Spruce St. and the extension of Theresa Avenue from Forest Park Avenue to Chouteau, over the existing railroad.

It is important to note that the transportation modifications represented in Alternative #2 are not *commitments*, but rather recommendations to develop this alternative for analysis purposes only. Additional study and engagement are needed through the decision-making process before MoDOT, the City of St. Louis and/or other partners commit to design and construction of the elements presented in Alternative #2.

As with the No Build (Maintenance Only) analysis, it was assumed that the constraint to the west of the Study Area on westbound I-64 at Hampton was resolved, as agreed upon by MoDOT in July 2022.

6.1. TRAFFIC OPERATIONS

The methodology, and associated assumptions, for the PEL were summarized in the Methods and Assumptions Report, as required by Section 905.3.7.1 of MoDOT's EPG which provides guidance for MoDOT reviewed Transportation Impact Analysis. The reader is reminded that special event traffic for Grand Center or Midtown entertainment venues was not evaluated as part of the PEL. As with previous alternatives, VISSIM and Synchro were the primary and predominant tools used for the traffic operations analysis. Using the calibrated VISSIM model from the Existing Conditions, the Year 2050 traffic conditions along I-64 within Tier 1 limits were evaluated, including its ramp terminals, assuming the corridor is reconfigured as envisioned for Corridor Alternative #2.

The development of transportation improvement options for Alternative #2 followed MoDOT's policy for level of service E for auto traffic in urban areas, as outlined in the approved Methods & Assumptions Report. Although local roadways are not the authority of MoDOT, the MoDOT policy was also applied to local roadways to assess the vehicle capacity recommended for minimizing vehicle delay during peak traffic hours.

6.1.1. Tier 1 Limits: I-64

The primary focus of the PEL study is on the I-64 infrastructure within MoDOT's right-of-way and how it can be improved to meet the goals of the study. The Tier 1 limits include the I-64 mainline and MoDOT right-of-way, from the western gore points of the ramps to and from Kingshighway Blvd. to the eastern gore points of the ramps at 22nd St. (which operates as a split diamond interchange with Jefferson Ave.). The limits include I-64, inclusive of all merge, diverge, and weave sections, as well as the ramp terminals at each of the interchanges. However, note that modifications to the interchange configurations at Kingshighway Blvd. and Jefferson Ave./22nd St. were not contemplated as part of this PEL given the relatively recent and/or ongoing reconstruction at these locations.

6.1.1.1. Access to I-64

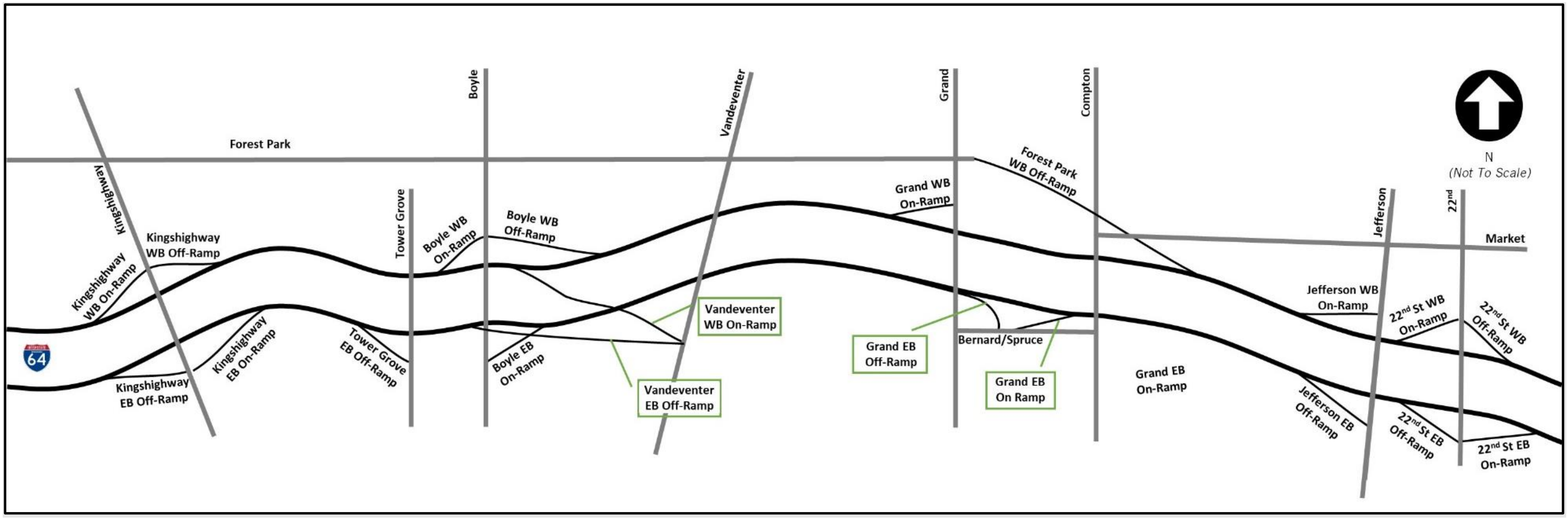
Under Corridor Alternative #2 scenario, the Tier 1 limits would be reduced to five interchanges with I-64 and access points that connect I-64 to nine local and regional roadways. Figure 68 schematically depicts the locations of access to and from I-64 and the distances between these access points.

6.1.1.2. Validation of Year 2050 Corridor Alternative #2 Traffic Models

The traffic simulation model calibration process was achieved during the evaluation of the existing conditions with the development of a base model that replicated existing conditions. The future year models (Year 2050) cannot be "validated" with respect to delays or queues since they are projections of forecasted conditions rather than replications of existing. Therefore, the same calibration parameters from the validated existing condition models form the basis for the Year 2050 Corridor Alternative #2 scenario; of which the traffic forecasts presented in Section 3.3.3 were used to update the model's origin-destination matrix.

Due to the inherent stochastic nature of simulation (imposed by random seeds), multiple simulation runs using different seed numbers were required for each time period, and the reported model results were averaged across runs. Based on the characteristics of this model network, the planning-level effort associated with the PEL study and the agreed-upon level of effort during scoping, it was determined that 10 simulation runs were sufficient to obtain an appropriate level of confidence in the results.

Figure 68. Alternative #2: I-64 Access to Road Network (Schematic)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

6.1.1.3. VISSIM Results

A summary of the following Measures of Effectiveness (MOE) along the I-64 corridor and at its ramp terminals (by approach) are provided for the Year 2050 Corridor Alternative #2 conditions analysis:

- Speed (I-64)
- Density (I-64)
- Throughput (I-64)
- Vehicular delay (ramp terminals)
- Vehicular queue lengths (ramp terminals)
- Volume/capacity ratio (ramp terminals)
- LOS (I-64 and ramp terminals)

This report presents, graphically, the overall conditions for the Year 2050 Corridor Alternative #2. Detailed operating results from the VISSIM and Synchro models are provided in Appendix C. **Figure 69** and **Figure 70** illustrate the Year 2050 Corridor Alternative #2 operating conditions, as modeled. **Figure 71** and **Figure 72** represent the assumed lane configurations and associated geometrics necessary to achieve the operating conditions represented. The lane configurations and associated geometrics presented were what was required to achieve the minimum levels of service and mobility targets as presented in the Approved Methods and Assumptions Report (LOS E, etc.). However, it was not always feasible to achieve the proposed minimum level of service and mobility targets. In such cases, a reasonable level of lanes and geometric improvements was assumed (multiple turn or through lanes, etc.).

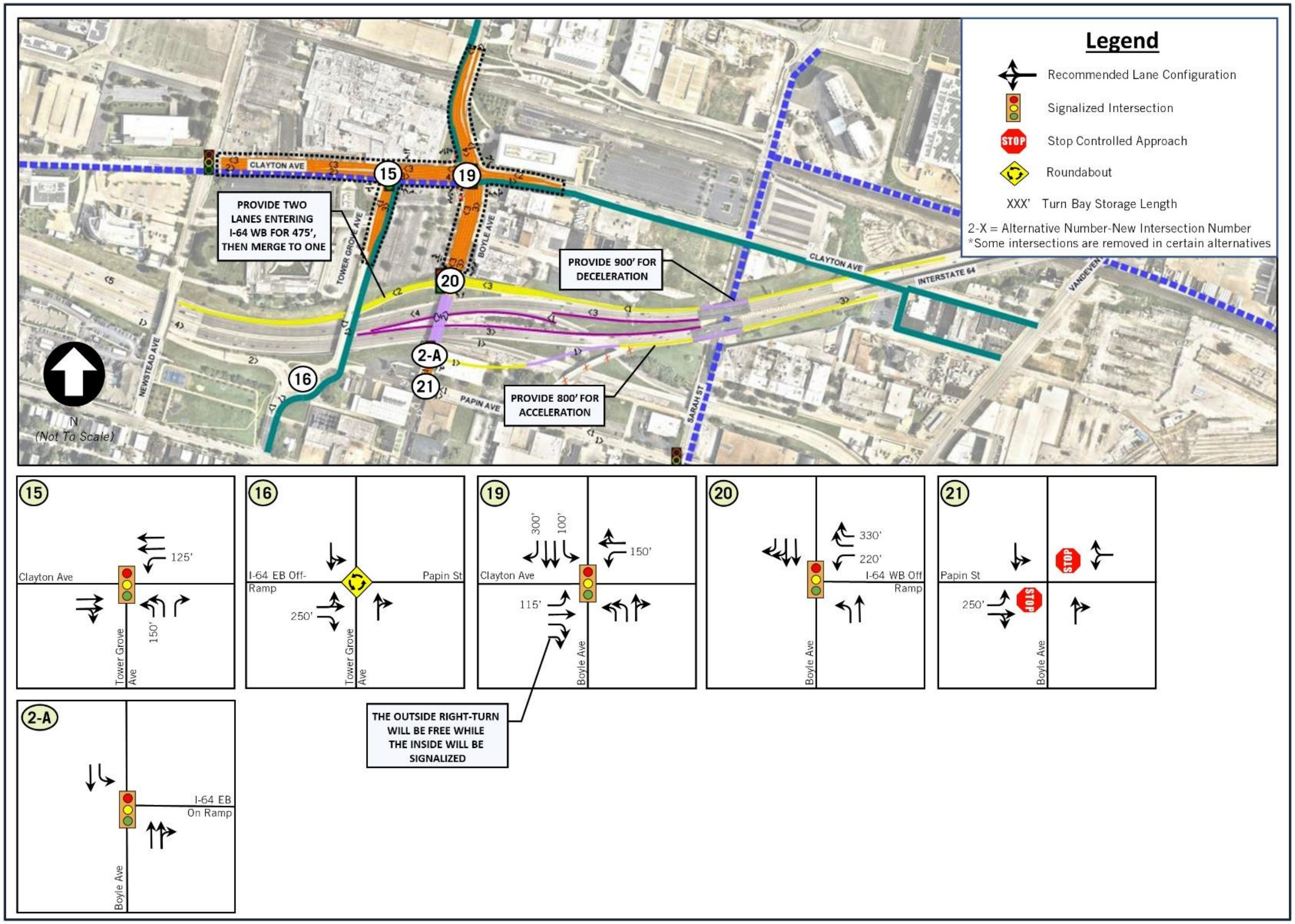
Figure 69. Alternative #2: Year 2050 Conditions - AM Tier 1 VISSIM Analysis

Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 70. Alternative #2: Year 2050 Conditions - PM Tier 1 VISSIM Analysis

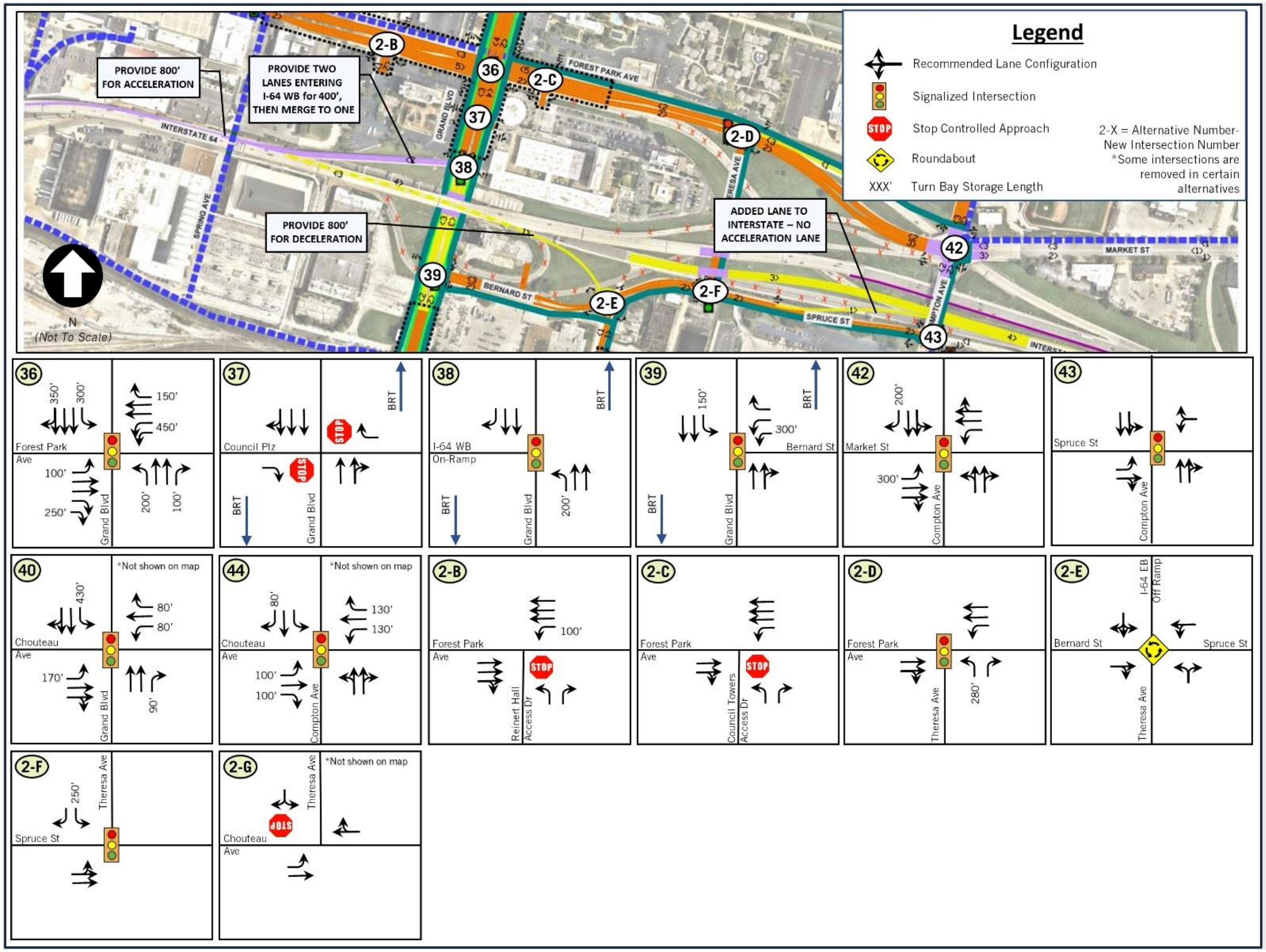
Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 71. Alternative #2: Year 2050 Geometrics/Traffic Control (Tower Grove Ave./Boyle Ave./Papin St. & Vandeventer Interchanges)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 72. Alternative #2: Year 2050 Geometrics/Traffic Control (Grand Blvd./Forest Park Ave./Spruce St. Interchange)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Overall conditions for the Alternative #2 VISSIM network were summarized with regards to average delay, average stops, total delay and throughput. It should be noted that total delay includes the latent delay associated with vehicles unable to enter the network and throughput volumes include traffic traveling through critical intersections immediately adjacent to the interstate that were included due to their potential to influence I-64 operations (such as Clayton at Boyle or Forest Park at Grand). **Table 24** compares these network parameters to those associated with the No Build (Maintenance Only) alternative.

Table 24. Alternative #2: Overall Network Performance Comparison to No Build (Maintenance Only) Scenario

Time Period/Variable	No Build (Maintenance Only) Alternative	Alternative #2
AM Peak Hour		
Average Delay	133 sec/veh	90 sec/veh
Average Stops	6.3 stops/veh	3.0 stops/veh
Throughput	27,588 veh	28,411 veh
PM Peak Hour		
Average Delay	86 sec/veh	75 sec/veh
Average Stops	2.5 stops/veh	1.9 stops/veh
Throughput	29,856 veh	30,789 veh

As shown, in the Tier 1 limits the interstate experiences reasonable levels of service at many locations during the peak hours. As can be seen from Figure 69 and Figure 70 all the segments in the study area experience level of service D or better. Additionally, the ramp terminals operate at an overall LOS D or better.

However, the VISSIM model does indicate congestion at the following locations:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - ♦ I-64 eastbound off ramp at Kingshighway Blvd. endures queues which extend back almost up to the gore point of the off ramp. However, the maximum queue length is more than four times the average queue length indicating that the occurrence of lengthy queues is low. It is important to note that persistence of these congested conditions can cause safety concerns.

PM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - ♦ The I-64 westbound and eastbound off ramps both experience considerable congestion.

- Clayton Ave. and Boyle Ave. - This intersection is discussed in this section due to its proximity to the Tier 1 zone. Please refer to the Tier 2 Synchro Analysis exhibits for the intersection LOS results.
    - The intersection at Clayton Ave. and Boyle Ave. would continue to experience congestion, although the proposed improvements at the intersection do provide additional capacity towards accommodating the congestion as compared to the No Build (Maintenance Only) scenario. However, the eastbound queue on Clayton Ave. could extend past Tower Grove Ave. during the peak hour. It should be noted that operations at this intersection are being impacted due to the 1,000 eastbound right turns from Clayton Ave. to Boyle Ave.

6.1.1.4. Synchro Results

The Year 2050 Corridor Alternative #2 operating conditions at the intersections within Tier 1 limits were evaluated using Synchro 11, while the roundabout at the intersection of the I-64 eastbound off ramp at Tower Grove Ave. was analyzed using Sidra 8. Detailed operating conditions for Tier 1 limits are provided in Appendix C as modeled by Synchro and Sidra. The intersections within the Tier 1 limits operate well overall, with each intersection expected to have an overall LOS D or better, with the exception of Forest Park Ave. and Grand Blvd. which has a LOS E overall during the PM peak hour. While not in Tier 1, the intersection of Forest Park Ave. and Grand Blvd. greatly impacts the operations of Tier 1 intersections, especially with the proposed changes along Grand Blvd. Therefore, the intersection of Forest Park Ave. and Grand Blvd. was referenced in the Tier 1 intersections.

In addition to LOS, the volume to capacity (v/c) ratios were analyzed. Several ramp terminals experience high v/c ratios with particular movements. While the intersections overall appear to currently operate well, some individual movements experience borderline operating conditions. The following intersections have individual movements that operate at a LOS F or have a v/c ratio above 0.90 for an off ramp from I-64 or 0.95 for all other movements:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - The southbound left-turn has a failing LOS with a v/c ratio of 1.17. The eastbound queue extends down the ramp diminishing the available deceleration length, thereby posing a potential safety concern for motorists exiting I-64.

PM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - The eastbound and westbound queues extend down the respective ramps diminishing the available deceleration length, thereby posing a potential safety concern for motorists exiting I-64.

6.1.1.5. Correlation of VISSIM and Synchro Results

It is not uncommon for the VISSIM results to deviate slightly from the Synchro and Sidra results due to the difference in programs and the level of detail included in the inputs and parameters. However, it is still expected that the results should be comparable regardless of the program utilized.

When the results from the various analytical tools used for the traffic analysis are compared, the Year 2050 Corridor Alternative #2 traffic operations for the overall intersection MOEs as well as the individual approaches are generally comparable to one another. The only differences observed between the various outputs were due to the manner in which a particular program handled the right-turn movement at intersections (VISSIM provides a more detailed analysis of the right-turn movement than Synchro). In addition, the intersection of Forest Park Ave. and Grand Blvd. shows some discrepancies between the VISSIM and Synchro model. These discrepancies are due to the manner in which the programs handled traffic progression and right-turn movements along the I-64 ramps south of the intersection.

It is worth noting that there are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities. Bringing this intersection to-grade could potentially reduce traffic volumes at this intersection as compared to the straight growth assumed in this study, which in turn would potentially reduce the number of lanes necessary to maintain a LOS E. Similar intersections, such as Kingshighway Blvd. at Forest Park Ave., which have been brought to grade have experienced a reduction between 20-30% in traffic volumes once the intersection was brought to grade. However, the removal of traffic at this intersection could be a result of either the diversion of traffic to other intersections, which was beyond the scope of this study, or the dissipation of traffic due to reduction in trip making and/or modal shifts.

6.1.2. Tier 2 Limits: Arterials and Major Collectors

Tier 2 includes the areas outside of Tier 1, but within the study area as defined by Forest Park Ave. and Market St. to the north and Route 100 to the south. Tier 2 encompasses several arterials and major collectors that cross or run parallel to I-64.

6.1.2.1. Synchro Results

The traffic operations conditions within the Tier 2 limits were completed using the same methodology used for the Tier 1 traffic operations but were analyzed using Synchro and/or Sidra, as necessary (VISSIM was not employed within Tier 2). **Figure 73** and **Figure 74** show the Year 2050 Corridor Alternative #2 operating conditions within the Tier 2 limits. Only the overall intersection LOS is provided for intersections within the Tier 2 limits. Detailed operating conditions are provided in Appendix C. Event traffic for Grand Center or Midtown entertainment venues was not considered in the analysis.

Figure 73. Alternative #2: Year 2050 Conditions - AM Tier 2 Synchro Analysis

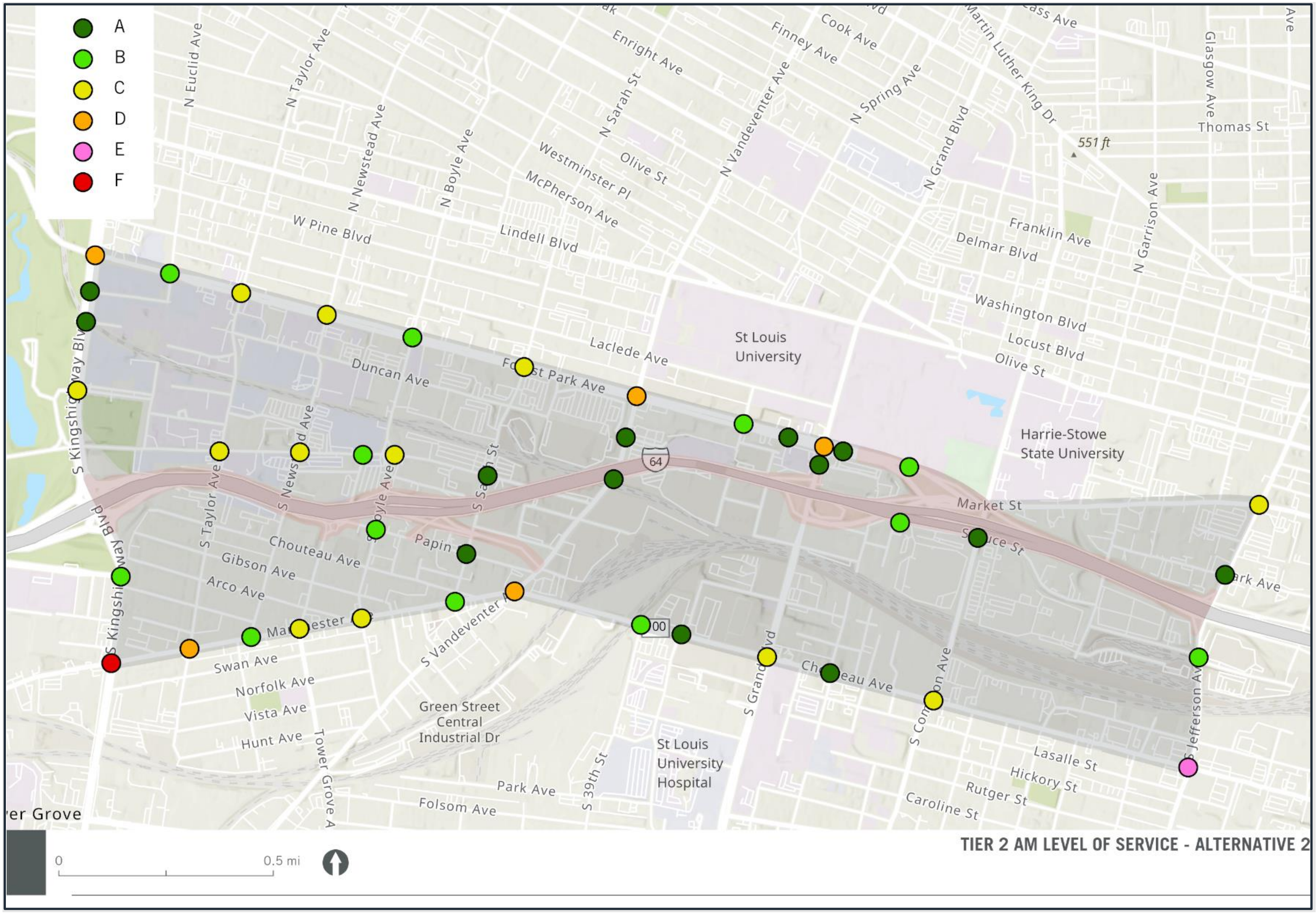
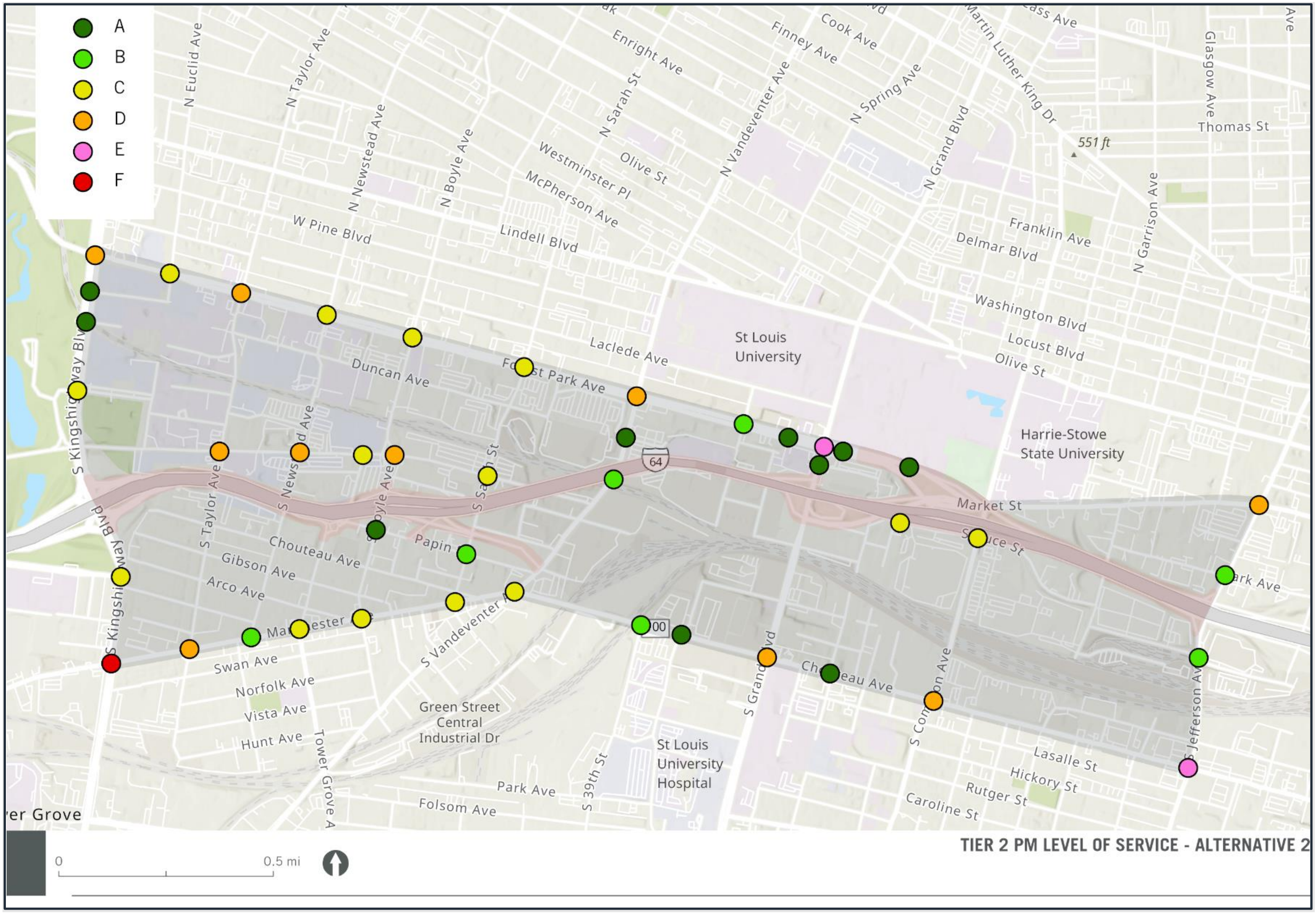


Figure 74. Alternative #2: Year 2050 Conditions - PM Tier 2 Synchro Analysis



As shown, each of the intersections has an overall LOS of E or better, with the exception of one intersection. Similar to the 2050 No Build (Maintenance Only) scenario, Kingshighway Blvd. at Route 100 operates at a failing LOS during both peak periods.

It should be noted that similar to Alternative #1, many intersections within the further reaches of Tier 2 experience the same operating conditions as the No Build (Maintenance Only) scenario. This is because no lane configuration or traffic volumes changes were expected at those intersections, due to the proposed changes in Alternative #2. The following intersections have at least one approach with a LOS F or a v/c ratio of 0.95 or higher during either the AM or PM peak period:

AM PEAK HOUR

- Kingshighway Blvd. and Manchester Ave. (Route 100)
    - The eastbound and northbound approaches have a failing LOS during the AM peak period. The eastbound approach has a v/c of 1.18, the northbound approach has a v/c ratio of 1.28, and the southbound approach has a v/c ratio of 1.16.
- Manchester Ave. and Taylor Ave.
    - The eastbound approach has a v/c ratio of 1.11, the westbound approach has a v/c ratio of 0.95, and the southbound approach has a v/c ratio of 0.99.
- Chouteau Ave. and Jefferson Ave.
    - The northbound approach has a v/c ratio of 1.06 and the southbound left-turn has a v/c ratio of 0.96.

PM PEAK HOUR

- Kingshighway Blvd. and Forest Park Ave.
    - The westbound through movement has a v/c ratio of 1.06.
- Kingshighway Blvd. and Manchester Ave. (Route 100)
    - The eastbound and westbound approaches of Manchester Road fail. The eastbound approach has a v/c ratio of 1.10 and the westbound left-turn has a v/c ratio of 1.37. Additionally, the southbound approach of Kingshighway has a v/c ratio of 1.03, indicating it is over capacity.
- Manchester Ave. and Taylor Ave.
    - The southbound approach has a v/c ratio of 1.07.
- Chouteau Ave. and Jefferson Ave.
    - The eastbound approach has a failing LOS and a v/c ratio of 1.04. The westbound approach has a v/c ratio of 1.02 and the southbound approach has a v/c ratio of 1.12.

As stated above, many of the movements that experience a LOS F or v/c ratio in excess of 0.95 are either side-street movements at unsignalized intersections where the traffic is unable to find a gap in the free-flowing traffic or where the traffic must wait through a long signal length, causing delays. More importantly, there are critical movements, most notably at Kingshighway Blvd. at Forest Park Ave., and Kingshighway Blvd. at Manchester Ave. that are over capacity. These intersections would require improvements to accommodate the anticipated 2050 traffic volumes.

Overall, as shown under Alterative #2, the recommended lane configurations and traffic control are able to accommodate the projected traffic volumes within the road network. The addition of the Theresa Ave. connection between Forest Park Ave. and Chouteau Ave. improves operations along Grand Blvd. as it provides an alternate route to Grand Blvd. that can accommodate some of the local traffic movements. This, in turn, diverts enough traffic that it allows for the reconstruction of the intersection of Forest Park Ave. and Grand Blvd to an at-grade intersection

6.2. SAFETY

The intent of the improvements presented in Alternative #2 were to address several existing safety issues from a vehicular perspective within the Tier 1 area, including the following:

- Extension of substandard deceleration length for the westbound I-64 off ramp to Boyle Ave.
- Improvements to Clayton Ave. and Boyle Ave. to better facilitate the flow of traffic to and from the Washington University Medical Campus and Cortex Commons.
- Removal of the substandard I-64 eastbound loop ramp to Grand Blvd.
- Removal of the left-hand eastbound entrance from Forest Park Ave. to I-64.

6.2.1. Corridor Alternative #2 Interchange Spacing, Ramp Lengths & Access Points

Table 25, Table 26, and Table 27 summarize the interchange and gore spacing for Alternative #2 as well as the anticipated ramp lengths. The spacing between each painted gore along the I-64 corridor for Alternative #2 is shown in Figure 75. As can be seen, Alternative #2 provides safety benefits within Tier 1 by removing the eastbound off ramp to Market St., the westbound on ramp from Market St./Compton Ave, and the eastbound on ramp from Forest Park Ave, thereby provides for significantly improved gore spacing between Grand Blvd. and the nearest upstream and downstream access points. In addition, the eastbound on ramp was relocated from Papin St. to Boyle Ave.

Table 25. Alternative #2: Interchange Spacing

Interchange	Existing/No Build (Maintenance Only)	Design Standard[1/]	Alternative #2
S. Kingshighway Blvd. to Tower Grove Ave. / Boyle Ave.*	3,440'	5,280'	3,440'
Tower Grove Ave. / Boyle Ave.* to Vandeventer Ave.	3,100	5,280'	3,100'
Vandeventer Ave. to Grand Blvd.	2,440'	5,280'	2,440'
Grand Blvd. to WB Forest Park Ave. off ramp	2,125'	5,280'	2,125'
WB Forest Park Ave. off ramp to Jefferson Ave.	2,985'	5,280'	2,985'
Jefferson Ave. to 22^{nd} St.	1,200'	5,280'	1,200'

Note: Distance represent centerline of cross street to centerline of adjacent cross street
** Distance based on a center point between the Tower Grove Ave. and Boyle Ave. overpasses*
1/: Table 1, Publication No. FHWA-HRT-07-031 Safety Assessment of Interchange Spacing on Urban Freeways

Table 26. Alternative #2: Gore Spacing

Interchange	Existing/No Build (Maintenance Only)	Design Standard	Alternative #2
I-64 Eastbound Direction			
I-64 EB On Ramp from S. Kingshighway Blvd. I-64 EB Off Ramp to Tower Grove Ave.	874'	1,600'	874'
I-64 EB Off Ramp to Tower Grove Ave. I-64 EB Off Ramp to Vandeventer Ave.	1,429'	1,000'	1,429'
I-64 EB Off Ramp to Vandeventer Ave. I-64 EB On Ramp from Papin St.	1,191'	500'	Papin St. Removed
I-64 EB Off Ramp to Vandeventer Ave. I-64 EB On Ramp from Boyle Ave.	n/a	500'	1,001'
I-64 EB On Ramp from Papin St. I-64 EB Off Ramp to Market St.	3,903'	1,600'	Market St. Removed
I-64 EB On Ramp from Boyle Ave.	n/a	1,600'	4,120'

Interchange	Existing/No Build (Maintenance Only)	Design Standard	Alternative #2
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)			
I-64 EB Off Ramp to Market St. I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	828’	1,000’	Market St. Removed
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.) I-64 EB On Ramp from Forest Park Ave.	1,755’	500’	Forest Park Ave. Removed
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.) I-64 EB On Ramp from Grand Blvd.	n/a	500’	2,540
I-64 EB On Ramp from Forest Park Ave. I-64 EB Off Ramp to Jefferson Ave.	2,204’	1,600’	Forest Park Ave. Removed
I-64 EB On Ramp from Grand Blvd. I-64 EB Off Ramp to Jefferson Ave.	n/a	1,600’	2,220
I-64 Westbound Direction			
I-64 WB Off Ramp to S. Kingshighway Blvd. I-64 WB On Ramp from Boyle Ave.	1,881’	1,600’	1,881’
I-64 WB On Ramp from Boyle Ave. I-64 WB On Ramp from Vandeventer Ave.	977’	1,000’	977’
I-64 WB On Ramp from Vandeventer Ave. I-64 WB Off Ramp to Boyle Ave.	755’	500’	1,525’
I-64 WB Off Ramp to Boyle Ave. I-64 WB On Ramp from Grand Blvd.	3,618’	1,600’	2,848’
I-64 WB On Ramp from Grand Blvd. I-64 WB On Ramp from Market St.	1,497’	1,000’	Market St. Removed
I-64 WB On Ramp from Market St. I-64 WB Off Ramp to Forest Park Ave.	2,468’	500’	Market St. Removed
I-64 WB Off Ramp to Grand Blvd. I-64 WB Off Ramp to Forest Park Ave.	n/a	1,000’	3,965’
I-64 WB Off Ramp to Forest Park Ave. I-64 WB On Ramp from Jefferson Ave.	1,144’	1,600’	1,144’

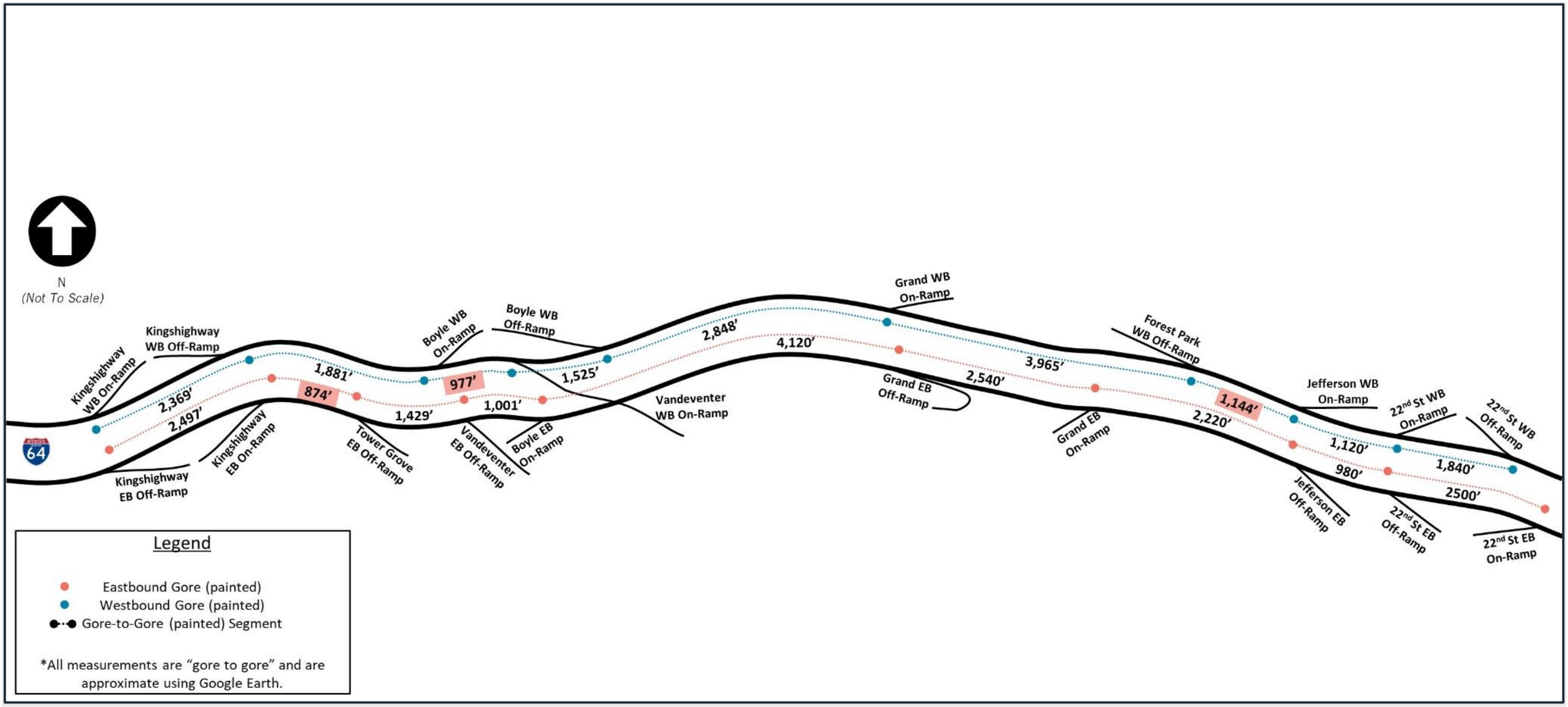
Note: Gore spacing that is non-compliant has been highlighted. Blue text indicates differences between existing and Alt #2 where gore spacing is improved by removal of existing access, or new access meeting the design standard. Red text indicates differences between existing and Alt #2 where the change reduces gore spacing.

Table 27. Alternative #2: Ramp Lengths

Ramp	Existing/No Build (Maintenance Only)	Alternative #2
Tower Grove Ave.		
I-64 EB Off Ramp to Tower Grove Ave.	1,010’	1,010’
Boyle Ave. / Papin St.		
I-64 WB On Ramp from Boyle Ave.	840'	840'
I-64 WB Off Ramp to Boyle Ave.	830'	830’
I-64 EB On Ramp from Papin St.	710'	830'
Vandeventer Ave.		
I-64 EB Off Ramp to Vandeventer Ave.	2,220'	2,220'
I-64 WB On Ramp from Vandeventer Ave.	1,970'	1,970'
Grand Blvd.		
I-64 WB On Ramp from Grand Blvd.	830'	830'
I-64 EB Off Ramp to Grand Blvd	660'	440'
Market St.		
I-64 WB On Ramp from Market St.	1,500'	Removed
I-64 EB Off Ramp to Market St..	2,850'	Removed
Forest Park Ave.		
Forest Park Ave. Off Ramp to Market St.	2,140'	Removed
I-64 WB Off Ramp to Forest Park Ave. (Theresa Ave. in Alt #2)	3,100'	2,000’
I-64 EB On Ramp to Forest Park Ave.	2,150'	Removed

Note: Ramp length is considered to be the distance between the painted gore and the curb line of the cross street at the ramp terminal.

Figure 75. Alternative #2: I-64 Corridor Gore-to-Gore Measurements



As shown below in **Table 28**, Alternative #2 results in a net reduction in on ramps and off ramps to/from I-64. The number of interchanges would be reduced to five with I-64 and access points that connect I-64 to nine local and regional roadways. Noting the improved ramp lengths above, in conjunction with increased gore spacing and acceleration and deceleration lengths, there would be an overall positive impact to vehicular safety in the Tier 1 area along the I-64 corridor.

Table 28. Alternative #2: I-64 Access Locations

Location	Existing/No Build (Maintenance Only)		Alternative #2	
	On Ramps	Off Ramps	On Ramps	Off Ramps
Kingshighway Blvd.	2	2	2	2
Tower Grove Ave.	0	1	0	1
Boyle St.	1	1	2	1
Papin St.	1	0	0	0
Vandeventer Ave.	1	1	1	1
Grand Blvd.	1	1	1	0
Market St./Bernard St.	1	1	0	0
Forest Park Ave.	1	1	0	1
S. Theresa Ave./Spruce St.	0	0	1	1
Jefferson Ave./22nd St.	3	3	3	3
Total	22		20	

Note: Highlighted cells denote a change in ramp number from No Build (Maintenance Only) to Alternative #2.

6.2.2. Potential Crash Reduction

It should be noted that HSM, ISATe and/or IHSDM was not utilized for the I-64 PEL, as outlined in the approved Methods & Assumptions Report. Rather, existing crashes were categorized by contributing factors and severity for the Existing Conditions. The safety analysis of the three corridor alternatives is *qualitatively* based upon how each alternative addresses the safety deficiencies and needs identified in the Existing Conditions, with limited quantitative analysis based on feasibly applicable Crash Modification Factors (CMFs) that have at least a 3-star quality rating in the national CMF Clearinghouse.

6.2.2.1. Tier 1 Limits: I-64

6.2.2.1.1. Applicable Crash Modification Factors

The following measurable elements can be determined in the No Build (Maintenance Only) and Alternative #2 scenarios, allowing for a comparison of the change in frequency of all crash types and severities.

Acceleration Lane Length – CMF ID 5216

$$CMF = e^{-4.55(L_{accelNew} - L_{accelExist})}$$

Where:

$L_{accelNew}$ = new (or proposed) length of acceleration lane in miles

$L_{accelExist}$ = existing length of acceleration lane in miles

Clearinghouse Reference - https://www.cmfclearinghouse.org/detail.cfm?facid=5216

-Deceleration Lane Length – CMF ID 3042

$$CMF = e^{2.198\ (Y - X)}$$

Where:

Y = new deceleration lane length in miles (length between 265' – 900')

Y = existing deceleration lane length in miles (length between 265' – 900')

Clearinghouse Reference - https://www.cmfclearinghouse.org/detail.cfm?facid=3042

Table 29, Table 30, and Table 31 summarize the acceleration lane lengths, deceleration lane lengths, shoulder lane widths, and their associated CMFs for Alternative #2.

Table 29. Alternative #2: Freeway Acceleration Lane Lengths & CMFs

Acceleration Lane	Existing/No Build (Maintenance Only)	Design Standard	Alternative #2	CMF*
I-64 WB On Ramp from Boyle Ave.	1,880'	1,326'	1,880'	No Change
I-64 EB On Ramp from Papin St.	415'	780'	780'	0.73
I-64 WB On Ramp from Vandeventer Ave.	Adds Lane	n/a	Adds Lane	No Change
I-64 WB On Ramp from Grand Blvd.	540'	1092'	1092'	0.62
I-64 WB On Ramp from Market St.	550'	670'	Removed	N/A
I-64 EB On Ramp from Forest Park Ave.	1,290'	670'	Removed	N/A

** CMF Calculated is based on CMF ID 5216 in the CMF Clearinghouse*

Table 30. Alternative #2: Deceleration Lane Lengths & CMFs

Deceleration Lane	Existing/No Build (Maintenance Only)	Design Standard	Alternative #2	CMF*
I-64 EB Off Ramp to Tower Grove Ave	872'	352'	872'	No Change
I-64 WB Off Ramp to Boyle Ave.	275'	256'	1,010'	0.74
I-64 EB Off Ramp to Vandeventer Ave	782'	285'	782'	No Change
I-64 EB Off Ramp to Grand Blvd.	285'	410'	820'	0.80
I-64 EB Off Ramp to Market St.	200'	342'	Removed	N/A
Forest Park Ave. Off Ramp to Market St.	627'	266'	Removed	N/A
I-64 WB Off Ramp to Forest Park Ave.	1,796'	380'	1,796'	No Change

**: CMF Calculated is based on CMF ID 3042 in the CMF Clearinghouse*

Table 31. Alternative #2: Ramp Shoulder Widths & CMFs

Location	Existing/No Build (Maintenance Only)		Alternative #2		CMF*
	Inside	Outside	Inside	Outside	% Change
I-64 EB Off Ramp to Tower Grove Ave.	4'	8'	4'	8'	0
I-64 EB Off Ramp to Vandeventer Ave.	5.5'	5.5'	5.5'	5.5'	0
I-64 EB On Ramp from Boyle Ave. (Existing at Papin St.)	4'	4'	4'	8'	FI: 24% PDO: 11%
I-64 EB Off Ramp to Market St.	2'	3'	Removed		N/A
I-64 EB Off Ramp to Bernard/Spruce (Existing Loop Ramp at Grand Blvd.)	2'	2'	4'	8'	FI: 38% PDO: 17%
I-64 WB Off Ramp to Forest Park Ave.	4'	8'	4'	8'	0
I-64 WB On Ramp from Grand Blvd.	4'	4'	4'	8'	0
I-64 WB Off Ramp to Boyle Ave.	4'	4'	4'	8'	FI: 24% PDO: 11%
I-64 WB On Ramp from Boyle Ave.	4'	8'	4'	8'	0

**Assumed that if a ramp is new or modified, then shoulders would meet base requirements of 4' inside and 8' outside. The CMF column is a percent reduction of all crashes, utilizing equations 19-35 and 19-36 of the current HSM.*

As shown in **Table 32**, Alternative #2 would also include improved inside shoulder widths on the mainline between Tower Grove Ave. and Sarah St. on the west end, and between a point 400' west of Theresa Ave. (extended) and Ewing Ave. on the east end. These widened inside shoulder segments are improvements on the west end, as well as WB I-64 on the east end, are not tied to any adjacent mainline realignments, but would allow for standard 10' inside shoulders. The realignment of EB I-64 on the east end would allow for the associated new shoulder to meet current standards.

Table 32. Alternative #2: Freeway Shoulder Widths & CMFs

Location	Existing/No Build (Maintenance Only)		Alternative #1		CMF*
	Inside	Outside	Inside	Outside	% Change
I-64 EB/WB between Newstead Ave. and Sarah St.	5.5'	10'	10'	10'	FI: 7% PDO: 8%
I-64 EB/WB between 400' west of Theresa Ave. and Ewing Ave.	4'	10'	10'	10'	FI: 10% PDO: 9%

** CMFs based on HSM equations 18-25 and 18-26*

6.2.2.1.2. Qualitative Safety Summary

High crash frequencies were previously identified in the Existing Conditions report along I-64 and several of the major corridors within the study area, including Jefferson Ave., Grand Blvd., Vandeventer Ave., Kingshighway Blvd., and I-64 ramp intersections. However, the improvements associated with Alternative #2 would address some of these concerns, such as the westbound off ramp at Boyle Ave. or the concerns associated with the eastbound loop ramp to Grand Blvd, which is to be removed and replaced with a tangent section terminating at roundabout. However, Alternative #2 does not address the following existing safety concerns (note that modifications to the interchange configurations at Kingshighway Blvd. and Jefferson Ave./22nd St. were not contemplated as part of this PEL given the relatively recent and/or ongoing reconstruction at these locations):

- I-64 & Jefferson Ave. (inclusion of this location is based upon crash data from 2017 thru 2020, prior to the reconstruction of this interchange)
- I-64 over Vandeventer Ave. (Directional share is ~50/50, slightly higher EB)
- I-64 EB between Kingshighway Blvd. and Tower Grove Ave.
- I-64 & Kingshighway Blvd.

The removal of several ramps between the existing Market St./Bernard St. eastbound off ramp and Jefferson Ave. provides for relatively significant safety improvements, due to the reduction of ramp lane-miles and merge/diverge conflict areas. Elimination of the left-hand entrance from Forest Park Ave. to eastbound I-64 also serves to reduce weaving movements for vehicles entering at the existing point attempting to access the downstream ramps to the east.

A quantitative safety analysis investigating the impact of improvements presented In Alternative #2, in addition to other countermeasures found to be feasible during subsequent detailed design efforts, will inform the decision-making process when selecting preferred transportation improvements.

6.2.2.2. Tier 2 Limits: Arterials & Major Collectors

6.2.2.2.1. Applicable Crash Modification Factors

Given the complexity of the proposed modifications, few CMFs are directly applicable to arterials and major collectors. The CMFs identified in **Table 33** would apply to improvements proposed as part of Alternative #2.

Table 33. Alternative #2: Tier 2 CMFs

Safety Improvement	CMF*	Crash Reduction (%)	Applicable Location
Conversion of intersection to right-in right-out only	0.49	51%	Grand Blvd. at Council Plaza

** CMF based on "Analysis of Right-In, Right-Out Commercial Driveway Safety, Operations and Use of Channelization as Compliance Countermeasure", May 2017 Clemson University.*

6.2.2.2.2. Qualitative Safety Summary

The safety of the broader study area network would improve as a result of the following improvements proposed by Alternative #2:

- Removal of the existing traffic signal at Grand Blvd. and Council Plaza. Less than 150 feet of vehicle stacking distance exists between this signal at the adjacent signal at Forest Park Ave. Removing this signal and converting the side street approaches to right-in right-out only will reduce conflict points and increase intersection spacing along Grand Blvd. to separate decision points and aid in wayfinding.
- Bringing Forest Park Ave. to grade at Grand Blvd. The intersection, which effectively acting as two closely spaced ramp terminals between the roadways, currently functions as one wide intersection that is confusing and often results in vehicles stopping incorrectly in between the signalized intersections. This creates a dangerous condition where turning traffic and stopped vehicles are in conflict within one another in a confined space. Creating an at-grade intersection, albeit large in size due to the need for multiple lanes, would simplify operations for all users, resulting in a more intuitive configuration.
- Increasing traffic capacity at Boyle Ave. and Clayton Ave. Morning peak period congestion on northbound Boyle Ave. originates at the signal at Clayton Ave. Providing increased capacity by widening the northbound approach and expanding the intersection overall will reduce backups, thereby alleviating congestion exiting westbound I-64 at Boyle Ave. in the morning peak periods.

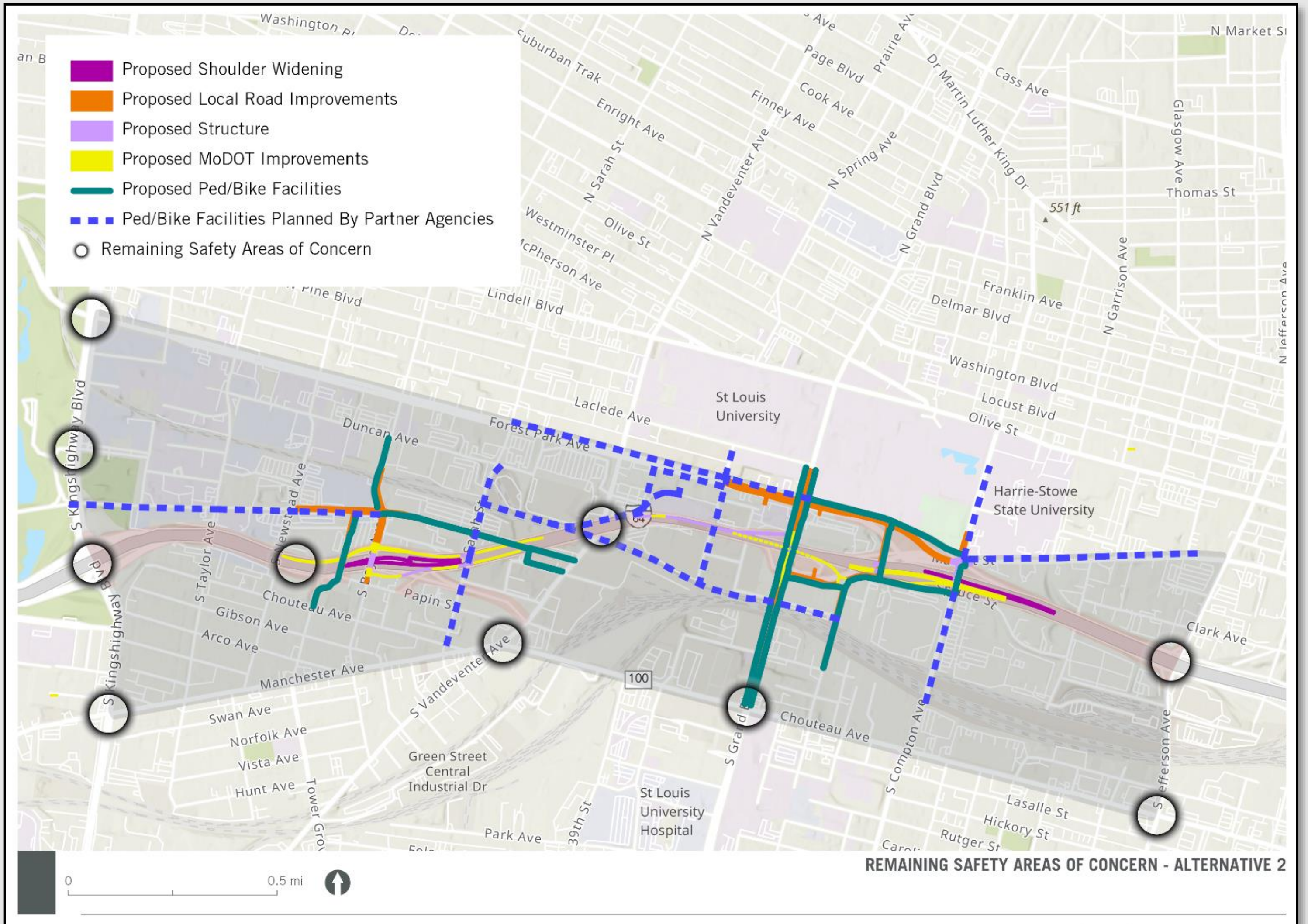
- Relocating I-64 eastbound on ramp from Papin St. to Boyle Ave. This would establish a more traditional interchange configuration at Boyle Ave., which would, in turn, lessen the interstate traffic that utilizes Papin St., a local roadway in the Forest Park Southeast neighborhood. This should result in tangible safety improvements for Papin St., as fewer vehicular trips would enable the street to function as a neighborhood street, potentially attracting more pedestrians and bicyclists. Furthermore, the addition of the eastbound on ramp via Boyle Ave. meets drivers' expectations in terms of one roadway providing access to the interstate in multiple directions.
- Directly connecting Market St. and Forest Park Ave. Establishing this connection and reducing the confusing system of ramps at the existing Forest Park Ave./Compton Ave. interchange would be expected to improve safety. Ease of navigation will be improved; access to/from I-64 will be shifted to a traditional interchange on Grand Blvd; and short-distance lane changes and merges associated with the existing system of ramps will be eliminated.

Despite these improvements, some areas of concern within Tier 2 would remain, as follows:

- Chouteau Ave. & Jefferson Ave.
- Grand Blvd. & Chouteau Ave.
- Chouteau Ave. & Vandeventer Ave.
- Kingshighway Blvd. & Forest Park Ave.
- Kingshighway Blvd. & Hospital Dr.
- Manchester Ave. & Kingshighway Blvd.

Figure 76 depicts the locations of likely safety concerns (based upon locations identified in the Existing Conditions Report that are not directly addressed from a safety perspective by this alternative) assuming Alternative #2 is in place. However, as new developments occur in the study area driving economic activity and vehicular traffic, additional locations may become high frequency locations. For example, significant new developments planned in the Chouteau Ave. and Forest Park Ave. corridors may increase the flow of traffic in those areas creating opportunities for more crashes. However, it should be noted that the responsible agencies would request proven safety countermeasures to be implemented with any significant development, with considerations given to the context of the adjacent corridor(s) potentially changing mode share and user population. Concurrently, each agency will continuously incorporate safety countermeasures as part of maintenance activities and capital improvement projects in an effort to address needs for users of all ages and abilities.

Figure 76. Alternative #2: Safety Areas of Concern



6.2.2.3. Safety Enhancements for Bicyclists and Pedestrians

Crashes involving bicyclists and pedestrians are much more likely to result in an injury or fatality because the relationship between vehicle speed at impact and the severity of the crash is non-linear as speeds increase. Additional bicycle and pedestrian facilities in Alternative #2 include the following:

- A new multiuse path north of Forest Park Ave. from Market St./Compton Ave. to Spring Ave
- A new parallel multiuse path along Theresa Ave. crossing I-64
- Grade-separated structure with bicycle and pedestrian accommodations on Theresa Ave. crossing the railroad the railroad tracks,
- Wayfinding signs and markings on Clayton Ave. from Boyle Ave. to Vandeventer Ave. connecting to a potential path under I-64 connecting to Sarpy Ave.

Not only do these facilities effectively separate bicyclists and pedestrians from vehicles to improve safety but also create safer opportunities for crossing I-64. Additionally, the Forest Park Ave. multiuse path connection allows users to travel south to the Grand transit center without using Grand Blvd. Later phases of project development and design should consider specific pedestrian and bicyclist safety countermeasures and design treatments such as illuminated refuge islands, curb extensions, high-visibility crosswalks, rectangular rapid flashing beacons, and separated intersections for bicyclists.

6.3. MULTIMODAL MOBILITY

As the study area experiences continued growth and development in the coming years, multimodal transportation will become increasing essential to the movement of residents, employees, and visitors to the area. Based on assumptions regarding investments in active transportation reflected in Alternative #2, it is evident that the surface transportation network would be a safer, more connected, and more comfortable place to walk, bike, and access transit. This section of the report documents conditions in Year 2050 assuming the infrastructure represented in Alternative #2 is in place, including committed and likely active transportation projects, bicycle and pedestrian comfort and connectivity, anticipated transit investments, and future transit ridership and access.

6.3.1. Pedestrian & Bicycle Activity

This section discusses the pedestrian and bicycle operations anticipated for Alternative #2. Each element is discussed independently in terms of operation and connectivity. However, many of the facilities anticipated to serve these modes would likely involve adding multiuse paths.

6.3.1.1. Pedestrian Facilities

6.3.1.1.1. Proposed Pedestrian Improvements

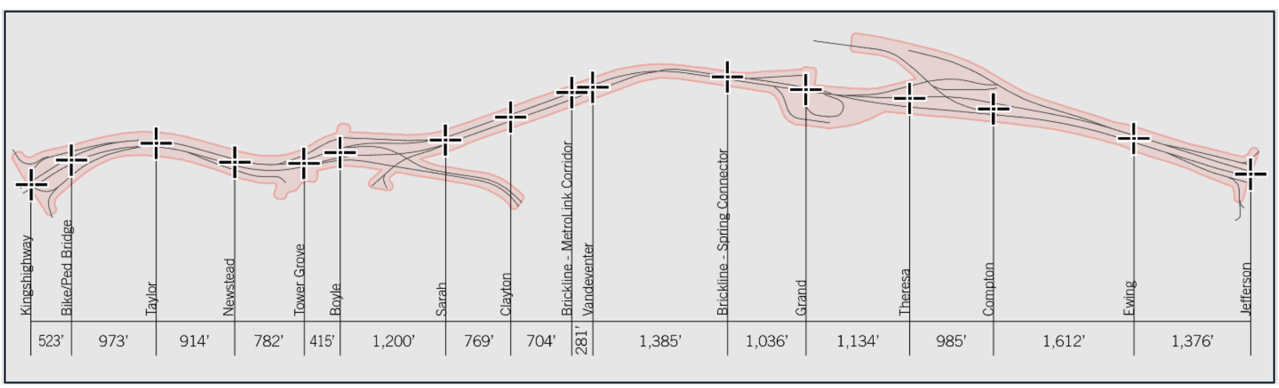
In addition to the committed and likely projects described in the No Build (Maintenance Only) scenario in Section 4.3.1.1.1., Corridor Alternative #2 includes the following pedestrian facilities:

- Parallel multiuse path structures along both sides of Grand Blvd.

- Parallel multiuse path on Forest Park Ave. between Grand Blvd. And Market St./Compton Ave.
- Parallel multiuse path on Theresa Ave. between Scott Ave. and Forest Park Ave.
- Pedestrian facility as part of the grade-separated crossing along Theresa Ave. over the railroad tracks
- Parallel multiuse path on Bernard St. Between Grand Blvd. and Theresa Ave.
- Multiuse path connecting Sarpy Ave. And Clayton Ave. immediately southeast of I-64.

These improvements are located within or adjacent to the Tier 1 study area, enhancing existing I-64 crossings and within the interchange improvement alternatives areas of influence creating new low-stress crossings for pedestrians. Combined with the committed and likely pedestrian network additions, the Alternative #2 pedestrian improvements would reduce the barrier effect of I-64 as compared to the No Build (Maintenance Only) alternative. New crossings along the Brickline Greenway parallel to the MetroLink at Vandeventer Ave., at 39th St., and at Theresa Ave. would reduce distances between interstate crossings and increase network connectivity to destinations along the corridor. It should be noted that while the No Build (Maintenance Only) scenario identifies Spruce St. to Compton Ave. to Market St. as the current path option, this alternative offers Theresa Ave. to Forest Park Ave. as an alternative option. The Alternative #2 scenario provides a total 16 crossings supporting active transportation, three of which are pedestrian- and bicycle-only bridges. These crossings are displayed below in **Figure 77.**

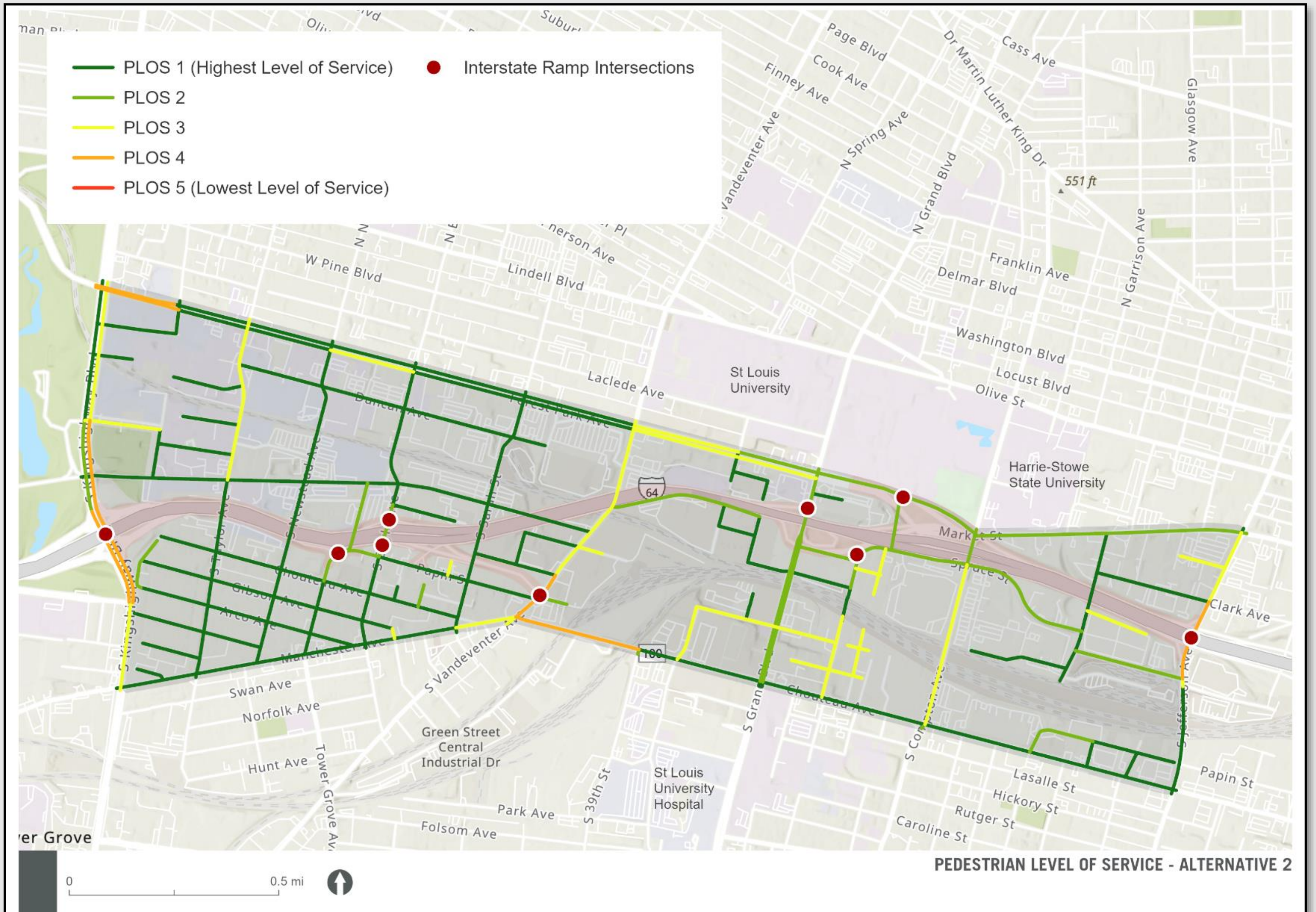
Figure 77. Alternative #2: I-64 Pedestrian & Bicycle Crossings of I-64



6.3.1.1.2. Pedestrian Level of Service (PLOS)

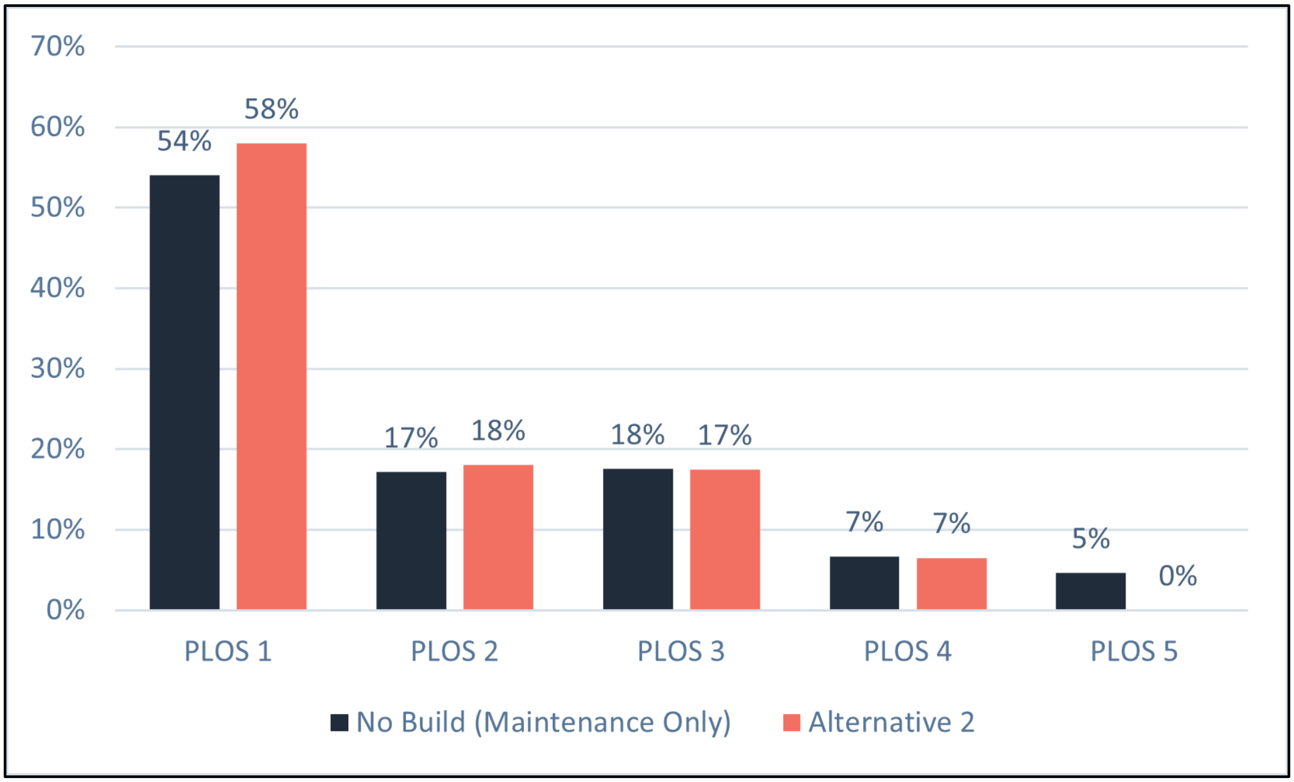
PLOS provides an objective measure of the perceived pedestrian experience based on sidewalk and roadway geometry and motor vehicle travel speeds. The underlying premise of the HCM's PLOS still drives the scoring in the simplified methodology: pedestrian comfort increases with fewer travel lanes, lower vehicle speeds, and greater separation from motor vehicle traffic. Scores range from PLOS 1 (lowest stress) to PLOS 5 (highest stress). As described in the No Build (Maintenance Only) section, the methodology has been adjusted to account for the impact of interstate ramp intersections on pedestrian level of service. The results of the PLOS analysis for Alternative #2, which are displayed in **Figure 78**, highlight the impact that likely and committed investments in pedestrian mobility will have within the study area. It is important to note that multiuse paths and other pedestrian pathways located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

Figure 78. Alternative #2: Pedestrian Level of Service



Alternative #2 provides slight improvements in pedestrian levels of service over the No Build (Maintenance Only) scenario. **Figure 79** displays the percentage of roadway network miles by level of traffic stress for the Alternative #2 and No Build (Maintenance Only) scenarios. Most notable are a 4% increase in PLOS 1 network miles and a decrease of 5% in PLOS 5 resulting from multiuse path and sidewalk installations along existing and new roadway segments. Potential high-stress conflict points remain at interstate interchanges, as indicated in **Figure 78**. Mitigation of these conflict points through design interventions that reduce pedestrian exposure to motor vehicle traffic should be considered in project development and detailed design.

Figure 79. Alternative #2: Percent of Roadway Network by Pedestrian Level of Service



As described in the Existing Traffic, Safety, and Multimodal Conditions Report, it is likely that the PLOS results do not accurately reflect the pedestrian experience and present level of service in a more favorable light, reasons for which were presented in that report. Regardless of those potential shortcomings, the changes in level of service scores between the No Build (Maintenance Only) and Alternative #2 scenarios are measurable and reflect the benefit to pedestrian comfort afforded by these improvements.

6.3.1.1.3. Pedestrian Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, pedestrian network connectivity was analyzed for Alternative #2 based on ten-minute/half-mile pedestrian travelsheds. Pedestrian connectivity scores vary widely throughout the study area, from a low of 0.08 to a high of 0.62, with lower scores representing poor connectivity and higher scores representing greater connectivity. Note that even small network changes can have large effects on individual scores. These ratios are displayed in Figure 80. The average (mean) pedestrian connectivity score is 0.43, which indicates that roughly 43% of the land area within walking distance can be reached based on the characteristics of the pedestrian network. This represents a slight increase over the No Build (Maintenance Only) scenario mean pedestrian connectivity of 0.42 (42%).

Figure 81 displays Alternative #2 improvements in pedestrian connectivity ratios as compared to the No Build (Maintenance Only) scenario. The results show how increased local links in the roadway network associated with Alternative #2 impact people’s ability to walk to nearby destinations. The greatest improvements in connectivity ratios occur along the Theresa Ave. corridor, reflecting the new network links north to Forest Park Ave. and the south to Chouteau Ave.

6.3.1.2. Bicycle Facilities

6.3.1.2.1. Proposed Bicycle Improvements

In addition to the committed and likely projects described in the No Build (Maintenance Only) scenario described in Section 4.3.1., Alternative #2 includes the following bicycle facilities:

- Dedicated bicycle lanes on Tower Grove Ave. across I-64, extending north of Clayton Ave. via Boyle Ave.
- Parallel multiuse path on Forest Park Ave. between Grand Blvd. And Market St./Compton Ave.
- Bicycle facility Grand Blvd. to north of Forest Park Ave, including parallel multiuse path structures along both sides of Grand Blvd. bridge across I-64.
- Parallel multiuse path on Theresa Avenue between Scott Ave. and Forest Park Ave.
- Parallel multiuse path on Bernard St. Between Grand Blvd. and Theresa Ave.
- Multiuse path connecting Sarpy Ave. And Clayton Ave. immediately southeast of I-64.

These improvements are located within or adjacent to the Tier 1 study area, enhancing existing I-64 crossings and within the interchange improvement alternatives areas of influence creating new low-stress crossings for people traveling by bicycle.

Figure 80. Alternative #2: Pedestrian Connectivity Analysis Results

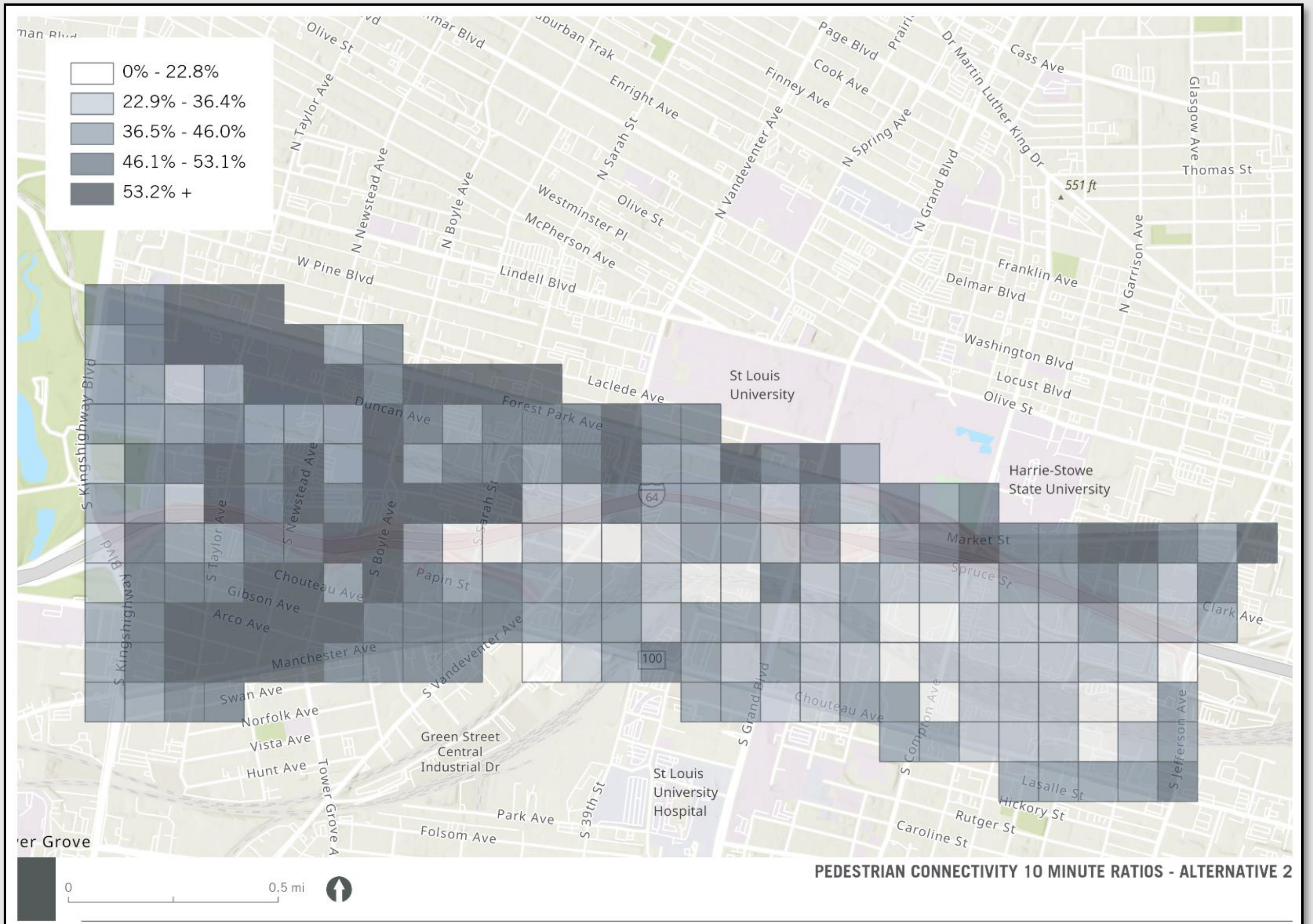
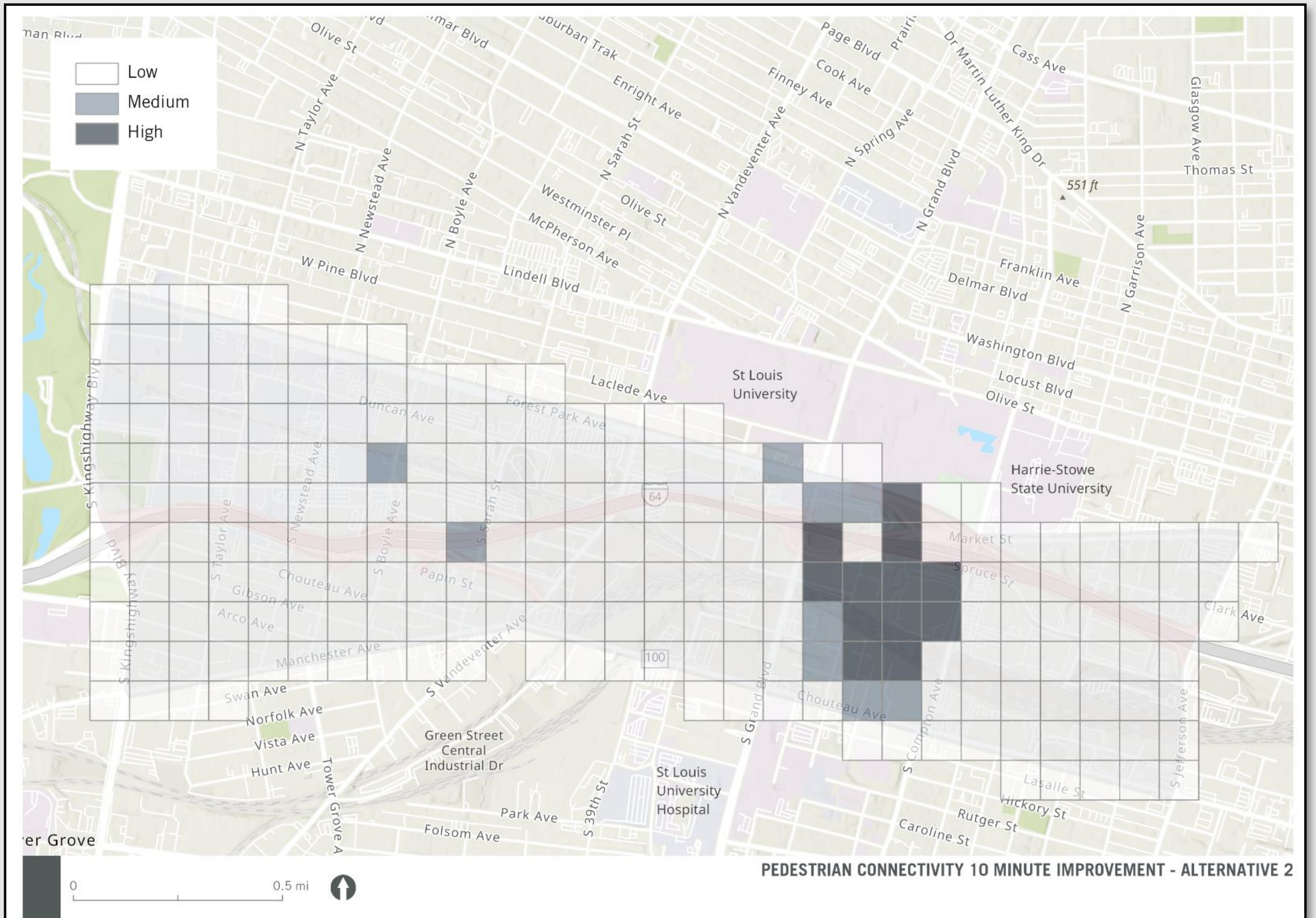


Figure 81. Alternative #2: Pedestrian Connectivity Ratio Improvements



6.3.1.2.2. Bicycle Level of Traffic Stress (BLTS)

Bicycle Level of Traffic Stress (BLTS) provides an intuitive framework to categorize roadways based on the level of stress, or conversely level of comfort, for people bicycling. The analysis incorporates motor vehicle volumes, posted speed limits, the presence of parking, and the presence of bike lanes as key determinants of level of traffic stress. Scores range from BLTS 1 (lowest stress) to BLTS 4 (highest stress). As described in the No Build (Maintenance Only) section, the BLTS methodology has been adjusted to account for the negative impact of interstate ramp intersections on level of stress for people bicycling.

The results of the BLTS analysis, which are displayed in Figure 82, highlight the impact of investments in active transportation associated with Alternative #2. It is important to note that multiuse paths located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

While low-stress network additions related to Alternative #2 do add valuable connections across and adjacent to I-64, there are minimal changes to overall levels of traffic stress for bicycling in the study area. Figure 83 compares the percentage of roadway network miles by level of traffic stress for the No Build (Maintenance Only) and Alternative #2 scenarios. There is an increase in the percentage of low-stress BLTS 1 roadways from 19% to 21%, a slight increase in BLTS 2 roadways from 37% to 38% and decreases of a percentage point or less for BLTS 3 and BLTS 4 roadways. Much like the No Build (Maintenance Only) scenario, the western half of the study area from Vandeventer Ave. to Kingshighway Blvd. remains largely unchanged in terms of level of traffic stress, as major arterials like Forest Park Ave., Kingshighway Blvd., Manchester Ave., and Vandeventer Ave. are not expected to see investments in low-stress bicycle facilities.

Figure 82. Alternative #2: Bicycle Level of Traffic Stress

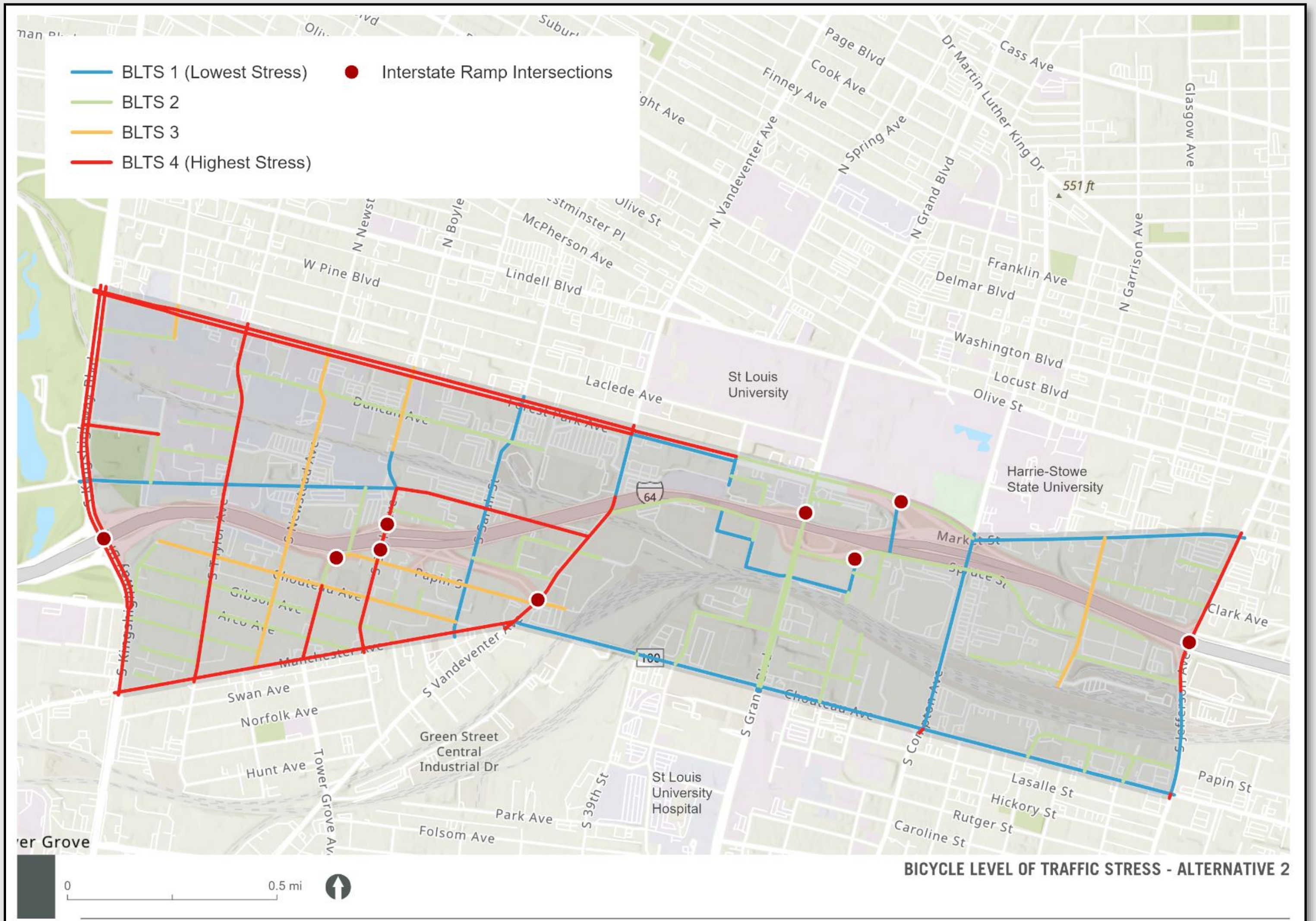
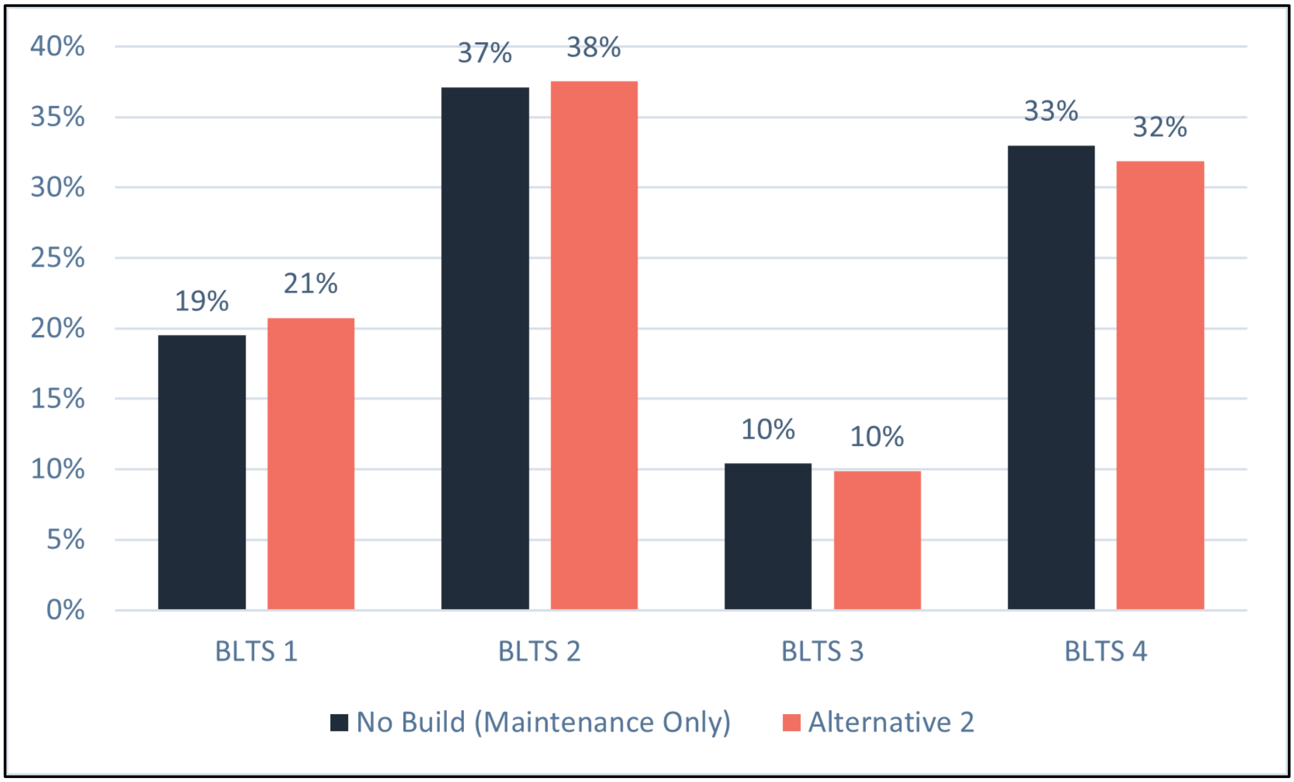


Figure 83. Alternative #2: Percent of Roadway Network by Level of Traffic Stress



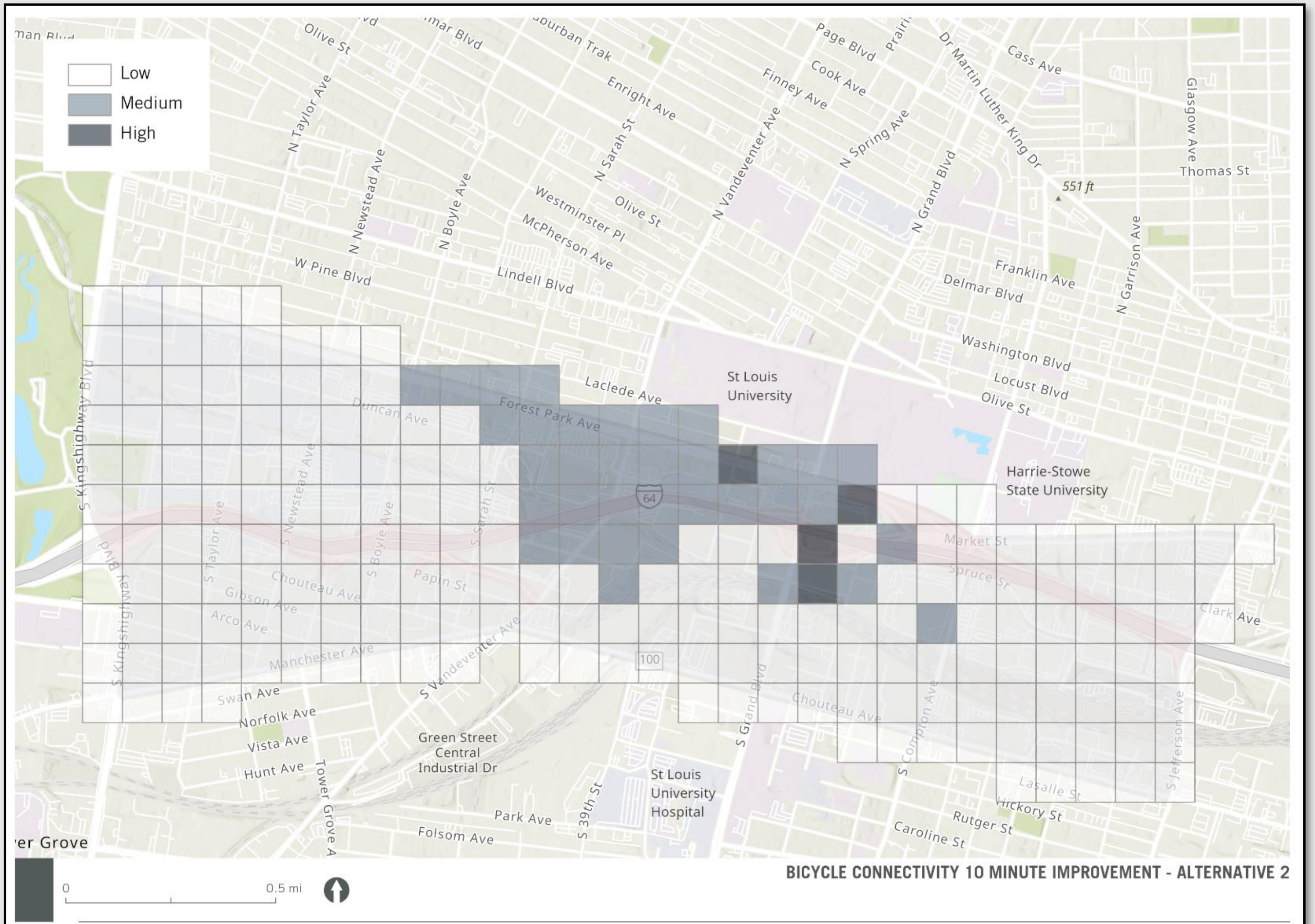
6.3.1.2.3. Bicycle Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, bicycle network connectivity was analyzed for Alternative #2 based on ten-minute/1.67-mile bicycle travelsheds. While less than the 2.8-mile median bicycle trip distance, the ten-minute/1.67 travelshed, which represents a short bicycle trip at an average speed of 10 miles per hour, is a consistent unit of measurement for analyzing bicycling activity and potential and is an appropriate scale by which to analyze network changes within the Tier 2 study area. Bicycle connectivity scores vary widely throughout the study area, from a low of 0.41 to a high of 0.80, with lower scores representing poor connectivity and higher scores representing greater connectivity. These ratios are depicted in Figure 84. The average (mean) bicycle connectivity score is 0.64, which indicates that roughly 64% of the land area within bicycling distance can be reached based on the characteristics of the bicycle network. This represents a modest increase over the No Build (Maintenance Only) scenario mean bicycle connectivity of 0.60 (60%).

Figure 85 displays Alternative #2 improvements in bicycle network connectivity ratios as compared to the No Build (Maintenance Only) scenario. The results show how increased local links in the roadway network associated with Alternative #2 impact people's ability to bike to nearby destinations. The greatest connectivity ratio improvements are located in the north central portion of the study area, notably along the Theresa Ave. corridor.

Figure 84. Alternative #2: Bicycle Connectivity Analysis Results

Figure 85. Alternative #2: Bicycle Connectivity Ratio Improvements



6.3.2. Transit

This section discusses the transit accommodations anticipated for Alternative #2.

6.3.2.1. Year 2050 Transit System

Alternative #2 would provide for the same Year 2050 transit system as previously presented in Section 4.3.2.1 for the No Build (Maintenance Only) scenario with one exception. Accommodations for a dedicated bus lane would be provided along the Grand Blvd. corridor between Forest Park Ave. and Chouteau Ave. The intent would be to improve transit operations and ridership on the #70 Grand MetroBus route for 0.5 miles within the study area by adding dedicated bus lanes and enhanced station amenities. This would include two-way bus operations in dedicated curb lanes and two (2) stations in each direction within the study area.

The goals of this transit enhancement would be to shorten the dwell time of the transit vehicle at proposed stations by expediting the boarding and alighting process and to improve travel speeds between the stations by having an exclusive travel lane, thereby lessening the impact of traffic congestion and improving travel time and on time reliability. This would enhance the rider experience and potentially attract increased ridership.

The rationale for this investment includes the fact that the #70 Grand route is the busiest MetroBus route in the system, with ridership approaching 10,000 passengers per day prior to the pandemic. Dedicated bus lanes and station enhancements have the ability to support even higher levels of ridership in the future, which would be desirable to promote given planned growth and developments in the area.

The following concepts and amenities are proposed for the dedicated lane running way and at the stations:

- Dedicated bus lane along the curb with transit signal priority
- Two stations with the following amenities: an ADA compliant platform, ADA ramp, shelters (Type C in design manual), heat, lighting, canopy/roof, and other amenities (benches, trash cans, system or bus line map, digital advertising / local information), bike lockers or racks, accommodations for E-scooters – all scaled to fit ridership and fit in with the local context and allowable right of way that could be dedicated to the station
- Off board fare collection / ticket vending machines (TVMs)
- Next bus information displays (GPS linked vehicles to GTFS / schedules)

Metro currently has suitable station design concepts in their existing design manual that can be used as a starting point when and if this concept moves beyond the PEL stage. Encouragement for transit-oriented development (TOD) should be considered at the stations along with improvements to non-motorized access, including improved sidewalks, countdown pedestrian signals, high visibility crosswalks and/or median refuge islands. Consideration should be given to potential changes to zoning ordinances, adoption of a form-based code, and reductions in parking requirements near the proposed stations to promote transit-oriented development. Lastly, the existing bus stops should be eliminated in the 0.5-mile section of Grand Blvd. within the study area to consolidate ridership at the stations, maximizing their effectiveness.

Since the dedicated bus lanes are confined to only 0.5 miles in the study area, the transit benefits would be limited until the concept could be extended beyond Forest Park Ave. or Chouteau Ave. The potential travel time savings reflect the transit vehicle running in a dedicated curb lane for only 0.5 miles. As shown in **Table 34**, changes to the street network and interstate ramps in Alternative #2 would result in increased traffic congestion along Grand Blvd. as compared to the No Build (Maintenance Only) scenario. Peak hour travel times are expected to increase based on data output from the VISSIM traffic simulation model. The addition of dedicated lanes would help negate the effects of increased congestion on transit travel times and on-time reliability. The anticipated impact of dedicated lanes on actual transit running times is not estimated, as it would be dependent upon operational strategies not typically defined in a planning study such as transit signal priority, which is beyond the scope of this PEL.

Table 34. Alternative #2: Forecasted Travel Times along Grand Blvd.

Direction	Travel Time (sec)			
	AM Peak Hour		PM Peak Hour	
	No Build (Maintenance Only)	Alt #2	No Build (Maintenance Only)	Alt #2
Northbound	43	75	55	93
Southbound	43	48	35	74

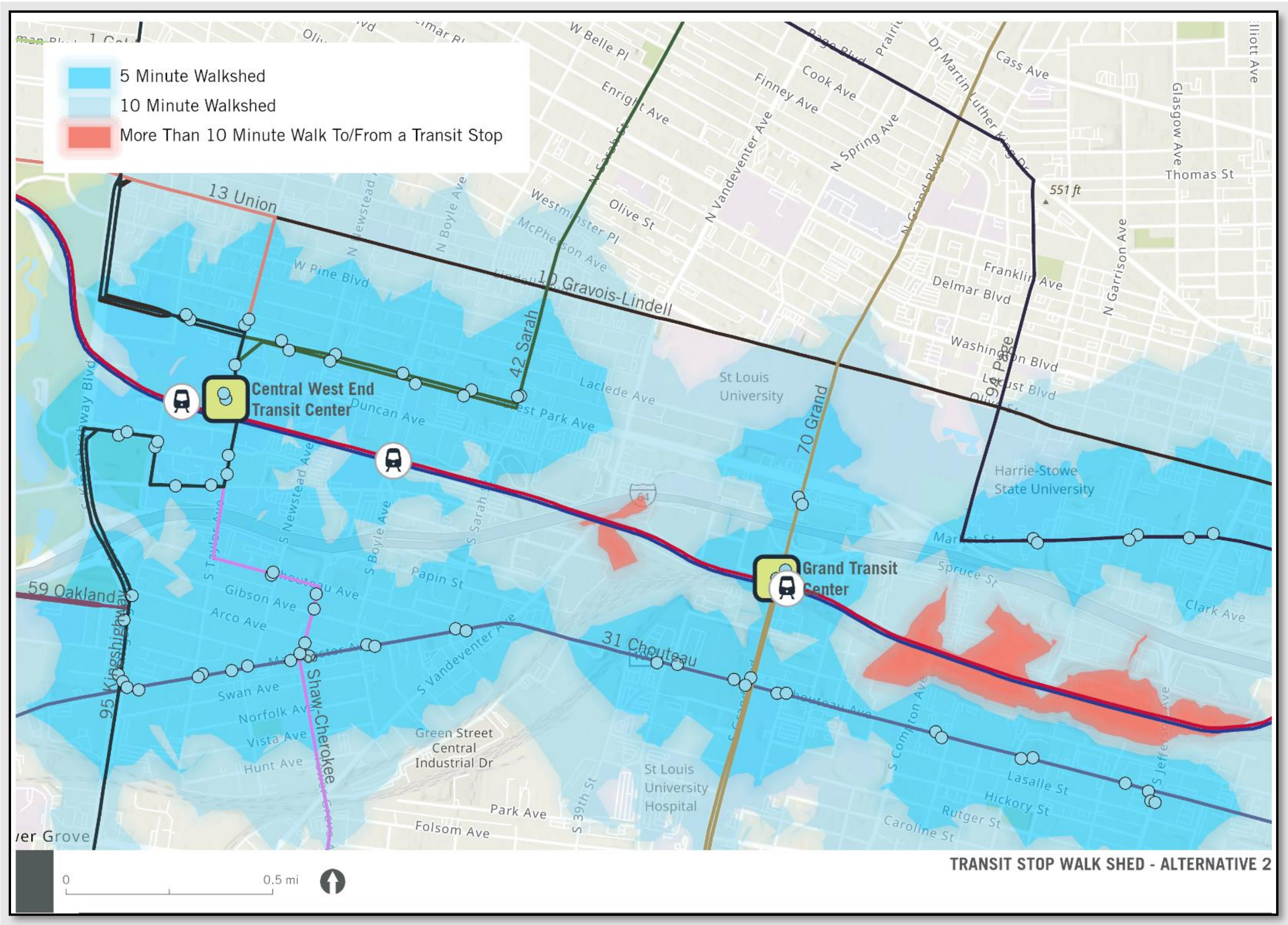
Despite the limitations of dedicated bus lanes within Alternative #2. this concept would still have a positive effect on transit service in the corridor, which would benefit the study area. Bus only lanes would also benefit ambulances and other emergency vehicles by allowing them to more easily avoid traffic congestion and stopped vehicles. Note that this initial deployment represents an initial building block towards implementing corridor-wide transit lane and station improvements along the #70 Grand Blvd. MetroBus route.

6.3.2.2. Transit Ridership in 2050

Forecasts addressing the ridership impacts of the dedicated bus lanes included in Alternative #2 are beyond the scope of this planning study. For general transit ridership growth trends in the study area, refer to the transit ridership summary presented in Section 4.3.2.2.

Since many, if not all, transit trips begin and/or end with a non-motorized trip (i.e., walking), walksheds help define the accessibility of transit stops within the study area. Additional pedestrian connections included in Alternative #2 would help increase transit accessibility, including the Theresa Ave. extension across I-64, MetroLink, and the railroad lines and a better pedestrian connection at Forest Park Ave. and Market St. **Figure 86** shows the 5-minute and 10-minute walksheds as well as the area beyond a 10-minute walk to each transit stop in the study area.

Figure 86. Alternative #2: 5- and 10-Minute Walksheds as Related to Transit Routes



The need for transit service in and around the study area was estimated based on the number of transit-dependent residents estimated for the Year 2050. Forecasts for transit-dependent residents were based upon total population derived from the EWG Regional TDM for the year 2045 and then extrapolated to represent the Year 2050. The estimated number of transit-dependent residents within the study area would be 3,831 persons in Year 2050 (as compared to 3,647 persons as presented in the Existing Conditions Technical Report). To measure the impact of new pedestrian connections on transit access, the transit-dependent population within a 10-minute walkshed area was also estimated, as summarized in Table 35.

Table 35. Alternative #2: Transit-Dependent Population Near Transit Stops

	Population	
	No Build (Maintenance Only)	Alt #2
Transit Dependent Within 10-Min Walkshed	7,765	7,742

As shown, the additional pedestrian connections would negligibly affect access to/from transit stops as compared to the No Build (Maintenance Only) alternative, based on the walksheds of transit-dependent populations. That said, these new pedestrian connections would help transit be more accessible to major destinations in the study area, including St. Louis University and the Foundry, by providing a high-quality and comfortable walking environment, which is not captured by the walkshed distance analysis. Most of the benefit would be realized in the vicinity of the Grand MetroLink Station, as a result of improved pedestrian facilities linking north-south across I-64 and east-west to the MetroLink Station

6.4. YEAR 2050 CORRIDOR ALTERNATIVE #2 CONCLUSIONS

The following represents the conclusion drawn from the traffic operations, safety and multimodal analysis of the Year 2050 Corridor Alternative #2:

6.4.1. Traffic Conclusions

- Under Alternative #2, interchange spacing would be improved due to the removal of the ramps to and from Market St. and Compton Ave. as well as the eastbound on ramp to I-64 from Forest Park Ave.
- Favorable operating conditions could be provided along I-64 mainline, merge, diverge and weave segments assuming Alternative #2 is in place.
- The interchange of I-64 with Kingshighway would continue to show congestion during the peak hours due to the anticipated volume of traffic. However, modifications to this interchange were not contemplated as part of this PEL given its relatively recent reconstruction.
- The widening of the westbound I-64 off ramp and lengthening of the deceleration lane to Boyle Avenue would accommodate the anticipated Year 2050 volumes and minimize any impacts upon the I-64 corridor.

- The intersection of Clayton Ave. at Boyle Ave., as well as both Clayton Ave. and Boyle Ave. themselves, would require significant reconstruction to provide numerous turn and travel lanes to efficiently accommodate the traffic traveling between I-64 and the Washington University Medical Campus.
- The conversion of the grade separated intersection of Forest Park Ave. at Grand Blvd. to an at grade intersection is feasible as proposed in Alternative #2. However, extensive turn and travel lanes would be necessary to achieve the operational target of LOS E overall during the peak periods, which is critical in order to minimize backups that would, in turn, impact the ramp terminals with I-64 at Grand Blvd. In order to achieve a balance between vehicular and active transportation modes, it would be prudent to provide refuge medians within the intersection on all approaches to facilitate non-motorized crossings.

  However, there are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities. Bringing this intersection to-grade could potentially reduce traffic volumes at this intersection as compared to the straight growth assumed in this study, which in turn would potentially reduce the number of lanes necessary to maintain a LOS E. The removal of traffic at this intersection could be a result of either the diversion of traffic to other intersections, which was beyond the scope of this study, or the dissipation of traffic due to reduction in trip making and/or modal shifts.
- A roundabout would be the preferred means of traffic control at the intersection of the eastbound I-64 off ramp with Bernard St./Theresa Ave./Spruce St.
- The extension of Theresa Ave. between Forest Park Ave. and Chouteau Ave. provides an alternate north-south route to Grand Blvd. for local traffic, bikes and pedestrians and should be pursued as a two-lane roadway.

6.4.2. Safety Conclusions

- Consolidation of interchange access points, and improvement of existing ramps, provides for safety enhancement within the Tier 1 area, notably near Grand Blvd. and Boyle Ave. interchanges. The removal of the left-hand entrance to eastbound I-64 from Forest Park Ave. has positive safety impacts tied to proper driver expectation and current standards of practice.
- Shifting the eastbound on ramp from Papin St. to a more typical diamond-type ramp at Boyle Ave. has dual benefits of removing a relatively atypical merge conflict on the existing ramp, while also improving the intuitiveness of the interchange from a driver perspective.
- Within the Tier 1 limits, existing safety concern not addressed would expectantly carry forward on I-64 near the Vandeventer Ave. overpass (both directions), as well at the I-64/Kingshighway interchange.
- The Tier 2 area would see safety benefits with the removal of the closely spaced signalized intersection on Grand Blvd. at Forest Park Ave. and at Council Plaza, which currently are a

source of congestion and significant safety concerns for all users. Additionally, addressing congestion at the Clayton Ave. and Boyle Ave. signalized intersection would provide a reduction in crashes, especially higher severity types. Bicycle and pedestrian safety is also enhanced by the addition of separated facilities along multiple Tier 2 routes. Alternative #2 includes a valuable shared use path along Clayton Ave. from the heavily travelled Vandeventer Ave. to the Cortex Metrolink station via Boyle Ave.

6.4.3. Multimodal Conclusions

- Alternative #2 offers a moderate increase in active transportation facility mileage through new on-street bikeways and multiuse paths on Tower Grove Ave., Grand Blvd., Forest Park Ave., and Theresa Ave.
- With an additional 1.5 miles of new bicycle and multiuse facilities represented in Alternative #2, there is a moderate improvement in overall levels of pedestrian level of service and bicycle level of traffic stress (4% increase in low-stress PLOS 1 roadways and 2% increase in low-stress BLTS 1 roadways) over the No Build (Maintenance Only) scenario.
- While the proposed active transportation improvements provide a new north-south link across I-64 between Grand Blvd. and Jefferson Ave. at Theresa Ave., overall levels of connectivity in the study area see only moderate increases outside the immediate vicinity Grand Blvd. and I-64.
- Alternative #2 would provide accommodations for dedicated bus lanes and enhanced station amenities along the Grand Blvd. corridor between Forest Park Ave. and Chouteau Ave. This would include two-way bus operations in a dedicated curb lane.
- Since the dedicated bus lanes concept is confined to only 0.5 miles in the study area, the transit benefits would be limited until it could be extended beyond Forest Park Ave. or Chouteau Ave.
- Changes to the street network and interstate ramps in Alternative #2 would result in increased traffic congestion along Grand Blvd. as compared to the No Build (Maintenance Only) scenario. The addition of dedicated bus lanes would help negate the effects of increased congestion on transit travel times and on-time reliability.
- The additional pedestrian connections in Alternative #2 would have a negligible effect on access to/from transit stops as compared to the No Build (Maintenance Only) alternative, based on the walksheds of transit-dependent populations. That said, qualitatively these new pedestrian connections would help transit be more accessible to major destinations in the study area.

7. CORRIDOR ALTERNATIVE #3

The following subsections present the findings of the traffic operations, safety, and multimodal analysis as it pertains to the Year 2050 for Corridor Alternative #3, which assumes reconstruction along the I-64 corridor as outlined in Section 2.4 and reflected in Figure 10 and Figure 11. As with the previous alternatives, Alternative #3 assumes that the westbound off ramp to Boyle Ave. would be widened and lengthened to better accommodate future traffic volumes. In addition, the eastbound on ramp from Papin St. would be removed. However, unlike the previous alternatives, Alternative #3 would provide for a new one-way eastbound outer roadway along the south side of I-64 that would provide enhanced access to Tower Grove, Boyle Ave., and Vandeventer. This alternative also contemplates relocating the westbound on ramp from Vandeventer to the north side of I-64 to facilitate a right sided merge onto the interstate. All of this is accomplished via the realignment of westbound I-64 between Newstead Ave. and Sarah St.

Similarly, at the east end of the corridor, access to and from Grand would be accomplished via new ramps that would replace the existing eastbound loop ramp from I-64, add a new eastbound on ramp and a new westbound off ramp to and from Grand Blvd., and would remove both ramps to and from Forest Park Ave. and I-64, including the left-side entry ramp.

It is important to note that the transportation modifications represented in Alternative #3 are not *commitments*, but rather recommendations to develop this alternative for analysis purposes only. Additional study and engagement are needed through the decision-making process before MoDOT, the City of St. Louis and/or other partners commit to design and construction of the elements presented in Alternative #3.

As with the previous alternatives, it was assumed that the constraint to the west of the Study Area on westbound I-64 at Hampton was resolved, as agreed upon by MoDOT in July 2022.

7.1. TRAFFIC OPERATIONS

The methodology, and associated assumptions, for the PEL were summarized in the Methods and Assumptions Report, as required by Section 905.3.7.1 of MoDOT's EPG which provides guidance for MoDOT reviewed Transportation Impact Analysis. The reader is reminded that special event traffic for Grand Center or Midtown entertainment venues was not evaluated as part of the PEL. As with previous alternatives, VISSIM and Synchro were the primary and predominant tools used for the traffic operations analysis. Using the calibrated VISSIM model from the Existing Conditions, the Year 2050 traffic conditions along I-64 within Tier 1 limits were evaluated, including its ramp terminals, assuming the corridor is reconfigured as envisioned for Corridor Alternative #3.

The development of transportation improvement options for Alternative #3 followed MoDOT's policy for level of service E for auto traffic in urban areas, as outlined in the approved Methods & Assumptions Report. Although local roadways are not the authority of MoDOT, the MoDOT policy was also applied to local roadways to assess the vehicle capacity recommended for minimizing vehicle delay during peak traffic hours.

7.1.1. Tier 1 Limits: I-64

The primary focus of the PEL study is on the I-64 infrastructure within MoDOT's right-of-way and how it can be improved to meet the goals of the study. The Tier 1 limits include the I-64 mainline and MoDOT right-of-way, from the western gore points of the ramps to and from Kingshighway Blvd. to the eastern gore points of the ramps at 22nd St. (which operates as a split diamond interchange with Jefferson Ave.). The limits include I-64, inclusive of all merge, diverge, and weave sections, as well as the ramp terminals at each of the interchanges. However, note that modifications to the interchange configurations at Kingshighway Blvd. and Jefferson Ave./22nd St. were not contemplated as part of this PEL given the relatively recent and/or ongoing reconstruction at these locations.

7.1.1.1. Access to I-64

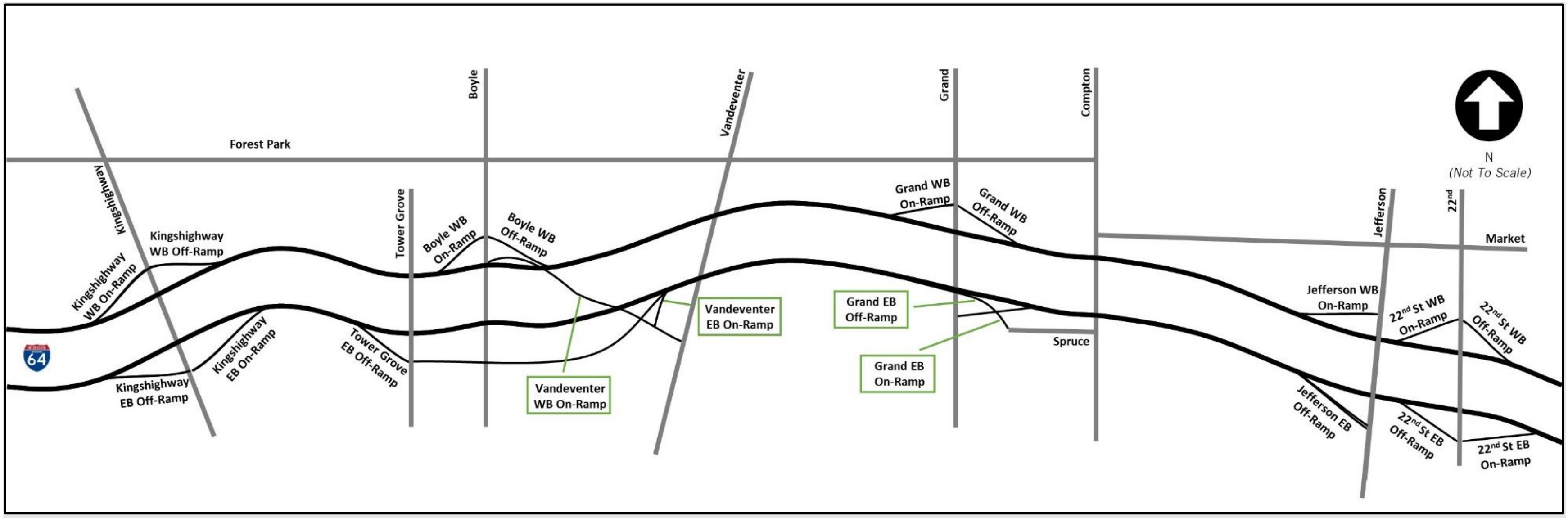
Under Corridor Alternative #3 scenario, the Tier 1 limits would be reduced to five interchanges with I-64 and access points that connect I-64 to eight local and regional roadways. Figure 87 schematically depicts the locations of access to and from I-64 and the distances between these access points.

7.1.1.2. Validation of Year 2050 Corridor Alternative #3 Traffic Models

The traffic simulation model calibration process was achieved during the evaluation of the existing conditions with the development of a base model that replicated existing conditions. The future year models (Year 2050) cannot be "validated" with respect to delays or queues since they are projections of forecasted conditions rather than replications of existing. Therefore, the same calibration parameters from the validated existing condition models form the basis for the Year 2050 Corridor Alternative #3 scenario; of which the traffic forecasts presented in Section 3.3.4 were used to update the model's origin-destination matrix.

Due to the inherent stochastic nature of simulation (imposed by random seeds), multiple simulation runs using different seed numbers were required for each time period, and the reported model results were averaged across runs. Based on the characteristics of this model network, the planning-level effort associated with the PEL study and the agreed-upon level of effort during scoping, it was determined that 10 simulation runs were sufficient to obtain an appropriate level of confidence in the results.

Figure 87. Alternative #3: I-64 Access to Road Network (Schematic)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

7.1.1.3. VISSIM Results

A summary of the following Measures of Effectiveness (MOE) along the I-64 corridor and at its ramp terminals (by approach) are provided for the Year 2050 Corridor Alternative #3 conditions analysis:

- Speed (I-64)
- Density (I-64)
- Throughput (I-64)
- Vehicular delay (ramp terminals)
- Vehicular queue lengths (ramp terminals)
- Volume/capacity ratio (ramp terminals)
- LOS (I-64 and ramp terminals)

This report presents, graphically, the overall conditions for the Year 2050 Corridor Alternative #3. Detailed operating results from the VISSIM and Synchro models are provided in Appendix D. **Figure 88** and **Figure 89** illustrate the Year 2050 Corridor Alternative #3 operating conditions, as modeled. **Figure 90** and **Figure 91** represent the assumed lane configurations and associated geometrics necessary to achieve the operating conditions represented for Corridor Alternative #3. The lane configurations and associated geometrics presented were what was required to achieve the minimum levels of service and mobility targets as presented in the Approved Methods and Assumptions Report (LOS E, etc.). However, it was not always feasible to achieve the proposed minimum level of service and mobility targets. In such cases, a reasonable level of lanes and geometric improvements was assumed (multiple turn or through lanes, etc.)

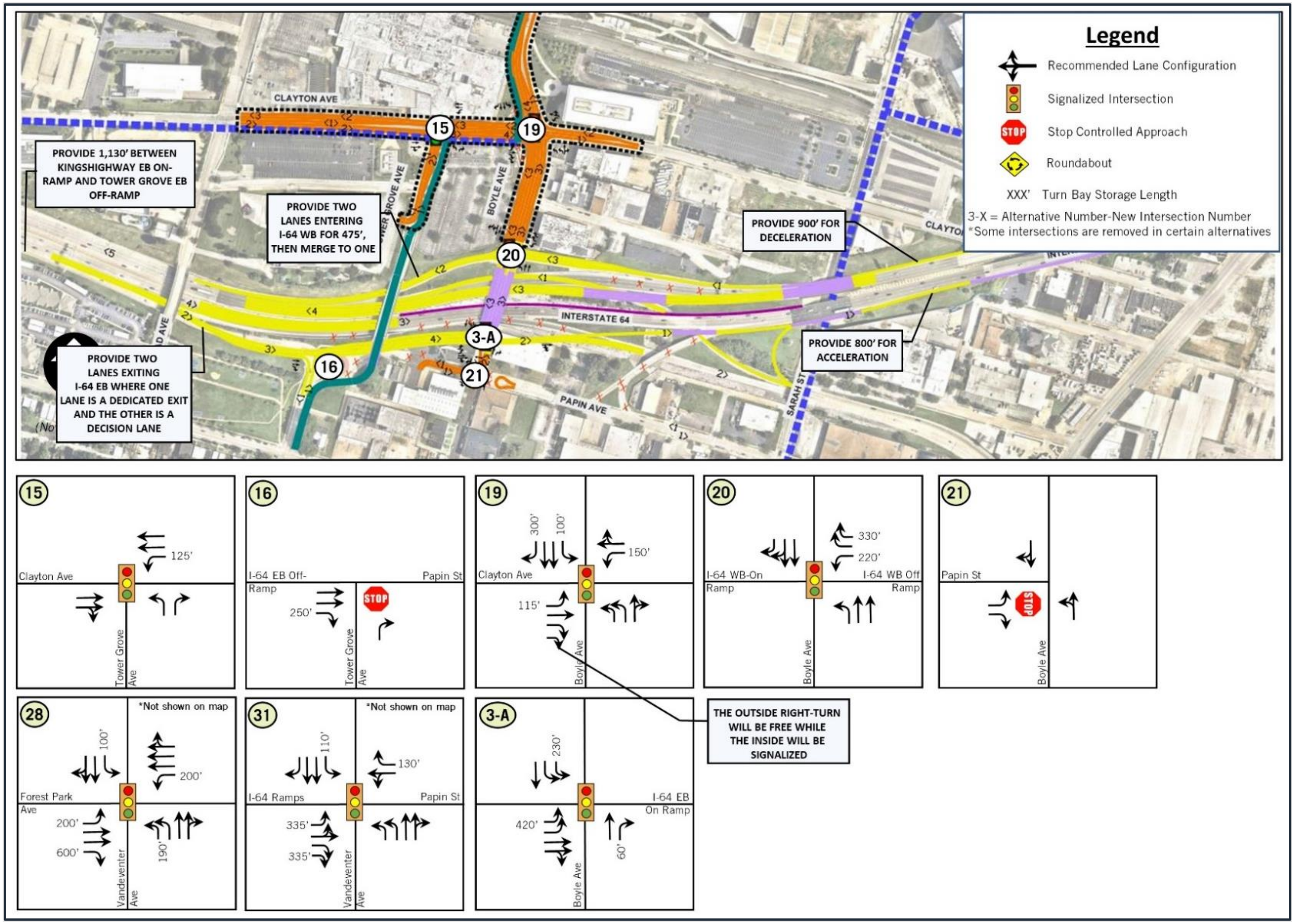
Figure 88. Alternative #3: Year 2050 Conditions - AM Tier 1 VISSIM Analysis

Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 89. Alternative #3: Year 2050 Conditions - PM Tier 1 VISSIM Analysis

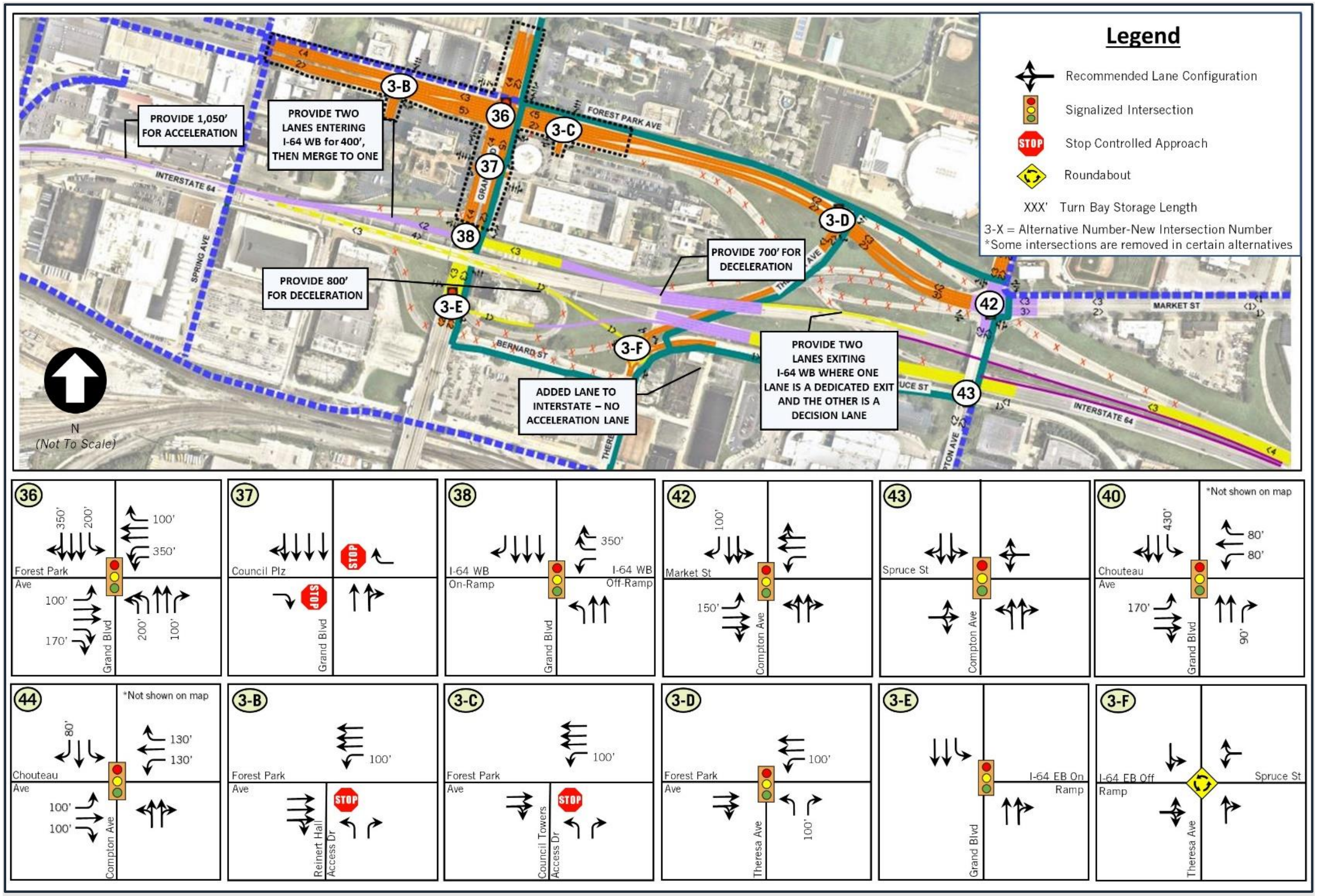
Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 90. Alternative #3: Year 2050 Geometrics/Traffic Control (Tower Grove Ave./Boyle Ave./Papin St. & Vandeventer Interchanges)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Figure 91. Alternative #3: Year 2050 Geometrics/Traffic Control (Grand Blvd./Forest Park Ave./Spruce St. Interchange)



Note: All drawings are for evaluation of opportunities and feasibility. MoDOT and our partners have not yet committed to implementing any of the elements shown.

Overall conditions for the Alternative #3 VISSIM network were summarized with regards to average delay, average stops, total delay and throughput. It should be noted that total delay includes the latent delay associated with vehicles unable to enter the network and throughput volumes include traffic traveling through critical intersections immediately adjacent to the interstate that were included due to their potential to influence I-64 operations (such as Clayton at Boyle or Forest Park at Grand). **Table 36** compares these network parameters to those associated with the No Build (Maintenance Only) alternative.

Table 36. Alternative #3: Overall Network Performance Comparison to No Build (Maintenance Only) Scenario

Time Period/Variable	No Build (Maintenance Only) Alternative	Alternative #3
AM Peak Hour		
Average Delay	133 sec/veh	108 sec/veh
Average Stops	6.3 stops/veh	4.7 stops/veh
Throughput	27,588 veh	28,105 veh
PM Peak Hour		
Average Delay	86 sec/veh	87 sec/veh
Average Stops	2.5 stops/veh	2.6 stops/veh
Throughput	29,856 veh	30,335 veh

As shown, in the Tier 1 limits the interstate experiences reasonable levels of service at many locations during the peak hours. As can be seen from Figure 88 and Figure 89 all the segments in the study area experience level of service D or better. Additionally, the majority of the intersection approaches operate at an overall LOS D or better.

However, the VISSIM model does indicate congestion at the following locations:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - I-64 eastbound off ramp at Kingshighway Blvd. endures queues which extend back almost up to the gore point of the off ramp. However, the maximum queue length is almost 4 times the average queue length indicating that the occurrence of lengthy queues is low. It is important to note that persistence of these congested conditions can cause safety concerns.

PM PEAK HOUR

- I-64 and Kingshighway Blvd.
  - The I-64 westbound and eastbound off ramps both experience considerable congestion.
- Clayton Ave. and Boyle Ave - This intersection is discussed in this section due to its proximity to the Tier 1 zone. Please refer to the Tier 2 Synchro Analysis exhibits for the intersection LOS results
  - The intersection at Clayton Ave. and Boyle Ave. would continue to experience congestion, although the proposed improvements at the intersection do provide additional capacity towards accommodating the congestion as compared to the No Build (Maintenance Only) scenario. However, the eastbound queue on Clayton Ave. could extend past Tower Grove Ave. during the peak hour. It should be noted that operations at this intersection are being impacted due to the 1,000 eastbound right turns from Clayton Ave. to Boyle Ave.
- Boyle Ave. and I-64 EB on ramp
  - The eastbound approach operates at an LOS E. However, the maximum queue is under 200' which easily contained on the outer road. The main reason for the poor LOS for this approach is due to the heavier north-south movements as compared to the other alternatives. The heavier movements in the north-south direction are due to the diversion of traffic formerly using the Tower Grove Ave. connection since this alternative contemplates the removal of vehicular traffic from the Tower Grove Ave. overpass.

7.1.1.4. Synchro Results

The Year 2050 Corridor Alternative #3 operating conditions at the intersections within Tier 1 limits were evaluated using Synchro 11. Detailed operating conditions for Tier 1 limits are provided in Appendix D as modeled by Synchro. The intersections within the Tier 1 limits operate well overall, with each intersection expected to have an overall LOS D or better.

In addition to LOS, the volume to capacity (v/c) ratios were analyzed. Several ramp terminals experience high v/c ratios with particular movements. While the intersections overall appear to currently operate well, some individual movements experience borderline operating conditions. The following intersections have individual movements that operate at a LOS F or have a v/c ratio above 0.90 for an off ramp from I-64 or 0.95 for all other movements:

AM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - The southbound left-turn has a failing LOS with a v/c ratio of 1.17. The eastbound queue extends down the ramp diminishing the available deceleration length, thereby posing a potential safety concern for motorists exiting I-64.

PM PEAK HOUR

- I-64 and Kingshighway Blvd.
    - As the eastbound and westbound queues extends down the respective ramps, the available deceleration length is diminished, posing a potential safety concern for motorists exiting I-64.

7.1.1.5. Correlation of VISSIM and Synchro Results

It is not uncommon for the VISSIM results to deviate slightly from the Synchro and Sidra results due to the difference in programs and the level of detail included in the inputs and parameters. However, it is still expected that the results should be comparable regardless of the program utilized.

When the results from the various analytical tools used for the traffic analysis are compared, the Year 2050 Corridor Alternative #3 traffic operations for the overall intersection MOEs as well as the individual approaches are generally comparable to one another. The only differences observed between the various outputs were due to the manner in which a particular program handled the right-turn movement at intersections (VISSIM provides a more detailed analysis of the right-turn movement than Synchro). In addition, the intersection of Forest Park Ave. and Grand Blvd. shows some discrepancies between the VISSIM and Synchro model. These discrepancies are due to the manner in which the programs handled traffic progression and right-turn movements along the I-64 ramps south of the intersection.

It is worth noting that there are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities. Bringing this intersection to-grade could potentially reduce traffic volumes at this intersection as compared to the straight growth assumed in this study, which in turn would potentially reduce the number of lanes necessary to maintain a LOS E. Similar intersections, such as Kingshighway Blvd. at Forest Park Ave., which have been brought to grade have experienced a reduction between 20-30% in traffic volumes once the intersection was brought to grade. However, the removal of traffic at this intersection could be a result of either the diversion of traffic to other intersections, which was beyond the scope of this study, or the dissipation of traffic due to reduction in trip making and/or modal shifts.

7.1.2. Tier 2 Limits: Arterials and Major Collectors

Tier 2 includes the areas outside of Tier 1, but within the study area as defined by Forest Park Ave. and Market St. to the north and Route 100 to the south. Tier 2 encompasses several arterials and major collectors that cross or run parallel to I-64.

7.1.2.1. Synchro Results

The traffic operations conditions within the Tier 2 limits were completed using the same methodology used for the Tier 1 traffic operations but were analyzed using only Synchro. **Figure 92** and **Figure 93** show the Year 2050 Corridor Alternative #3 operating conditions as modeled by Synchro for the Tier 2 limits. Per the approved scope, only overall intersection LOS is provided for intersections within the Tier 2 limits. Detailed operating conditions are provided in Appendix D. Event traffic for Grand Center or Midtown entertainment venues was not considered in the analysis.

As shown, each of the intersections has an overall LOS of D or better, with the exception of one intersection. Similar to the 2050 No Build (Maintenance Only) scenario, Kingshighway Blvd. at Route 100 operates at a failing LOS during both peak periods.

It should be noted that like Alternatives #1 and #2, many intersections within the further reaches of Tier 2 experience the same operating conditions as the No Build (Maintenance Only) scenario. This is because no lane configuration or traffic volumes changes were expected at those intersections, due to the proposed changes in Alternative #3. The following intersections have at least one approach with a LOS F or a v/c ratio of 0.95 or higher during either the AM or PM peak period:

AM PEAK HOUR

- Kingshighway Blvd. and Manchester Ave. (Route 100)
    - The eastbound and northbound approaches have a failing LOS during the AM peak period. The eastbound approach has a v/c of 1.18, the northbound approach has a v/c ratio of 1.28, and the southbound approach has a v/c ratio of 1.16.
- Forest Park Ave. and Grand Blvd. (at grade)
    - The westbound approach has a v/c ratio of 1.05. It should be noted that this intersection has been brought to grade in Alternative #3 and would require numerous travel and turn lanes to achieve a LOS E.
- Manchester Ave. and Taylor Ave.
    - The eastbound approach has a v/c ratio of 1.11, the westbound approach has a v/c ratio of 0.95, and the southbound approach has a v/c ratio of 0.99.
- Manchester Ave./Chouteau Ave. and Vandeventer Ave.
    - The northbound approach has a v/c ratio of 1.06, the westbound right-turn has a v/c ratio of 0.95, and the southbound left-turn has a v/c ratio of 0.96.

PM PEAK HOUR

- Kingshighway Blvd. and Forest Park Ave.
    - The westbound through movement has a v/c ratio of 1.06.

- Kingshighway Blvd. and Manchester Ave. (Route 100)
    - The eastbound and westbound approaches of Manchester Road fail. The eastbound approach has a v/c ratio of 1.10 and the westbound left-turn has a v/c ratio of 1.37. Additionally, the southbound approach of Kingshighway has a v/c ratio of 1.03, indicating it is over capacity.
- Manchester Ave. and Taylor Ave.
    - The southbound approach has a v/c ratio of 1.05.
- Chouteau Ave. and Jefferson Ave.
    - The eastbound approach has a failing LOS and a v/c ratio of 1.04. The westbound approach has a v/c ratio of 1.02 and the southbound approach has a v/c ratio of 1.12.

As stated above, many of the movements that experience a LOS F and/or a v/c ratio of 0.95 or higher are either side-street movements at unsignalized intersections where the traffic is unable to find a gap in the free-flowing traffic or where the traffic must wait through a long signal length, causing delays. More importantly, there are critical movements, most notably at Kingshighway Blvd. at Forest Park Ave., and Kingshighway Blvd. at Manchester Ave. that are over capacity. These intersections would require improvements in order to accommodate the anticipated 2050 traffic volumes regardless of the alternatives considered.

Overall, as shown for Alterative #3, the recommended lane configurations and traffic control are able to accommodate the projected traffic volumes. The addition of the I-64 eastbound on ramp from Vandeventer improves operations along Grand Blvd. as this access provides a viable alternative to access I-64 for vehicles traveling along Forest Park Ave. between Vandeventer and Grand Blvd.; as it was assumed that a portion would divert to the Vandeventer eastbound on ramp rather than travel through to Grand Blvd. This, in turn, diverts enough traffic away from Grand Blvd. that it allows for the reconstruction of the intersection of Forest Park Ave. and Grand Blvd to an at-grade intersection.

Figure 92. Alternative #3: Year 2050 Conditions - AM Tier 2 Synchro Analysis

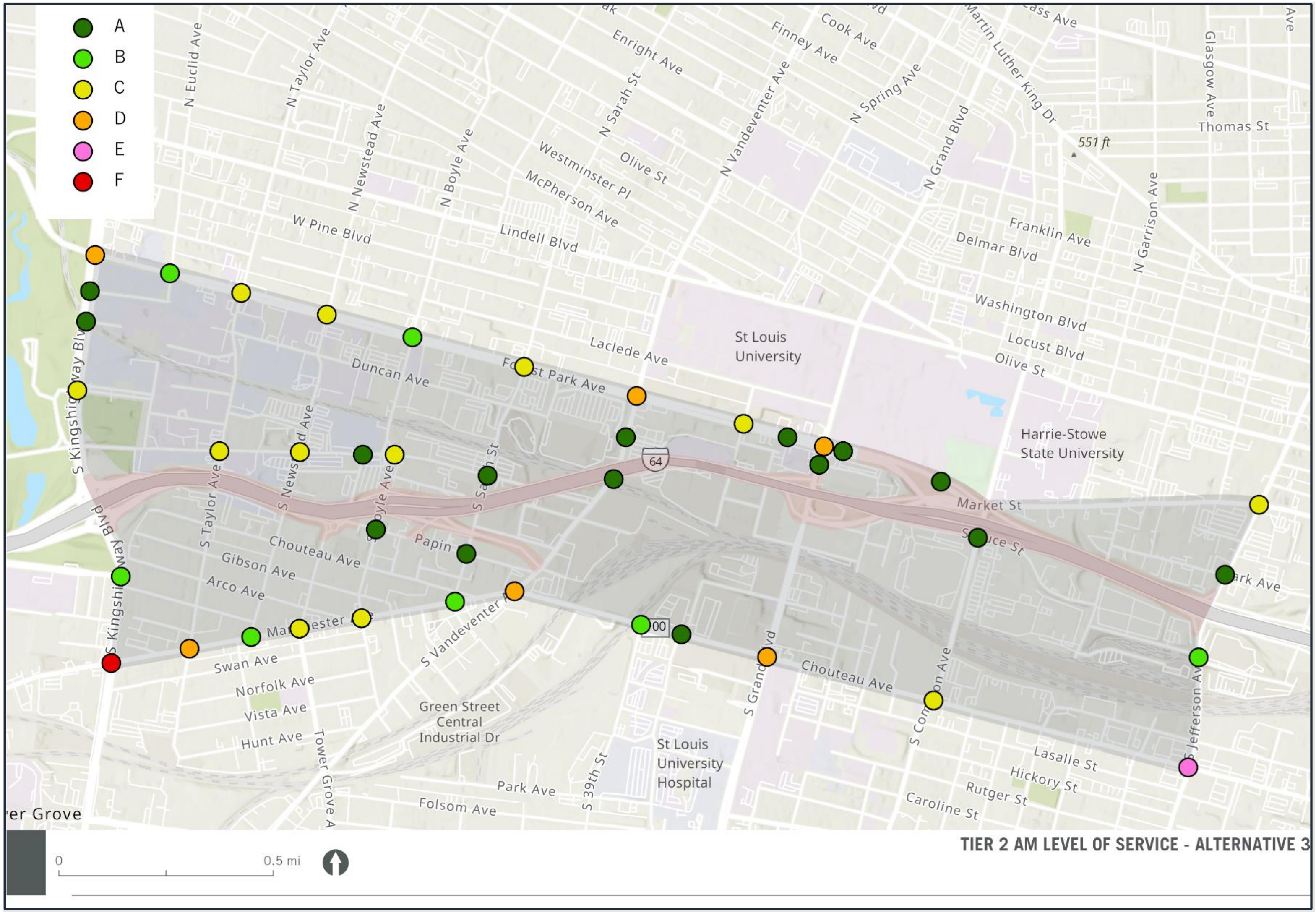
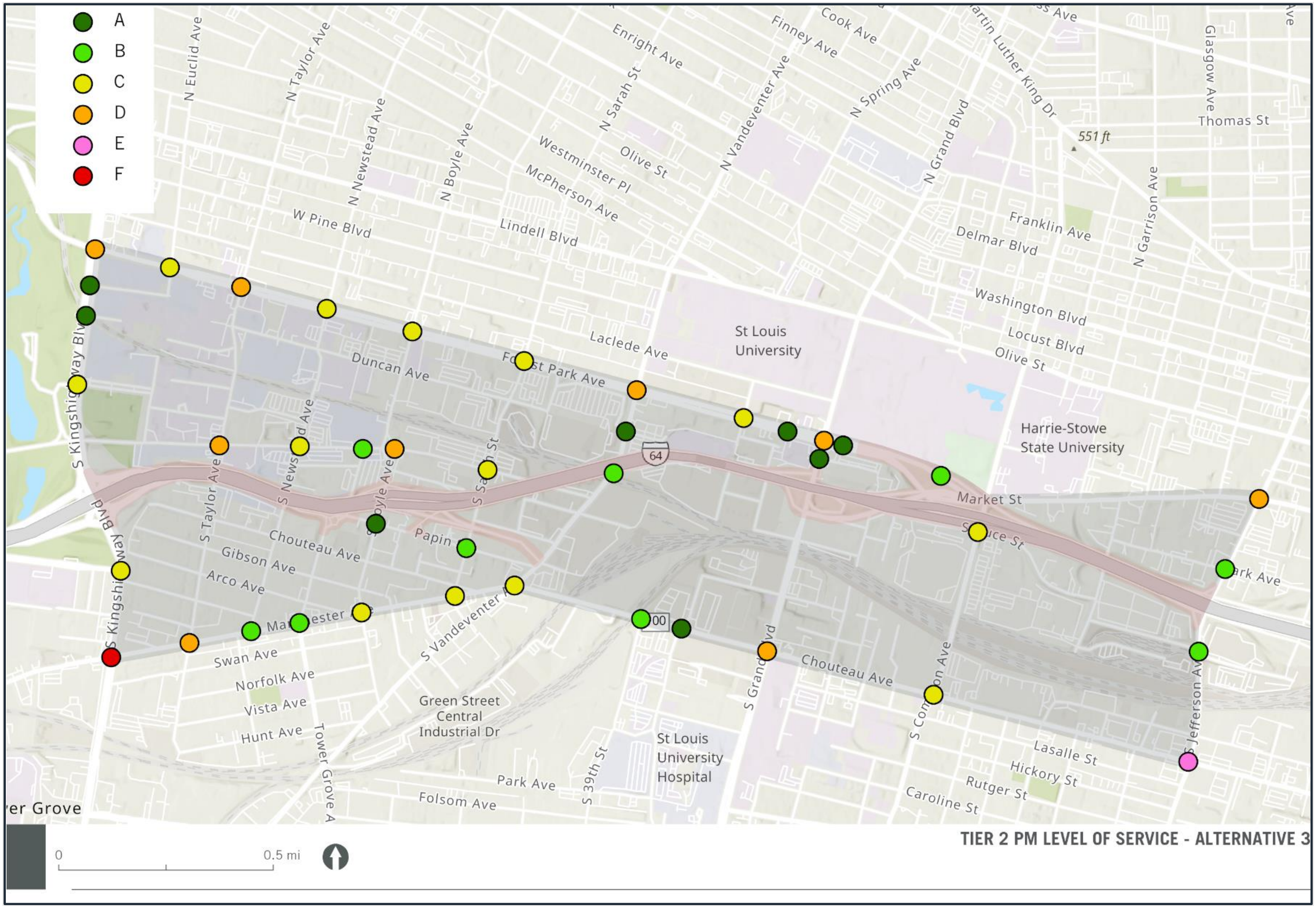


Figure 93. Alternative #3: Year 2050 Conditions - PM Tier 2 Synchro Analysis



7.2. SAFETY

The intent of the improvements presented in Alternative #3 were to addresses several existing safety issues from a vehicular perspective within the Tier 1 area, including the following:

- Extension of substandard deceleration and ramp length for the westbound I-64 off ramp to Boyle Ave.
- Improvements to Clayton Ave. and Boyle Ave. to better facilitate the flow of traffic to and from the Washington University Medical Campus and Cortex Commons.
- Improvement of the geometry of the eastbound off ramp to Grand Blvd.
- Removal of the left-hand entrance ramps from Vandeventer to westbound I-64 and from Forest Park Ave. to eastbound I-64.

7.2.1. Corridor Alternative #3 Interchange Spacing, Ramp Lengths & Access Points

Table 37, **Table 38**, and **Table 39** summarize the interchange and gore spacing for Alternative #3 as well as the anticipated ramp lengths. The spacing between each painted gore along the I-64 corridor for Alternative #3 is shown in **Figure 94.** As can be seen, Alternative #3 provides safety enhancements within Tier 1 by removing the eastbound off ramp to Market St., removing the westbound on ramp from Market St./Compton Ave, and both ramps to and from Forest Park Ave., one of which is a left sided entrance to I-64. In addition, this alternative relocates the westbound on ramp from Vandeventer Ave. to the right side of I-64, thereby eliminating both left sided entrance ramps along the corridor. The result is significantly improved gore spacing along the corridor.

Table 37. Alternative #3: Interchange Spacing

<table>
<tr><th>Interchange</th><th>Existing/No Build (Maintenance Only)</th><th>Design Standard[1/]</th><th>Alternative #3</th></tr>
<tr><td>S. Kingshighway Blvd. to
Tower Grove Ave. / Boyle Ave. / Papin St.*</td><td>3,440’</td><td>5,280’</td><td>3,650’</td></tr>
<tr><td>Tower Grove Ave. / Boyle Ave. / Papin St.*
to Vandeventer Ave.</td><td>3,100’</td><td>5,280’</td><td>2,890’</td></tr>
<tr><td>Vandeventer Ave. to
Grand Blvd.</td><td>2,440’</td><td>5,280’</td><td>2,440’</td></tr>
<tr><td>Grand Blvd. to
Market St. / Compton Ave.</td><td>2,125’</td><td>5,280’</td><td rowspan="2">5,110’</td></tr>
<tr><td>Market St. / Compton Ave. to
Jefferson Ave.</td><td>2,985’</td><td>5,280’</td></tr>
<tr><td>Jefferson Ave. to
22nd St.</td><td>1,200’</td><td>5,280’</td><td>1,200’</td></tr>
</table>

Note: Distance represent centerline of cross street to centerline of adjacent cross street

** Dist. based on a mid point b/w the Tower Grove and Boyle overpasses for NB and on Boyle for Alternative #3*
1/: Table 1, Publication No. FHWA-HRT-07-031 Safety Assessment of Interchange Spacing on Urban Freeways

Table 38. Alternative #3: Gore Spacing

Interchange	Existing/No Build (Maint. Only)	Design Standard	Alternative #3
I-64 Eastbound Direction			
I-64 EB On Ramp from S. Kingshighway Blvd. I-64 EB Off Ramp to Tower Grove Ave.	874’	1,600’	874’
I-64 EB Off Ramp to Tower Grove Ave. I-64 EB Off Ramp to Vandeventer Ave.	1,429’	1,000’	Vandeventer Off Ramp Removed
I-64 EB Off Ramp to Tower Grove Ave. I-64 EB On Ramp from Vandeventer Ave.	n/a	500’	2,720’
I-64 EB Off Ramp to Vandeventer Ave. I-64 EB On Ramp from Papin St.	1,191’	500’	Removed
I-64 EB On Ramp from Papin St. I-64 EB Off Ramp to Market St.	3,903’	1,600’	Removed
I-64 EB On Ramp from Vandeventer Ave. I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	n/a	1,600’	3,850
I-64 EB Off Ramp to Market St. I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	828’	1,000’	Market St. Removed
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.) I-64 EB On Ramp from Forest Park Ave.	1,755’	500’	Forest Park Ave. Removed
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.) I-64 EB On Ramp from Grand Blvd.	n/a	500’	1,480’
I-64 EB On Ramp from Forest Park Ave. I-64 EB Off Ramp to Jefferson Ave.	2,204’	1,600’	Forest Park Ave. Removed
I-64 EB On Ramp from Grand Blvd. I-64 EB Off Ramp to Jefferson Ave.	n/a	1,600’	3,260’
I-64 Westbound Direction			
I-64 WB Off Ramp to S. Kingshighway Blvd. I-64 WB On Ramp from Boyle Ave.	1,881’	1,600’	1,881’
I-64 WB On Ramp from Boyle Ave. I-64 WB On Ramp from Vandeventer Ave.	977’	1,000’	450’[1/]

Interchange	Existing/No Build (Maint. Only)	Design Standard	Alternative #3
I-64 WB On Ramp from Vandeventer Ave. I-64 WB Off Ramp to Boyle Ave.	755'	500'	1,590'
I-64 WB Off Ramp to Boyle Ave. I-64 WB On Ramp from Grand Blvd.	3,618'	1,600'	3,310'
I-64 WB On Ramp from Grand Blvd. I-64 WB On Ramp from Market St.	1,497'	1,000'	Market St. Removed
I-64 WB On Ramp from Grand Blvd. I-64 WB Off Ramp to Grand Blvd.	n/a	1,600'	1,849'
I-64 WB On Ramp from Market St. I-64 WB Off Ramp to Forest Park Ave.	2,468'	500'	Market St. Removed
I-64 WB Off Ramp to Grand Blvd. I-64 WB Off Ramp to Forest Park Ave.	n/a	1,000'	Forest Park Ave. Removed
I-64 WB Off Ramp to Grand Blvd. I-64 WB On Ramp from Jefferson Ave.	n/a	500'	3,260'
I-64 WB Off Ramp to Forest Park Ave. I-64 WB On Ramp from Jefferson Ave.	1,144'	1,600'	Forest Park Ave. Removed

Note: Gore spacing that is non-compliant has been highlighted. Blue text indicates differences between existing and Alt #2 where gore spacing is improved by removal of existing access, or new access meeting the design standard. Red text indicates differences between existing and Alt #2 where the change reduces gore spacing.

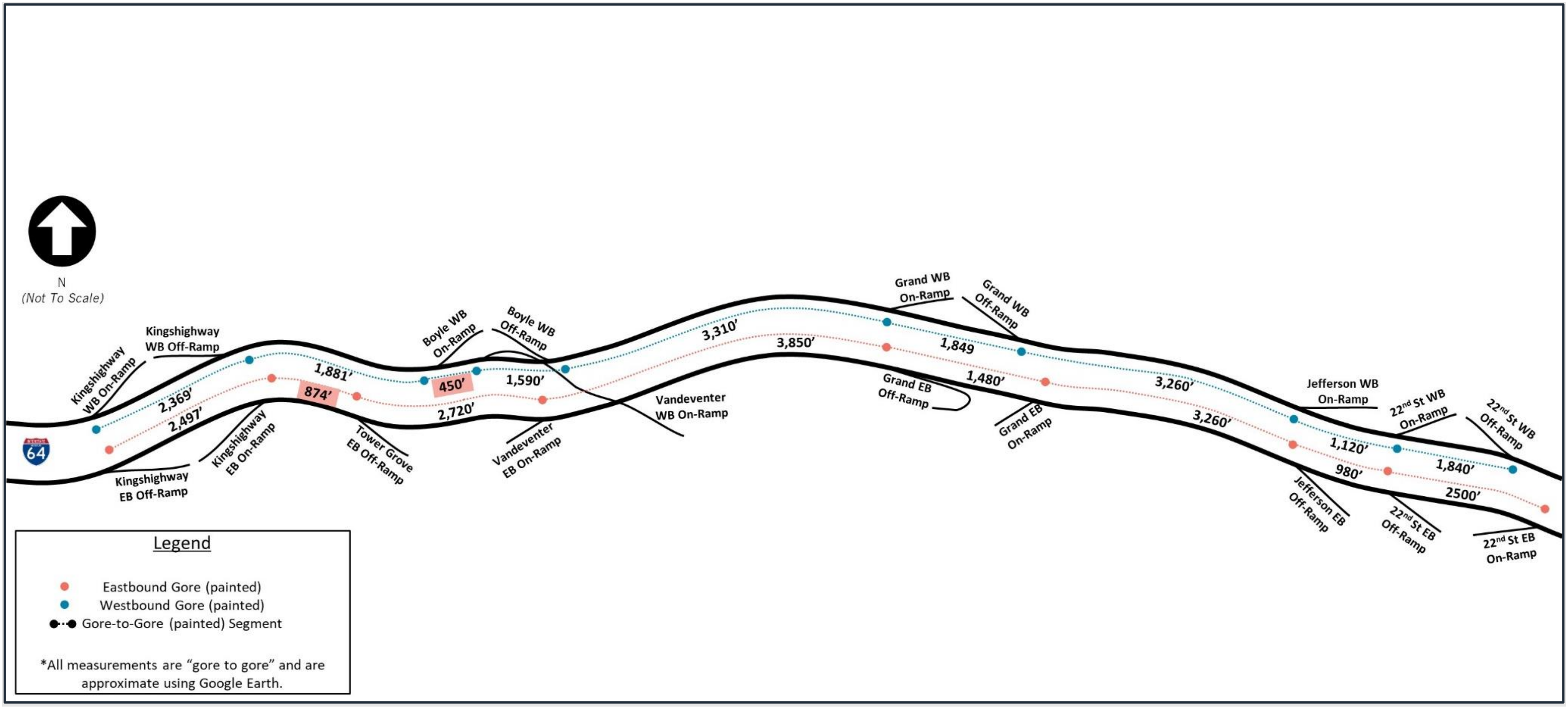
1/: 450 feet between two adjacent WB on ramps; each with an associated lane add to I-64. Effective weave distance to WB off at Kingshighway is 2,331' from WB Vandeventer gore.

Table 39. Alternative #3: Ramp Lengths

Ramp	Existing/No Build (Maintenance Only)	Alternative #3
Tower Grove Ave.		
I-64 EB Off Ramp to Tower Grove Ave.	1,010’	1,200’
Boyle Ave. / Papin St.		
I-64 WB On Ramp from Boyle Ave.	840'	840'
I-64 WB Off Ramp to Boyle Ave.	830'	1,150’
I-64 EB On Ramp from Papin St.	710'	1,500'
Vandeventer Ave.		
I-64 EB Off Ramp to Vandeventer Ave.	2,220'	Removed
I-64 WB On Ramp from Vandeventer Ave.	1,970'	2,500'
Grand Blvd.		
I-64 WB On Ramp from Grand Blvd.	830'	820'
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	660'	420'
Market St.		
I-64 WB On Ramp from Market St.	1,500'	Removed
I-64 EB Off Ramp to Market St..	2850'	Removed
Forest Park Ave.		
Forest Park Ave. Off Ramp to Market St.	2140'	Removed
I-64 WB Off Ramp to Forest Park Ave.	3100'	Removed
I-64 EB On Ramp to Forest Park Ave.	2150'	Removed

Note: Ramp length is considered to be the distance between the painted gore and the curb line of the cross street at the ramp terminal.

Figure 94. Alternative #3: I-64 Corridor Gore-to-Gore Measurements



As shown below in **Table 40**, Alternative #3 results in a net reduction in on ramps and off ramps to/from I-64. The number of interchanges would be reduced to five with I-64 and access points that connect I-64 to eight local and regional roadways. Noting the improved ramp lengths above, in conjunction with increased along with increased deceleration, acceleration lengths and gore spacing, there would be an overall positive impact to vehicular safety in the Tier 1 area along the I-64 corridor.

Table 40. Alternative #3: I-64 Access Locations

Location	Existing/No Build (Maintenance Only)		Alternative #3	
	On Ramps	Off Ramps	On Ramps	Off Ramps
Kingshighway Blvd.	2	2	2	2
Tower Grove Ave.	0	1	0	1
Boyle St.	1	1	2	2
Papin St.	1	0	0	0
Vandeventer Ave.	1	1	1	1
Grand Blvd.	1	1	2	1
Market St./Bernard St.	1	1	0	0
Forest Park Ave.	1	1	0	0
S. Theresa Ave./Spruce St.	0	0	0	1
Jefferson Ave./22nd St.	3	3	3	3
Total	22		21	

Note: Highlighted cells denote a change in ramp number from No Build (Maintenance Only) to Alternative #3.

7.2.2. Potential Crash Reduction

It should be noted that HSM, ISATe and/or IHSDM was not utilized for the I-64 PEL, as outlined in the approved Methods & Assumptions Report. Rather, existing crashes were categorized by contributing factors and severity for the Existing Conditions. The safety analysis of the three corridor alternatives is *qualitatively* based upon how each alternative addresses the safety deficiencies and needs identified in the Existing Conditions.

7.2.2.1. Tier 1 Limits: I-64

7.2.2.1.1. Applicable Crash Modification Factors

The following measurable elements can be determined in the No Build (Maintenance Only) and Alternative #2 scenarios, allowing for a comparison of the change in frequency of all crash types and severities.

Acceleration Lane Length – CMF ID 5216

$$CMF = e^{-4.55(L_{accelNew} - L_{accelExist})}$$

Where:

$L_{accelNew}$ = new (or proposed) length of acceleration lane in miles

$L_{accelExist}$ = existing length of acceleration lane in miles

Clearinghouse Reference - https://www.cmfclearinghouse.org/detail.cfm?facid=5216

-Deceleration Lane Length – CMF ID 3042

$$CMF = e^{2.198\ (Y - X)}$$

Where:

Y = new deceleration lane length in miles (length between 265’ – 900’)

Y = existing deceleration lane length in miles (length between 265’ – 900’)

Clearinghouse Reference - https://www.cmfclearinghouse.org/detail.cfm?facid=3042

Table 41, **Table 42**, and **Table 43** summarize the acceleration lane lengths, deceleration lane lengths, shoulder lane widths, and their associated CMFs for Alternative #3.

Table 41. Alternative #3: Freeway Acceleration Lane Lengths & CMFs

Acceleration Lane	Existing/No Build (Maintenance Only)	Design Standard	Alternative #3	CMF*
I-64 WB On Ramp from Boyle Ave.	1,880’	1,326’	1880’	No Change
I-64 EB On Ramp from Papin St.	415’	780’	1470’	0.73
I-64 WB On Ramp from Vandeventer Ave.	Adds Lane	n/a	Adds Lane	No Change
I-64 WB On Ramp from Grand Blvd.	540’	1,092’	1120’	0.61
I-64 WB On Ramp from Market St.	550’	670’	Removed	N/A
I-64 EB On Ramp from Forest Park Ave.	1,290’	670’	Removed	N/A

** CMF Calculated is based on CMF ID 5216 in the CMF Clearinghouse*

Table 42. Alternative #3: Deceleration Lane Lengths & CMFs

Deceleration Lane	Existing/No Build (Maintenance Only)	Design Standard	Alternative #3	CMF*
I-64 EB Off Ramp to Tower Grove Ave	872’	352’	872’	No Change
I-64 WB Off Ramp to Boyle Ave	275’	256’	980’	0.79
I-64 EB Off Ramp to Vandeventer Ave	782’	285’	Removed	N/A
I-64 EB Off Ramp to Grand Blvd. (Loop Ramp at Grand Blvd.)	285’	410’	870’	0.78
I-64 EB Off Ramp to Market St.	200’	342’	Removed	N/A
Forest Park Ave. Off Ramp to Market St.	627’	266’	Removed	N/A
I-64 WB Off Ramp to Forest Park Ave.	1,796’	380’	Removed	N/A

** CMF Calculated is based on CMF ID 3042 in the CMF Clearinghouse*

Table 43. Alternative #3: Ramp Shoulder Widths & CMFs

Location	Existing/No Build (Maintenance Only)		Alternative #3		CMF*
	Inside	Outside	Inside	Outside	% Change
I-64 EB Off Ramp to Tower Grove Ave.	4’	8’	4’	8’	No Change
I-64 EB Off Ramp to Vandeventer Ave.	5.5’	5.5’	Removed		N/A
I-64 EB On Ramp from Boyle Ave. (Existing at Papin St.)	4’	4’	4’	8’	FI: 24% PDO: 11%
I-64 EB Off Ramp to Market St.	2’	3’	Removed		N/A
I-64 EB Off Ramp to Theresa/Spruce (Existing Loop Ramp at Grand Blvd.)	2’	2’	4’	8’	FI: 38% PDO: 17%
I-64 WB Off Ramp to Forest Park Ave.	4’	8’	Removed		N/A
I-64 WB On Ramp from Grand Blvd.	4’	4’	4’	8’	FI: 24% PDO: 11%
I-64 WB Off Ramp to Boyle Ave.	4’	4’	4’	8’	FI: 24% PDO: 11%
I-64 WB On Ramp from Boyle Ave.	4’	8’	4’	8’	0

**Assumed that if a ramp is new or modified, then shoulders would meet base requirements of 4’ inside and 8’ outside. The CMF column is a percent reduction of all crashes, utilizing equations 19-35 and 19-36 of the current HSM.*

Alternative #3 would also include improved inside shoulder widths on the mainline between Newstead Ave. and Sarah St. on the west end, as tabulated in **Table 44**. For EB I-64, mainline and ramp improvements would allow for standard inside shoulders between a point 125' west of Theresa Ave. (extended) and Ewing Ave., while widening of the inside shoulder on WB I-64 from Ewing Ave. to a point 400' west of Compton Ave. would not be tied to adjacent mainline improvements.

Table 44. Alternative #3: Freeway Shoulder Widths & CMFs

Location	Existing/No Build (Maintenance Only)		Alternative #1		CMF*
	Inside	Outside	Inside	Outside	% Change
I-64 EB/WB between Newstead Ave. and Sarah St.	5.5'	10'	10'	10'	FI: 7% PDO: 8%
I-64 EB between 125' west of Theresa Ave. and Ewing Ave.	4'	10'	10'	10'	FI: 10% PDO: 9%
I-64 WB between 400' west of Compton Ave. and Ewing Ave.	4'	10'	10'	10'	FI: 10% PDO: 9%

** CMFs based on HSM equations 18-25 and 18-26*

Using HSM equation 18-26, the resulting safety impact is a 6% reduction in PDO crashes and 8% reduction in FI crashes on the west end. Similarly, increasing the inside shoulder width between Theresa Ave. and Ewing Ave. would reduce PDO crashes by 9% and FI crashes by 10%.

7.2.2.1.2. Qualitative Safety Summary

High crash frequencies were previously identified in the Existing Conditions along I-64 and several of the major corridors within the study area, including Jefferson Ave., Grand Blvd., Vandeventer Ave., Kingshighway Blvd., and I-64 ramp intersections. However, the improvements associated with Alternative #3 would address some of these concerns, such as the westbound off ramp at Boyle Ave. or the concerns associated with the eastbound loop ramp at Grand Blvd. However, Alternative #3 does not address the following existing safety concerns (note that modifications to the interchange configurations at Kingshighway Blvd. and Jefferson Ave./22nd St. were not contemplated as part of this PEL given the relatively recent and/or ongoing reconstruction at these locations):

- I-64 & Jefferson Ave. (inclusion of this location is based upon crash data from 2017 thru 2020, prior to the reconstruction of this interchange)
- I-64 over Vandeventer Ave. (~50/50, slightly higher EB)
- I-64 EB between Kingshighway Blvd. and Tower Grove Ave.
- I-64 & Kingshighway Blvd.

Similar to Alternative #2, this scenario addresses an existing crash hot spot on I-64 near Grand Ave. by adjusting the geometry of the eastbound off ramp at Grand Ave. from a loop to a tangent section terminating at a roundabout. Noting Alternative #3 is the only case where the existing left hand entrance from Vandeventer Ave. to westbound I-64 is converted to a traditional right hand entrance, the potential for weaving movements for vehicles trying to access the Kingshighway interchange or points west is eliminated. Alternative #3 also uniquely moves the terminal for the eastbound off ramp to Tower Grove Ave. and Boyle Ave. further east, lengthening the overall amount of space for vehicles to decelerate and queue. However, the existing roundabout at Tower Grove Ave. is essentially replaced by a signalized terminal at Boyle Ave., which mutes the safety benefit of the longer ramp length.

A quantitative safety analysis investigating the impact of improvements presented In Alternative #3, in addition to other countermeasures found to be feasible during subsequent detailed design efforts, will inform the decision-making process when selecting preferred transportation improvements.

7.2.2.2. Tier 2 Limits: Arterials & Major Collectors

7.2.2.2.1. Applicable Crash Modification Factors

Given the complexity of the proposed modifications, few CMFs are directly applicable to arterials and major collectors. The CMFs identified in **Table 45** would apply to improvements proposed as part of Alternative #3.

Table 45. Alternative #3: Tier 2 CMFs

Safety Improvement	CMF*	CMF (%)	Applicable Location
Conversion of intersection to right-in right-out only	0.41	59%	Grand Blvd. at Council Plaza

** CMF based on "Analysis of Right-In, Right-Out Commercial Driveway Safety, Operations and Use of Channelization as Compliance Countermeasure", May 2017 Clemson University.*

7.2.2.2.2. Qualitative Safety Summary

The safety of the broader study area network would improve as a result of the following improvements proposed by Alternative #3:

- Removal of the existing traffic signal at Grand Blvd. and Council Plaza. Less than 150 feet of vehicle stacking distance exists between this signal at the adjacent signal at Forest Park Ave. Removing this signal and converting the side street approaches to right-in right-out only will reduce conflict points and increase intersection spacing along Grand Blvd. to separate decision points and aid in wayfinding.
- Bringing Forest Park Ave. to grade at Grand Blvd. The intersection, which effectively acting as two closely spaced ramp terminals between the roadways, currently functions as one wide intersection that is confusing and often results in vehicles stopping incorrectly in between the signalized intersections. This creates a dangerous condition where turning traffic and stopped vehicles are in conflict within one another in a confined space. Creating an at-grade intersection, albeit large in size due to the need for multiple lanes, would simplify operations for all users, resulting in a more intuitive configuration.

- Increasing traffic capacity at Boyle Ave. and Clayton Ave. Morning peak period congestion on northbound Boyle Ave. originates at the signal at Clayton Ave. Providing increased capacity by widening the northbound approach and expanding the intersection overall will reduce backups, thereby alleviating congestion exiting westbound I-64 at Boyle Ave. in the morning.
- Relocating I-64 eastbound onramp from Papin St. to Boyle Ave. This will establish a more traditional interchange configuration at Boyle Ave, which would, in turn, lessen the interstate traffic that utilizes Papin St, which is a local street in the Forest Park Southeast neighborhood. This should result in tangible safety improvements for Papin St, as fewer vehicular trips should enable the street to function as a neighborhood street, potentially attracting more pedestrians and bicyclists. Furthermore, the addition of the eastbound on ramp via Boyle Ave. meets drivers' expectations in terms of one roadway providing access to the interstate in multiple directions.
- Relocating I-64 eastbound off ramp terminus from Tower Grove Ave. to Boyle Ave. Similar to the relocation of the on ramp, this results in a full traditional diamond interchange with all four I-64 ramps connecting directly to Boyle Ave, differing from Alternative #2 which keeps the eastbound off-ramp terminus at Tower Grove Ave. All access via Boyle would meet driver's expectations and reduce circuitous travel. Alternative #3 facilitates the closure of a portion of Tower Grove Ave. across I-64 to vehicular traffic, which provides for safer non-motorized crossing while also protecting the use of Tower Grove Ave. as a local roadway.
- Directly connecting Market St. and Forest Park Ave. Establishing this connection and reducing the confusing system of ramps at the existing Forest Park Ave./Compton Ave. interchange would be expected to improve safety. Ease of navigation will be improved; access to/from I-64 will be shifted to a traditional interchange on Grand Blvd; and short-distance lane changes and merging associated with the existing system of ramps will be eliminated.
- Removal of both left-sided entrance ramps to I-64 within the PEL Study area represents a standardization of access that provides for a safer corridor.

Despite these improvements, some areas of concern within Tier 2 would remain, as follows:

- Chouteau Ave. & Jefferson Ave.
- Grand Blvd. & Chouteau Ave.
- Chouteau Ave. & Vandeventer Ave.
- Kingshighway Blvd. & Forest Park Ave.
- Kingshighway Blvd. & Hospital Dr.
- Manchester Ave. & Kingshighway Blvd.

Figure 95 depicts the locations of likely safety concerns (based upon locations identified in the Existing Conditions Report that are not directly addressed from a safety perspective by this alternative) assuming Alternative #3 is in place. However, as new developments occur in the study area driving economic activity and vehicular traffic, additional locations may become high frequency locations. For example, significant new developments planned in the Chouteau Ave. and Forest Park Ave. corridors may increase the flow of traffic in those areas creating opportunities for more crashes. However, it should be noted that the responsible agencies would request proven safety countermeasures to be implemented with any significant development, with considerations given to the context of the adjacent corridor(s) potentially changing mode share and user population. Concurrently, each agency will continuously incorporate safety countermeasures as part of maintenance activities and capital improvement projects in an effort to address needs for users of all ages and abilities.

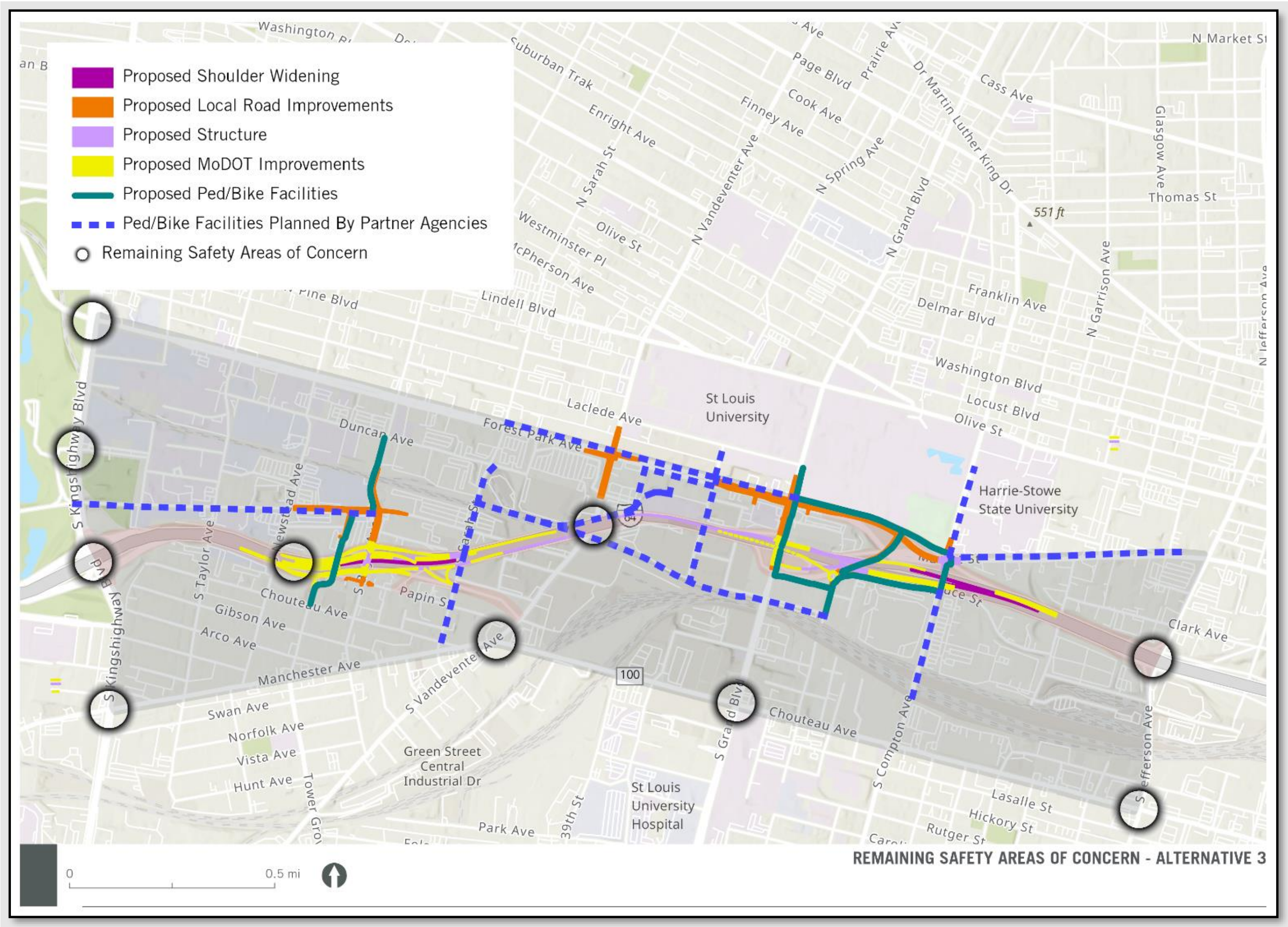
7.2.2.3. Safety Enhancements for Bicyclists and Pedestrians

Crashes involving bicyclists and pedestrians are much more likely to result in an injury or fatality because the relationship between vehicle speed at impact and the severity of the crash is non-linear as speeds increase. Additional bicycle and pedestrian facilities in Alternative #3 include the following:

- Repurposing of Tower Grove Ave. across I-64 to bicyclist or pedestrian only which includes a grade-separated crossing at I-64 eastbound off ramp and south outer road connection to Boyle Ave.
- A grade-separated crossing for bicyclists and pedestrians on Tower Grove Ave. at the I-64 south outer road
- A new shared use multiuse path north of Forest Park Ave. from Market St./Compton Ave. to Spring Ave.
- A parallel multiuse path along Theresa Ave. crossing I-64.

Not only do these facilities effectively separate bicyclists and pedestrians from vehicles to improve safety but also create safer opportunities for crossing I-64. Additionally, the Forest Park Ave. and Theresa Ave. multiuse paths allow users to travel south to the Grand transit center without relying upon Grand Blvd. Later phases of project development and design should consider specific pedestrian and bicyclist safety countermeasures and design treatments such as illuminated refuge islands, curb extensions, high-visibility crosswalks, rectangular rapid flashing beacons, and separated intersections for bicyclists.

Figure 95. Alternative #3: Safety Areas of Concern



7.3. MULTIMODAL MOBILITY

As the study area experiences continued growth and development in the coming years, multimodal transportation will become increasingly essential to the movement of residents, employees, and visitors to the area. Based on assumptions regarding investments in active transportation reflected in Alternative #3, it is evident that the surface transportation network would be a safer, more connected, and more comfortable place to walk, bike, and access transit. This section of the report documents conditions in Year 2050 assuming the infrastructure represented in Alternative #3 is in place, including committed and likely active transportation projects, bicycle and pedestrian comfort and connectivity, anticipated transit investments, and future transit ridership and access.

7.3.1. Pedestrian & Bicycle Activity

This section discusses the pedestrian and bicycle operations anticipated for Alternative #3. Each element is discussed independently in terms of operation and connectivity. However, many of the facilities anticipated to serve these modes would likely involve adding multiuse paths.

7.3.1.1. Pedestrian Facilities

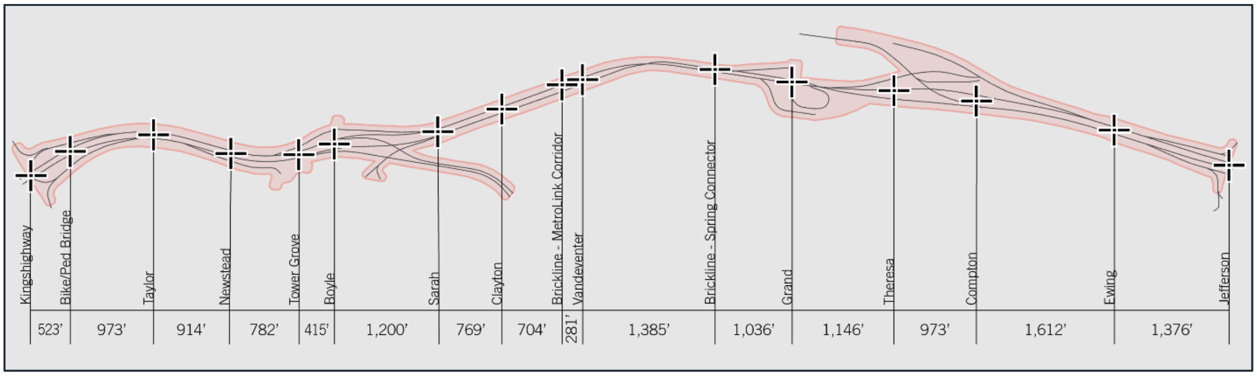
7.3.1.1.1. Proposed Pedestrian Improvements

In addition to the committed and likely projects described in the No Build (Maintenance Only) scenario in Section 4.3.1., Alternative #3 includes the following pedestrian facilities:

- Multiuse path across I-64 via Tower Grove Ave., which would be restricted to non-motorized modes only.
- Grade-separated crossing of the proposed eastbound one-way outer road at Tower Grove Ave.
- Parallel multiuse path on Forest Park Ave. between Grand Blvd. And Market St./Compton Ave.
- Parallel multiuse path on Theresa Avenue between Scott Ave. and Forest Park Ave.
- Parallel multiuse path on Bernard St. Between Grand Blvd. and Theresa Ave.

These improvements are located within or adjacent to the Tier 1 study area, enhancing existing I-64 crossings and within the interchange improvement alternatives areas of influence while creating new low-stress crossings for pedestrians. Combined with the committed and likely pedestrian network additions, Alternative #3 pedestrian improvements would reduce the barrier effect of I-64. New crossings along the Brickline Greenway parallel to the MetroLink at Vandeventer Ave., at 39th St., and at Theresa Ave. would reduce distances between interstate crossings and increase network connectivity to destinations along the corridor. It should be noted that while the No Build (Maintenance Only) scenario identifies Spruce St. to Compton Ave. to Market St. as the current path option, this alternative offers Theresa Ave. to Forest Park Ave. as an alternative option. Alternative #3 scenario provides a total 16 crossings supporting active transportation, four of which are pedestrian- and bicycle-only bridges. These crossings are displayed below in **Figure 96.**

Figure 96. Alternative #3: I-64 Pedestrian & Bicycle Crossings of I-64



7.3.1.1.2. Pedestrian Level of Service (PLOS)

PLOS provides an objective measure of the perceived pedestrian experience based on sidewalk and roadway geometry and motor vehicle travel speeds. The underlying premise of the HCM's PLOS still drives the scoring in the simplified methodology: pedestrian comfort increases with fewer travel lanes, lower vehicle speeds, and greater separation from motor vehicle traffic. Scores range from PLOS 1 (lowest stress) to PLOS 5 (highest stress). As described in the No Build (Maintenance Only) section, the methodology has been adjusted to account for the impact of interstate ramp intersections on pedestrian level of service. The results of the PLOS analysis, which are displayed in **Figure 97** highlight the impact that likely and committed investments in pedestrian mobility would have within the study area if improved per Alternative #3. It is important to note that multiuse paths and other pedestrian pathways located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

Alternative #3 provides moderate improvements in pedestrian levels of service as compared to the No Build (Maintenance Only) alternative. **Figure 98** displays the percentage of roadway network miles by level of traffic stress for Alternative #3 and No Build (Maintenance Only) scenarios. Most notable are a 7% increase in PLOS 1 network miles and a decrease of 5% in PLOS 5 resulting from multiuse path and sidewalk installations along existing and new roadway segments. Potential high-stress conflict points remain at interstate interchanges, as indicated in **Figure 97**. Mitigation of these conflict points through design interventions that reduce pedestrian exposure to motor vehicle traffic should be considered in project development and detailed design.

As described in the Existing Traffic, Safety, and Multimodal Conditions Report, it is likely that the PLOS results do not accurately reflect the pedestrian experience and present level of service in a more favorable light, reasons for which were presented in that report. Regardless of those potential shortcomings, the changes in level of service scores between the No Build (Maintenance Only) alternative and this alternative are measurable and reflect the benefit to pedestrian comfort afforded by Alternative #3 improvements.

Figure 97. Alternative #3: Pedestrian Level of Service

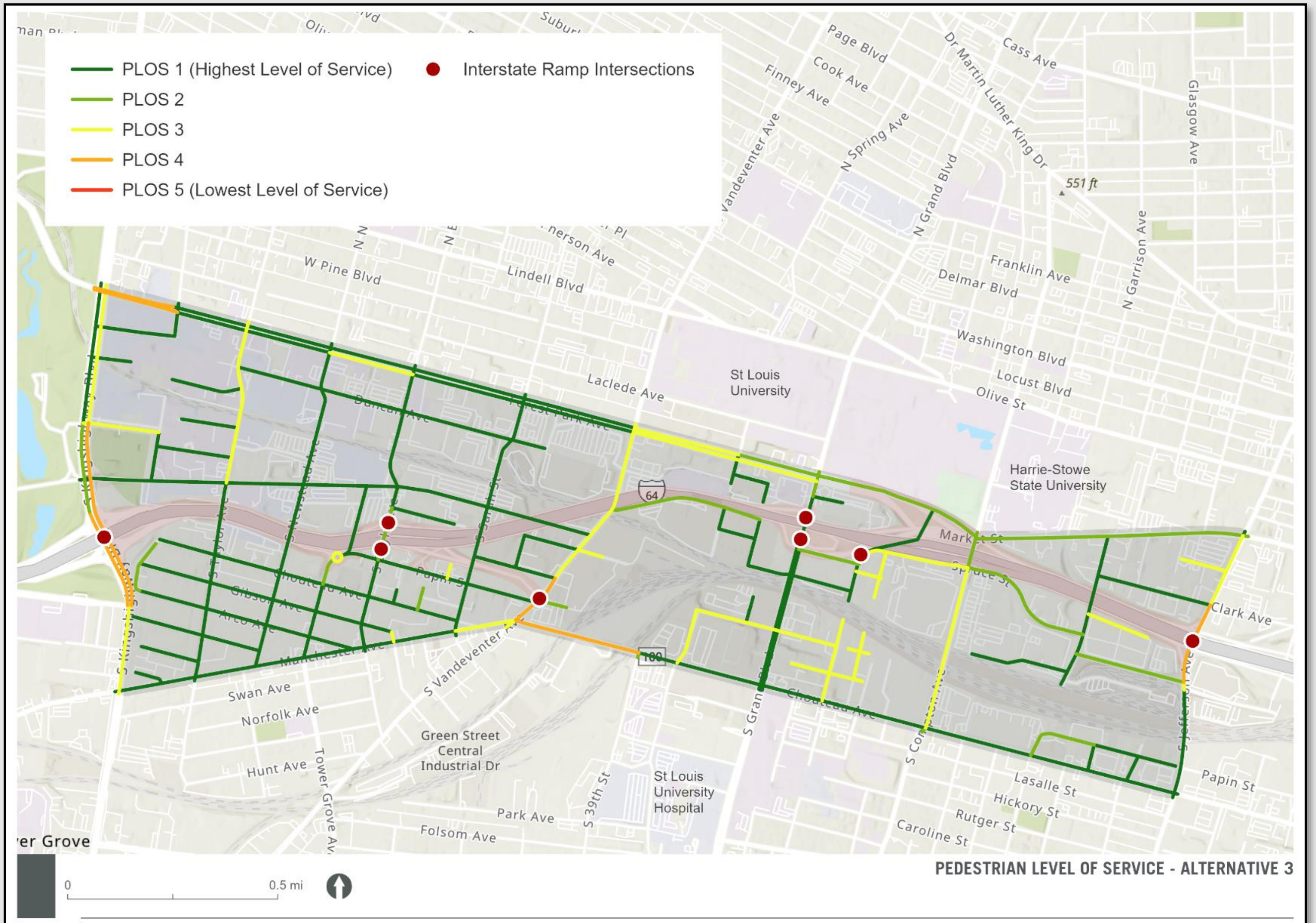
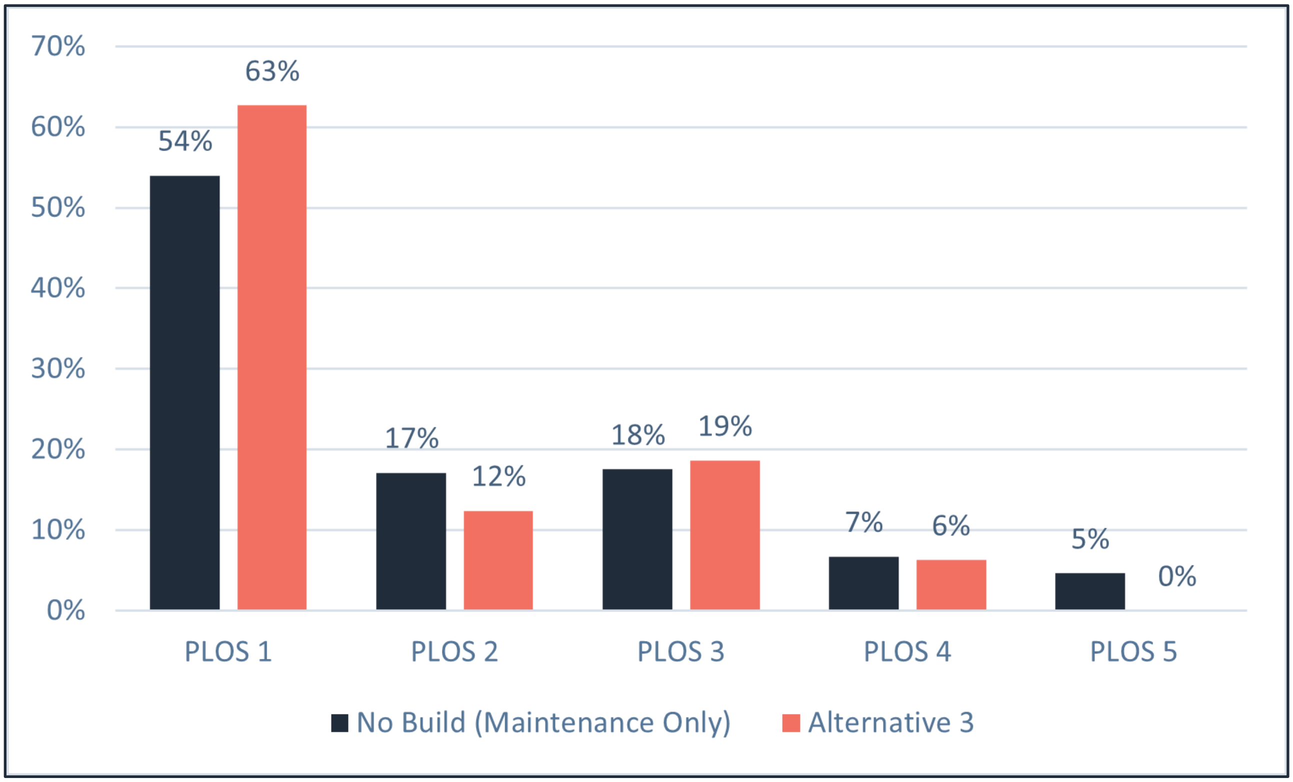


Figure 98. Alternative #3: Percent of Roadway Network by Pedestrian Level of Service



7.3.1.1.3. Pedestrian Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, pedestrian network connectivity was analyzed for Alternative #3 based on ten-minute/half-mile pedestrian travelsheds. Pedestrian connectivity scores vary widely throughout the study area, from a low of 0.08 to a high of 0.94, with lower scores representing poor connectivity and higher scores representing greater connectivity. Note that even small network changes can have large effects on individual scores. These ratios are displayed in **Figure 99**. The average (mean) pedestrian connectivity score is 0.46, which indicates that roughly 46% of the land area within walking distance can be reached based on the characteristics of the pedestrian network. This represents the greatest increase over the No Build (Maintenance Only) scenario mean pedestrian connectivity of 0.42 (42%) when compared to the other alternatives.

Figure 100 displays Alternative #3 improvements in pedestrian connectivity ratios over the No Build (Maintenance Only) scenario. The results show how increased local links in the roadway network associated with Alternative #3 impact people's ability to walk to nearby destinations. The greatest improvements are located in the middle of the corridor between Sarah St. and Compton Ave., north of the railroad corridor.

Figure 99. Alternative #3: Pedestrian Connectivity Analysis Results

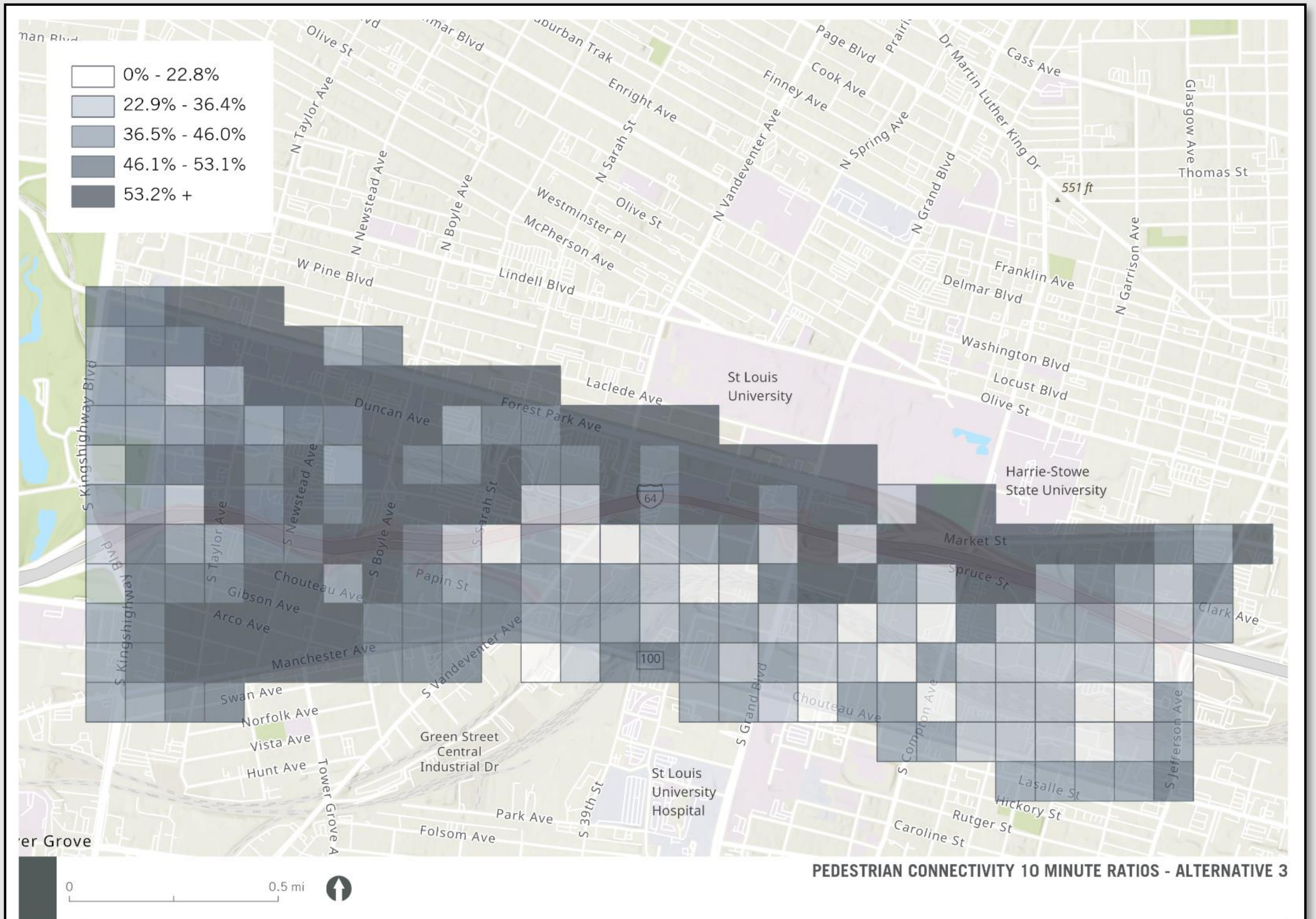
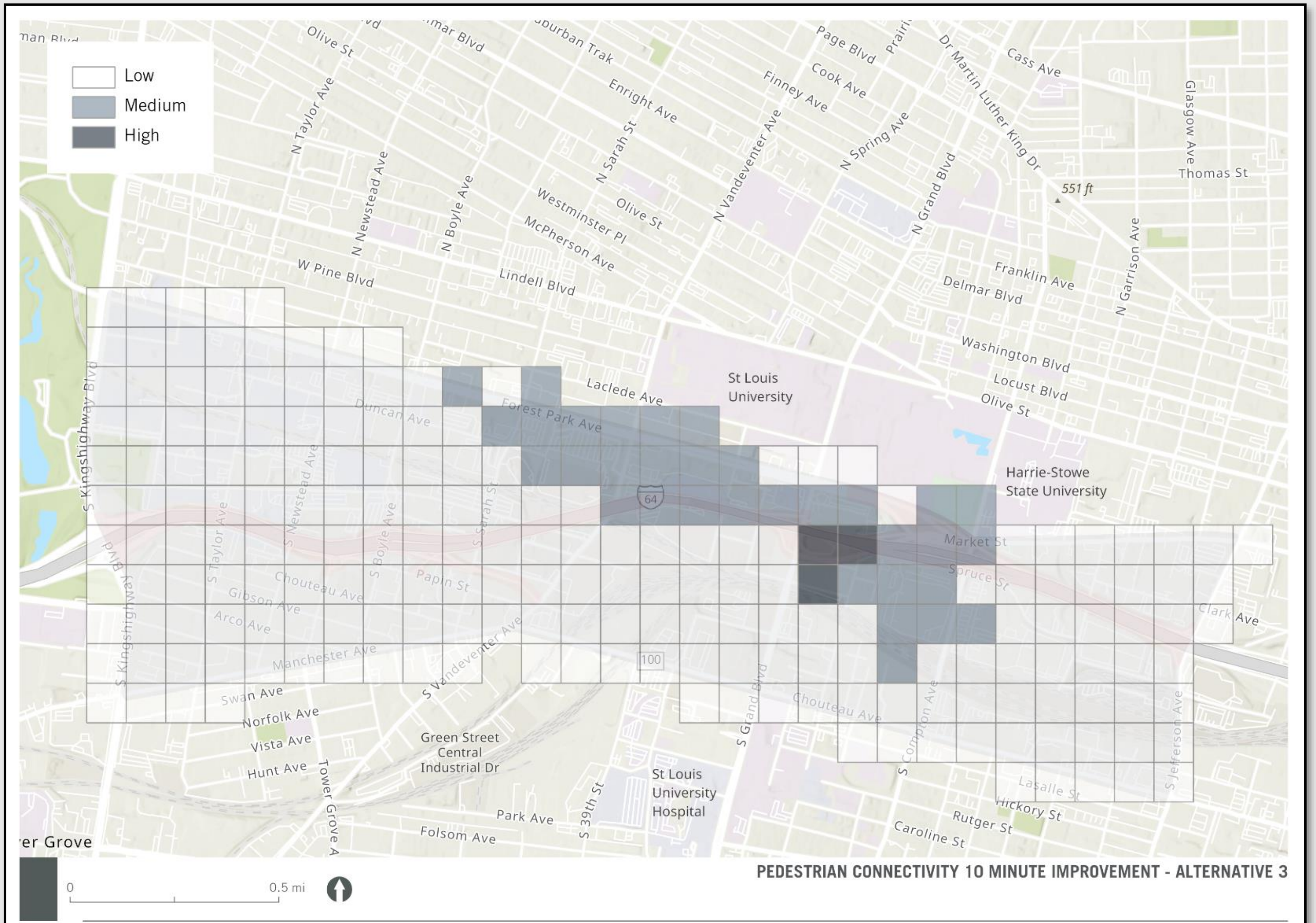


Figure 100. Alternative #3: Pedestrian Connectivity Ratio Improvements



7.3.1.2. Bicycle Facilities

7.3.1.2.1. Proposed Bicycle Improvements

In addition to the committed and likely projects described in the No Build (Maintenance Only) scenario in Section 4.3.1., Corridor Alternative #3 includes the following bicycle facilities:

- Multiuse path across I-64 via Tower Grove Ave., which would be restricted to non-motorized modes only.
- Grade separated crossing of the proposed eastbound one-way outer road at Tower Grove Ave.
- Low-stress separated bikeway Grand Blvd. to north of Forest Park Ave.
- Parallel multiuse path on Forest Park Ave. between Grand Blvd. and Market St./Compton Ave.
- Parallel multiuse path on Theresa Avenue between Scott Ave. and Forest Park Ave.
- Parallel multiuse path on Bernard St. Between Grand Blvd. and Theresa Ave.

These improvements are located within or adjacent to the Tier 1 study area, enhancing existing I-64 crossings and within the interchange improvement alternatives areas of influence while creating new low-stress crossings for people traveling by bicycle.

7.3.1.2.2. Bicycle Level of Traffic Stress (BLTS)

Bicycle Level of Traffic Stress (BLTS) provides an intuitive framework to categorize roadways based on the level of stress, or conversely level of comfort, for people bicycling. The analysis incorporates motor vehicle volumes, posted speed limits, the presence of parking, and the presence of bike lanes as key determinants of level of traffic stress. Scores range from BLTS 1 (lowest stress) to BLTS 4 (highest stress). As described in the No Build (Maintenance Only) section, the BLTS methodology has been adjusted to account for the negative impact of interstate ramp intersections on level of stress for people bicycling.

The results of the BLTS analysis, which are displayed in **Figure 101**, highlight the impact of investments in active transportation compared to current conditions. It is important to note that multiuse paths located in independent rights of way and not adjacent to motor vehicle traffic are omitted from the analysis and findings.

While low-stress network additions related to Alternative #3 do add valuable connections across and adjacent to I-64, there are minimal changes to overall levels of traffic stress for bicycling in the study area. **Figure 102** shows the percentage of roadway network miles by level of traffic stress for the No Build (Maintenance Only) and Alternative #3 scenarios. There is a slight increase in the percentage of low-stress BLTS 1 roadways from 19% to 21%, and a corresponding decrease in high-stress BLTS 3 and BLTS 4 roadways of a percentage point or less. Much like the No Build (Maintenance Only) scenario, the western half of the study area from Vandeventer Ave. to Kingshighway Blvd. remains largely unchanged in terms of level of traffic stress, as major arterials like Forest Park Ave., Kingshighway Blvd., Manchester Ave., and Vandeventer Ave. are not expected to see investments in low-stress bicycle facilities.

Figure 101. Alternative #3: Bicycle Level of Traffic Stress

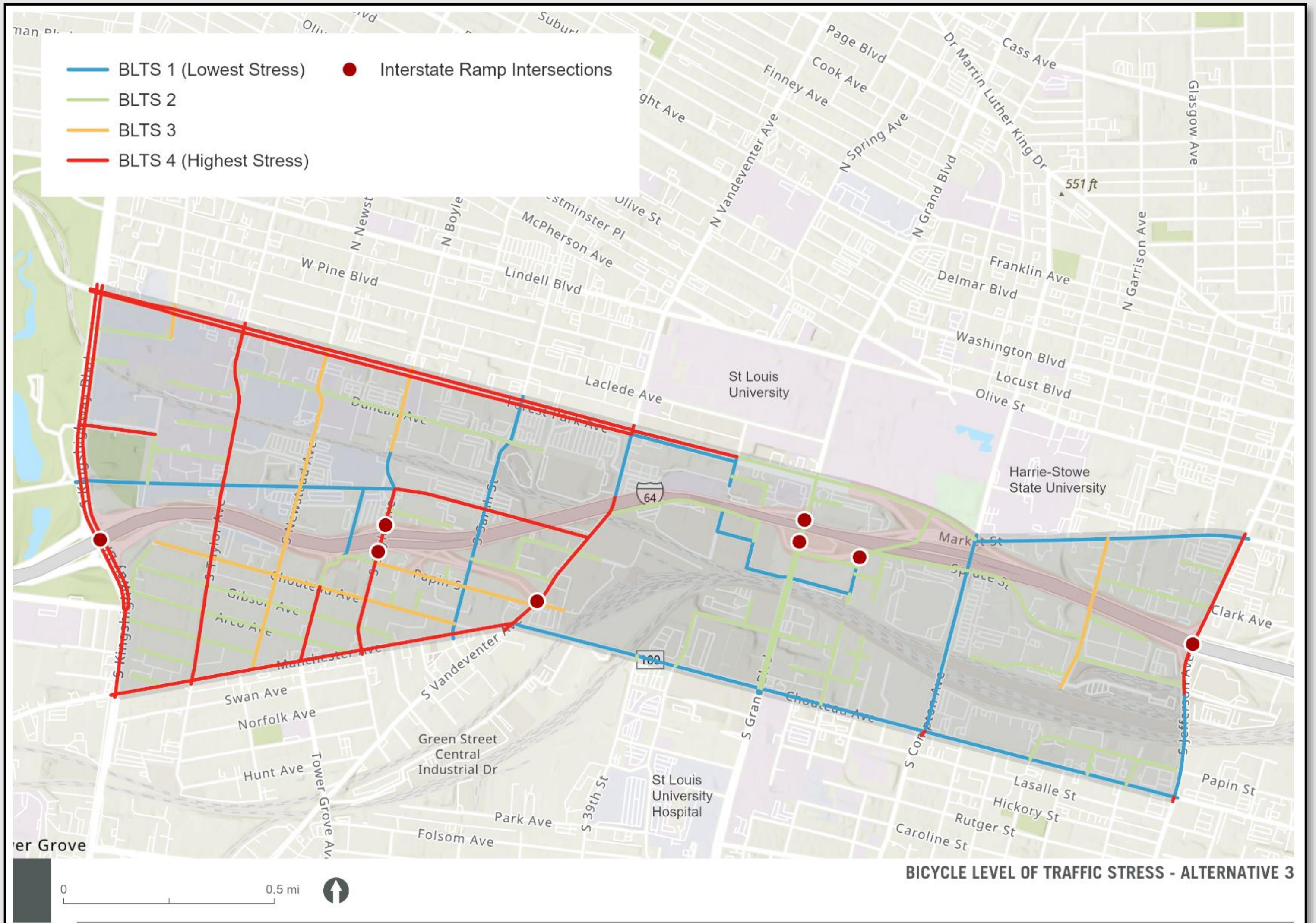
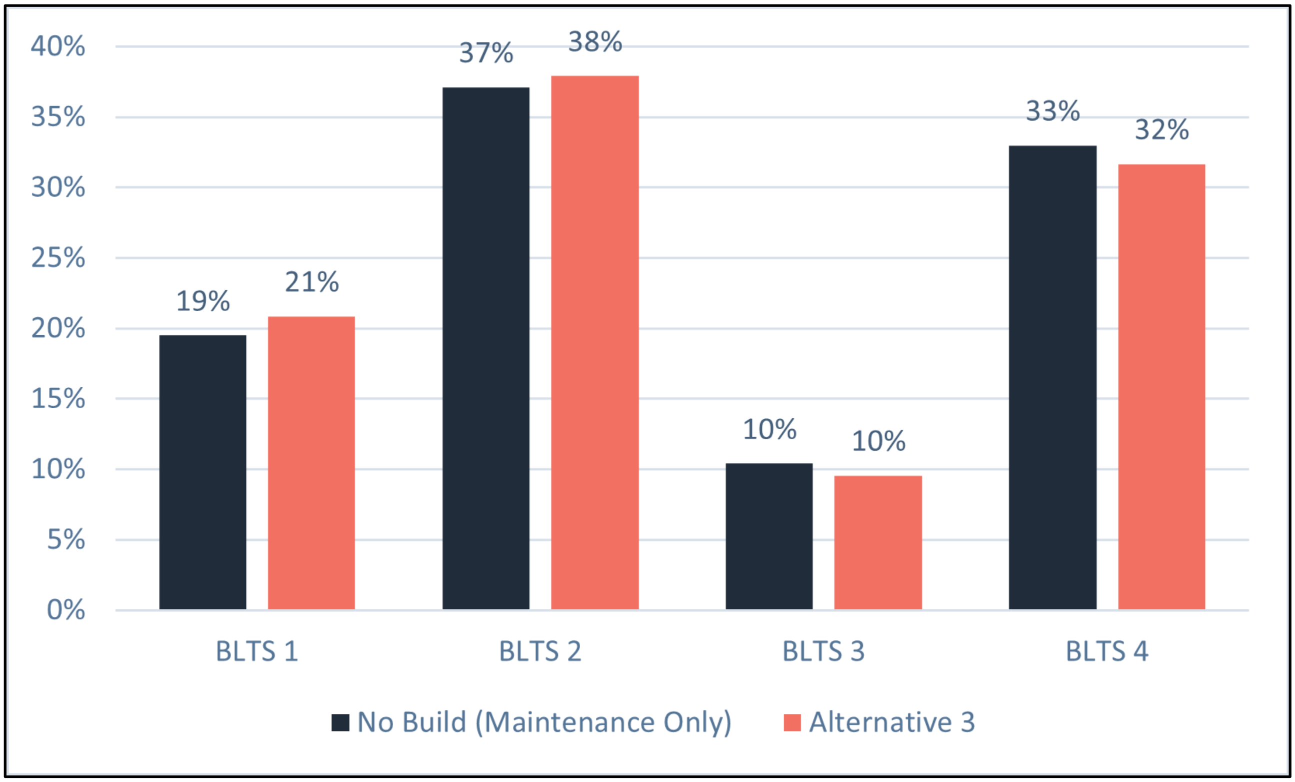


Figure 102. Alternative #3: Percent of Roadway Network by Level of Traffic Stress



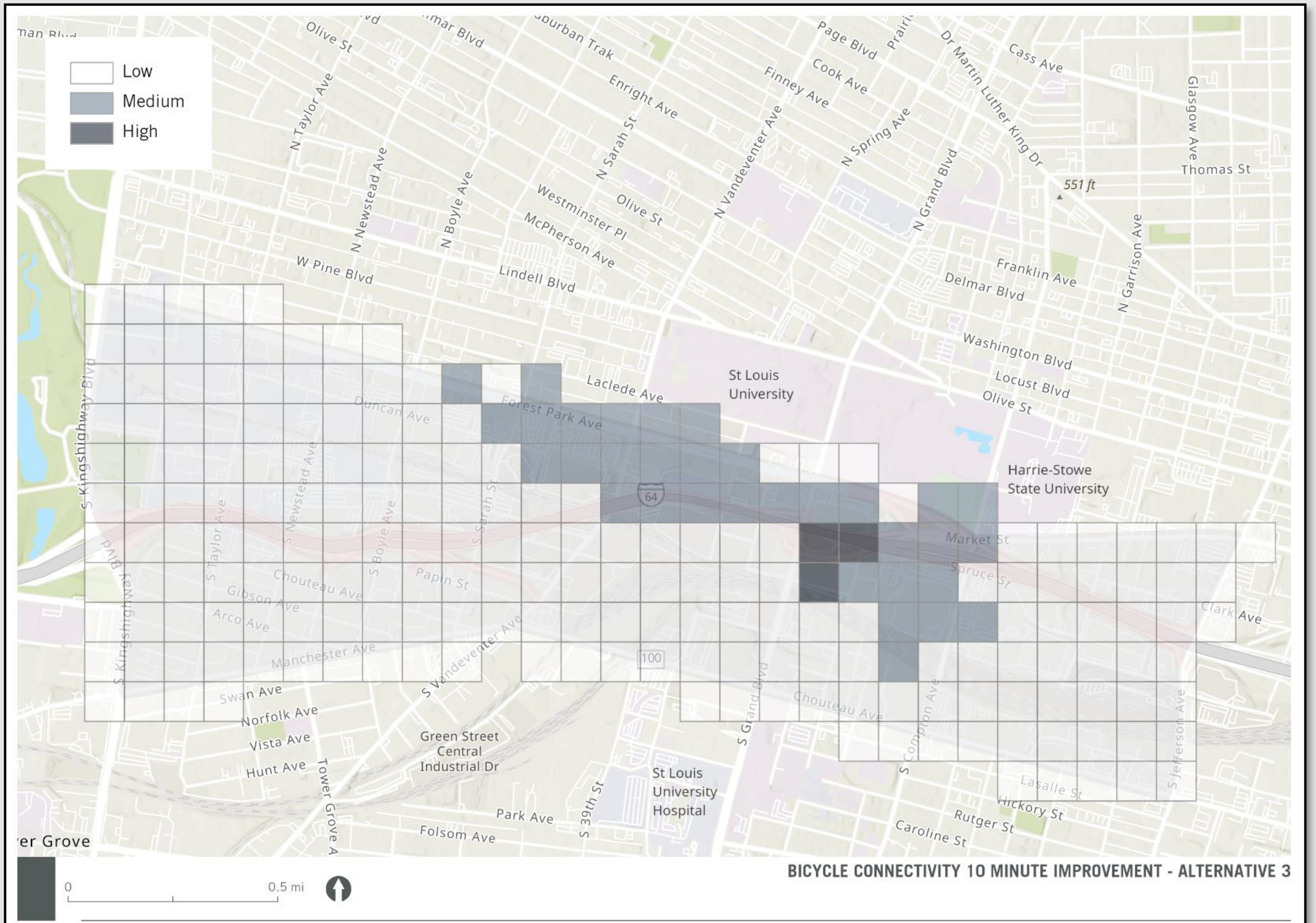
7.3.1.2.3. Bicycle Network Connectivity

Utilizing the Potential Mobility Index (PMI) methodology presented in the Existing Traffic, Safety, and Multimodal Conditions Technical Report, bicycle network connectivity was analyzed for Alternative #3 based on ten-minute/1.67-mile bicycle travelsheds. While less than the 2.8-mile median bicycle trip distance, the ten-minute/1.67 travelshed, which represents a short bicycle trip at an average speed of 10 miles per hour, is a consistent unit of measurement for analyzing bicycling activity and potential and is an appropriate scale by which to analyze network changes within the Tier 2 study area. Bicycle connectivity scores vary widely throughout the study area, from a low of 0.43 to a high of 0.78, with lower scores representing poor connectivity and higher scores representing greater connectivity. These ratios are depicted in **Figure 103.** The average (mean) bicycle connectivity score is 0.63, which indicates that roughly 63% of the land area within bicycling distance can be reached based on the characteristics of the bicycle network. This represents a slight increase over the No Build (Maintenance Only) scenario mean bicycle connectivity of 0.60 (60%).

Figure 104 displays Alternative #3 improvements in bicycle network connectivity ratios over the No Build (Maintenance Only) scenario. The results show how increased local links in the roadway network associated with Alternative #3 impact people's ability to bike to nearby destinations. The greatest improvements are located in the north central portion of the study area between Sarah St. and Compton Ave., reflecting the value of new network links such as Theresa Ave.

Figure 103. Alternative #3: Bicycle Connectivity Analysis Results

Figure 104. Alternative #3: Bicycle Connectivity Ratio Improvements



7.3.2. Transit

This section discusses the transit accommodations anticipated for Alternative #3.

7.3.2.1. Year 2050 Transit System

The Alternative #3 2050 transit system reflects the same transit service plan presented in Section 4.3.2.1, which consists of Metro Reimagined and the existing MetroLink service. However, it should be emphasized that changes to the street network and interstate ramps in Alternative #3 would result in increased traffic congestion along Grand Blvd. As summarized in **Table 46**, peak hour travel times are expected to increase significantly based on data output from the VISSIM traffic simulation model. This congestion would adversely affect the on-time reliability of the #70 Grand bus route.

Table 46. Alternative #3: Forecasted Travel Times along Grand Blvd.

	Travel Time (sec)			
Direction	AM Peak Hour		PM Peak Hour	
	No Build (Maintenance Only)	Alt #3	No Build (Maintenance Only)	Alt #3
Northbound	43	59	55	76
Southbound	43	113	35	115

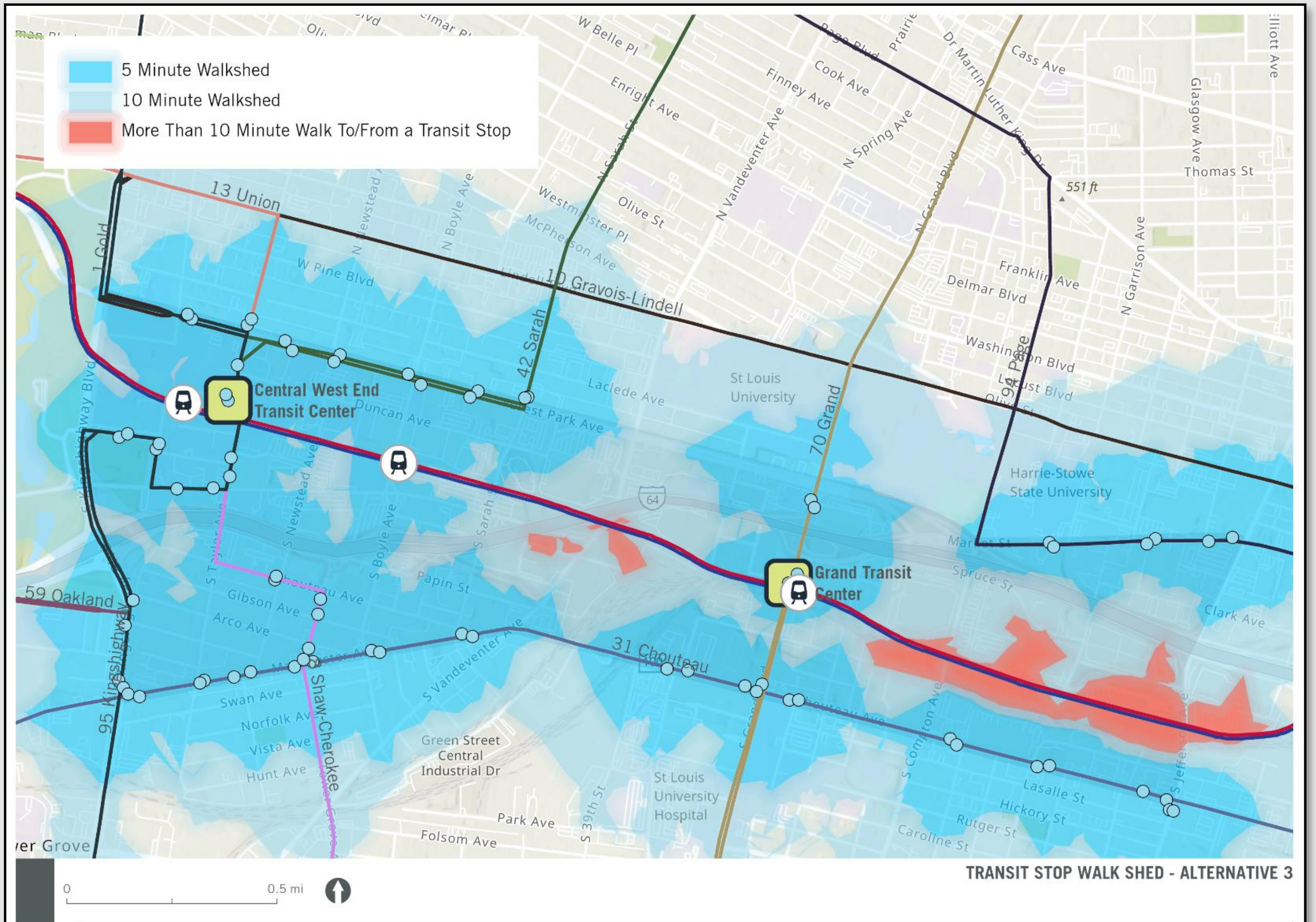
7.3.2.2. Transit Ridership in 2050

No changes beyond those previously presented in Section 4.3.2.1 were considered as part of Alternative #3. Hence the transit ridership in Year 2050 would remain as presented in Section 4.3.2.2.

7.3.2.3. Transit Needs Addressed

Since many, if not all, transit trips begin and/or end with a non-motorized trip (i.e., walking), walksheds help define the accessibility of transit stops within the study area. Additional pedestrian connections included in Alternative #3 would help increase transit accessibility, including the Theresa Ave. extension across I-64 and a better pedestrian connection at Forest Park Ave. and Market St. **Figure 105** shows the 5-minute and 10-minute walksheds as well as the area beyond a 10-minute walk to each transit stop in the study area.

Figure 105. Alternative #3: 5- and 10-Minute Walksheds as Related to Transit Routes



The need for transit service in and around the study area was estimated based on the number of transit-dependent residents estimated for the Year 2050. Forecasts for transit-dependent residents were based upon total population derived from the EWG Regional TDM for the year 2045 and then extrapolated to represent the Year 2050. The estimated number of transit-dependent residents within the study area would be 3,831 persons in Year 2050 (as compared to 3,647 persons as presented in the Existing Conditions Technical Report). To measure the impact of new pedestrian connections on transit access, the transit-dependent population within a 10-minute walkshed area was also estimated, as summarized in **Table 47**.

Table 47. Alternative #3: Transit-Dependent Population Near Transit Stops

	Population	
	No Build (Maintenance Only)	Alt #3
Transit Dependent Within 10-Min Walkshed	7,765	7,842

As shown, the additional pedestrian connections would improve access to/from transit stops as compared to the No Build (Maintenance Only) alternative, based on the walksheds of transit-dependent populations. The impact would be larger if not for the fact that most areas outside of the 10-minute walkshed comprise industrial areas that lack residential populations. That said, these new pedestrian connections would help transit be more accessible to major destinations in the study area, including St. Louis University and the Foundry, by providing a high-quality and comfortable walking environment, which is not captured by the walkshed distance analysis. Most of the benefit would be realized in the vicinity of the Grand MetroLink Station, as a result of improved pedestrian facilities linking north-south across I-64.

7.4. YEAR 2050 CORRIDOR ALTERNATIVE #3 CONCLUSIONS

The following represents the conclusion drawn from the traffic operations, safety and multimodal analysis of the Year 2050 Corridor Alternative #3:

7.4.1. Traffic Conclusions

- Under Alternative #3, interchange spacing would be improved due to the removal of the ramps to and from Market St. and Compton Ave. as well as ramps between I-64 and Forest Park Ave.
- Favorable operating conditions could be provided along I-64 mainline, merge, diverge and weave segments assuming Alternative #3 is in place.
- The interchange of I-64 with Kingshighway would continue to show congestion during the peak hours due to the anticipated volume of traffic. However, modifications to this interchange were not contemplated as part of this PEL given its relatively recent reconstruction.

- The widening of the westbound I-64 off ramp and lengthening of the deceleration lane to Boyle Avenue would accommodate the anticipated Year 2050 volumes and minimize any impacts upon the I-64 corridor.
- The intersection of Clayton Ave. at Boyle Ave., as well as both Clayton Ave. and Boyle Ave. themselves, would require significant reconstruction to provide numerous turn and travel lanes to efficiently accommodate the traffic traveling between I-64 and the Washington University Medical Campus.
- The introduction of the one-way eastbound outer road between Tower Grove Ave. and Vandeventer provides for efficient access to and from I-64 and various local roadways, including the addition of new access to I-64 eastbound from Vandeventer.
- Access to I-64 eastbound from Vandeventer is beneficial in that it would divert a portion of the traffic originating along Forest Park Ave. away from the heavily traveled intersection with Grand Blvd. as well as the on ramp at Grand Blvd. to I-64.
- The relocation of the westbound on ramp from Vandeventer to I-64 is feasible and does not exacerbate weave conditions between Boyle Ave. and Kingshighway Blvd.
- The conversion of the grade separated intersection of Forest Park Ave. at Grand Blvd. to an at grade intersection is feasible as proposed in Alternative #3. However, extensive turn and travel lanes would be necessary to achieve the operational target of LOS E overall during the peak periods, which is critical to minimize backups that would, in turn, impact the ramp terminals with I-64 at Grand Blvd. However, to achieve a balance between vehicular and active transportation modes, it would be prudent to provide refuge medians within the intersection on all approaches to facilitate non-motorized crossings.

  However, there are physical limitations at this intersection in terms of available space to accommodate vehicular traffic as well as bicycle and pedestrian facilities. Bringing this intersection to-grade could potentially reduce traffic volumes at this intersection as compared to the straight growth assumed in this study, which in turn would potentially reduce the number of lanes necessary to maintain a LOS E. The removal of traffic at this intersection could be a result of either the diversion of traffic to other intersections, which was beyond the scope of this study, or the dissipation of traffic due to reduction in trip making and/or modal shifts.
- A roundabout would be the preferred means of traffic control at the intersection of the eastbound I-64 off ramp with Theresa Ave./Spruce St.

7.4.2. Safety Conclusions

- Consolidation of interchange access points, and improvement of existing ramps, provides for safety enhancement within the Tier 1 area, notably near Grand Blvd.. and Boyle Ave. interchanges. Moving the eastbound off ramp terminal from Tower Grove Ave. to Boyle Ave. essentially creates a diamond interchange focused on Boyle Ave., although the safety benefit of the longer ramp and more intuitive interchange type is softened by replacement of a roundabout intersection with a traffic signal.

- The removal of the left-sided entrances to I-64 from Forest Park Ave. (eastbound) and Vandeventer Ave. (westbound) has positive safety impacts tied to proper driver expectation and current standards of practice.
- Shifting the eastbound on ramp from Papin St. to a more typical diamond-type ramp at Boyle Ave. has dual benefits of removing a relatively atypical merge conflict on the existing ramp, while also improving the intuitiveness of the interchange from a driver perspective.
- Within the Tier 1 limits, existing safety concerns not addressed would expectantly carry forward on I-64 near the Vandeventer Ave. overpass (both directions), as well at the I-64/Kingshighway interchange.
- The Tier 2 area would see safety benefits with the removal of the closely spaced signalized intersection on Grand Blvd. at Forest Park Ave. and at Council Plaza, which currently are a source of congestion and significant safety concerns for all users. Additionally, addressing congestion at the Clayton Ave. and Boyle Ave. signalized intersection would provide a reduction in crashes, especially higher severity types. Bicycle and pedestrian will benefit significantly by the conversion of Tower Grove Ave. to a non-vehicular roadway over and adjacent to I-64, dedicating the space to vulnerable road users and limiting conflict area with vehicles.

7.4.3. Multimodal Conclusions

- Multimodal Conclusions Alternative #3 offers a slight increase in active transportation facility mileage through new on-street bikeways and multiuse paths on Tower Grove Ave., Grand Blvd., Forest Park Ave., and Theresa Ave.
- The new facilities provide moderate improvements in overall levels of pedestrian level of service and bicycle level of traffic stress, with improvements like the Tower Grove Ave. dedicated bike/pedway over I-64 providing a low-stress crossing between Forest Park Southeast and The Grove to the south and the Cortex MetroLink Station, Cortex Innovation District, and other employment and educational opportunities to the north. The majority of increases in bicycle and pedestrian levels of comfort over existing conditions, however, are a result of committed and likely projects represented in the No Build (Maintenance Only) scenario.
- While the proposed active transportation improvements provide a new north-south link across I-64 between Grand Blvd. and Jefferson Ave. at Theresa Ave., overall levels of connectivity in the study area see only moderate increases outside the immediate vicinity Grand Blvd. and I-64.
- The Alternative #3 2050 transit system reflects the same transit service plan presented in the No Build (Maintenance Only) scenario, which consists of Metro Reimagined and

the existing MetroLink service. However, changes to the street network and interstate ramps in Alternative #3 would result in increased traffic congestion along Grand Blvd. that would likely affect the on-time reliability of the #70 Grand bus route.

- The additional pedestrian connections in Alternative #3 would only marginally improve access to/from transit stops as compared to the No Build (Maintenance Only) alternative, based on the walksheds of transit-dependent populations. That said, qualitatively these new pedestrian connections would help transit be more accessible to major destinations in the study area, particularly those benefitting from improved north-south connectivity across I-64.

8. ALTERNATIVES COMPARISON

Based upon the preceding analysis of the No Build (Maintenance Only) alternative as well as the three corridor wide improvement alternatives presented in Section 2, it was possible to summarize the alternatives with respect to traffic, safety, and multimodal operations with the intent of facilitating an efficient comparison. **Table 48** provides this comparison matrix.

The key takeaways from the matrix are as follows:

- All of the corridor alternatives would, at a minimum, remove one interchange from this section of I-64. This is accomplished, in general, via the removal of the ramps to and from Market St. / Bernard St. as well as the eastbound on ramp from Forest Park Ave. for all alternatives and the additional removal of the ramp to Forest Park Ave. in Alternative #3.
- All of the corridor alternatives would reduce the number of local roadways that the interchanges access as compared to the twelve local roads currently. This allows for more intuitive access to motorists that provides logical access to the perpendicular street grid.
- There is a clear need to enhance the capacity to Boyle Avenue from westbound I-64 in the morning. If left unaddressed, the insufficient vehicular queues along the off ramp would extend onto I-64 and cause backups that would extend eastward from Boyle, potentially as far back as Grand Blvd. All three alternatives address this issue.
- Alternatives #2 and #3 perform well in terms of reducing the overall network delay and increasing throughput during the peak periods. No operational concerns along I-64 in terms of basic segments, weave, merge or diverge operations were noted.
- Reconstruction of the intersection of Forest Park Ave. at Grand Blvd. proved problematic in Alternative #1, and in turn impacted the operations along Grand Blvd. and at the ramp terminals. Without an added alternate north-south route (Theresa Ave. connection) and/or additional access to eastbound I-64 (via Vandeventer or another prominent north-south arterial), the demand to travel between Forest Park Ave. and Grand Blvd. could not be managed with a traditional signalized intersection despite the addition of numerous turn lanes, etc.
- The westbound on ramp to I-64 from Vandeventer functions comparable in all three improvement alternatives, regardless of whether it is a left or right sided entry. Either scenario was accomplished in conjunction with a lane add, providing a transition from three to four westbound through lanes on I-64 as traffic enters from Vandeventer.
- For the No Build (Maintenance Only) scenario, where it is assumed all existing interchange spacing, gore spacing, and acceleration/deceleration lengths at ramps would remain the same as existing, the safety issues noted in the Existing Conditions report would continue to be experienced by users. Given congestion typically leads to higher crash frequencies, the No Build (Maintenance Only) alternative would lead to additional areas of concern from a safety standpoint above and beyond that previously summarized.

- Within the improvement alternatives, consolidation of access points, improvements to existing ramps, acceleration and deceleration lengths all provide for safety enhancements within Tier 1, notably in the vicinity of the Boyle Ave. and Grand Blvd. interchanges. However, existing safety concerns not addressed within Tiers 1 would expectantly remain at I-64 near the Vandeventer Ave. overpass (both directions), as well at the I-64/Kingshighway interchange.
- Safety with regards to multimodal users improves significantly within the PEL study area, largely due to the significant number of committed and likely bike/pedway improvements being pursued by MoDOT, the City of St. Louis and/or Great Rivers Greenway. These planned multimodal improvements often provide for separated and safer connections and would be in place regardless of the alternative considered (including No Build (Maintenance Only)).
- The corridor alternatives provide additional multimodal connectivity beyond those committed and likely projects being pursued by MoDOT, the City of St. Louis and/or Great Rivers Greenway. Alternatives #1 and #3 would add approximately 0.8 additional miles of bike/ped facilities (not including sidewalk additions), whereas Alternative #2 would add an additional 1.5 miles of bike/ped facilities.
- All three alternatives would add an additional bike/pedway crossing of I-64 as compared to the fifteen that are anticipated to be in place by the Year 2050 No Build (Maintenance Only) scenario.
- All three alternatives, as well as the No Build (Maintenance Only) alternative, function comparably with regards to the pedestrian and bicycle connectivity ratios. This is to be expected given the significant number of committed and likely bike/pedway improvements being pursued by MoDOT, the City of St. Louis and/or Great Rivers Greenway.
- By the Year 2050, it is assumed that Metro Reimagined would be fully operational and that the current outlook for future transit service in the study area is relatively stable. However, given ongoing work from home trends and reductions in transit ridership, any forecast of future ridership for 2050 would be uncertain and highly speculative. The regional TDM forecasts a 3 percent increase in transit ridership between 2019 and 2045, driven primarily by planned higher density and mixed-use developments in the study area. Planned projects to improve pedestrian connectivity within the study area would help connect transit stops with transit-dependent populations.
- The 2050 transit system in Alternatives #1 and #3 reflect the same transit service plan presented in the No Build (Maintenance Only) alternative, which consists of Metro Reimagined and the existing MetroLink service. However, changes to the street network and interstate ramps in Alternatives #1 and #3 would result in increased traffic congestion along Grand Blvd. that would likely affect the on-time reliability of the #70 Grand bus route.

- Alternative #2, along Grand Avenue, would provide accommodations intended to facilitate dedicated bus lane operations for 0.5 miles within the study area. The goal of this transit enhancement would be to shorten the dwell time of the vehicle at the stations, to expedite boarding and alighting thus improving travel time and travel time reliability resulting in an improved rider experience for transit riders and potentially an increase in overall transit ridership in the corridor from additional (new) riders. The dedicated lanes allow the bus to dwell at the stops in their own lane and pull in and out of them easier than in a shared and congested lane. Also, the dedicated lane allows the bus to travel in more of a free flow condition between the stops since the buses would not share the lane with other vehicles.
    - Since the dedicated bus lanes concept is limited to only 0.5 miles in length, the transit benefits are limited until the concept is extended beyond Forest Park Ave. or Chouteau Ave. However, this alternative would still have a positive effect on transit service in the corridor and would represent an initial building block towards implementing dedicated bus lanes along the entire #70 Grand Blvd. route.
- Given that dedicated bus lanes were not assumed to extend beyond the study area, travel time savings outside of it would be minimal. Incorporating the effects of transit signal priority or preemption is beyond the scope of this PEL. The biggest driver of transit performance within the study area is increased congestion on Grand Blvd., which is accounted for within the evaluation of Alternative #2, which incorporates dedicated bus lanes and their ability to offset the effects of traffic congestion on transit service.

Table 48. Alternative Comparison Matrix

Criterion	Description	No Build (Maintenance Only)	Alternative #1	Alternative #2	Alternative #3
Traffic Operations					
Access to I-64	The extent to which the alternative increases or decreases the number of access points along I-64 within Study Area	6 Interchanges connecting to 12 local roadways. Ramps are not in same order of local roads: exit to Market precedes exit to Grand. Local Road connections are: Kingshighway, Tower Grove, Boyle, Papin, Vandeventer, Market, Bernard, Grand, Forest Park, Compton, Jefferson, 22nd	5 Interchanges connecting to 9 local roadways. Ramps are in same order as local roads. Local Road connections are: Kingshighway, Tower Grove, Boyle, Papin, Vandeventer, Grand, Forest Park, Jefferson, 22nd	5 Interchanges connecting to 9 local roadways. Ramps are in same order as local roads. Local Road connections are: Kingshighway, Tower Grove, Boyle, Vandeventer, Grand, Bernard, Forest Park, Jefferson, 22nd	5 Interchanges connecting to 8 local roadways. Ramps are in same order as local roads. Local Road connections are: Kingshighway, Tower Grove, Boyle, Vandeventer, Grand, Theresa, Jefferson, 22nd
Overall Network	Year 2050 operating conditions for network within study area (including I-64, ramp terminals and critical intersections within close proximity to ramp terminals)	*AM Peak Hour*			
		• Average Delay: 133 sec/veh • Average Stops: 6.3 stops/veh • Total Delay: 1118 hr 33 min • Throughput: 27,588 veh	• Average Delay: 102 sec/veh • Average Stops: 3.4 stops/veh • Total Delay: 877 hr 48 min • Throughput: 28,404 veh	• Average Delay: 94 sec/veh • Average Stops: 3.1 stops/veh • Total Delay: 800 hr 30 min • Throughput: 28,407 veh	• Average Delay: 108 sec/veh • Average Stops: 4.7 stops/veh • Total Delay: 835 hr 21 min • Throughput: 28,105 veh
		PM Peak Hour			
		• Average Delay: 86 sec/veh • Average Stops: 2.5 stops/veh • Total Delay: 764 hr 17 min • Throughput: 29,856 veh	• Average Delay: 122 sec/veh • Average Stops: 3.3 stops/veh • Total Delay: 1110 hr 18 min • Throughput: 29,821 veh	• Average Delay: 75 sec/veh • Average Stops: 2 stops/veh • Total Delay: 685 hr 28 min • Throughput: 30,840 veh	• Average Delay: 87 sec/veh • Average Stops: 2.6 stops/veh • Total Delay: 786 hr 30 min • Throughput: 30,335 veh
I-64 Operations	The anticipated operating conditions along I-64 for the Year 2050 (basic segment, weave, merge/diverge)	Significant congestion along I-64 WB during morning peak between Boyle Avenue and 22nd St. due to insufficient off ramp at Boyle and spill back onto interstate causing a bottleneck situation. I-64 EB weave segment between Kingshighway Blvd. and Tower Grove Ave. operates at LOS E.	Due to the congestion at Forest Park Avenue and Grand Boulevard assuming an at grade intersection, the traffic on I-64 via the Grand Blvd. ramps would experience congestion and excessive delays and queues that would spill back onto I-64.	No operational concerns along I-64.	No operational concerns along I-64.
Vandeventer On Ramp to WB I-64	Left or right side ramp entrance	Left side ramp entrance with lane addition on I-64 (existing condition). The segment operates at LOS C	Left side ramp entrance with lane addition on I-64 (existing condition). The segment operates at LOS C	Left side ramp entrance with lane addition on I-64 (existing condition). The segment operates at LOS C	Right side ramp entrance with lane addition on I-64. The segment operates at LOS C

Criterion	Description	No Build (Maintenance Only)	Alternative #1	Alternative #2	Alternative #3
Boyle Off Ramp from WB I-64	Peak queue on off ramp versus the deceleration length provided	• Peak queue: 2670 ft • Deceleration length: 300 ft Exceeds ramp & spills onto interstate	• Peak queue: 295 ft • Deceleration length: 850 ft Contained within ramp & would not impact interstate	• Peak queue: 290 ft • Deceleration length: 900 ft Contained within ramp & would not impact interstate	• Peak queue: 525 ft • Deceleration length: 900 ft Contained within ramp & would not impact interstate
I-64 Ramp Terminals	The anticipated operating conditions at ramp terminals for the Year 2050	Acceptable LOS other than: • Kingshighway Interchange LOS E • Boyle Ave. and I-64 WB ramps terminal - WB approach maximum queue lengths in excess of the ramp length and spill onto the interstate.	Acceptable LOS other than: • Kingshighway Interchange LOS E	Acceptable LOS other than: • Kingshighway Interchange LOS E	Acceptable LOS other than: • Kingshighway Interchange LOS E
Reconstruction of Forest Park Ave. & Grand Blvd. to an At Grade Intersection	Feasibility of converting the current grade separated intersection to at-grade	Currently grade separated. Would operate at LOS C in this alternative if left as grade separated; however, there are some safety concerns associated with the grade separation and the closely spaced ramp terminals.	Not feasible as presented. May be feasible if EB on ramp is provided at Vandeventer and/or Theresa is extended from Forest Park Ave. to Chouteau Ave.	Feasible. Overall, LOS – D/E. Would require extensive turn lanes from Forest Park to Grand	Feasible. Overall, LOS – D/E. Would require extensive turn lanes from Forest Park to Grand
Other Local Intersections	Year 2050 operating conditions; notable intersections with concerns	• Kingshighway and Route 100 – LOS F in both peak periods • Clayton Ave. and Boyle Ave. – LOS F in both peak periods	• Kingshighway and Route 100 – LOS F in both peak periods • Forest Park Ave. and Grand Blvd. – LOS F in PM Peak Hour if at-grade	• Kingshighway and Route 100 – LOS F in both peak periods	• Kingshighway and Route 100 – LOS F in both peak periods
Safety					
Potential Crash Reduction on I-64 (Hot Spots from existing conditions that would be resolved with Alternative improvements)	East End (Grand/Forest Park/Compton)	Addressed: • I-64 & Jefferson Ave. will be reconstructed as of 2023, which will address the safety concerns 1/ Safety Concerns: • I-64 & Grand Blvd. tight loop ramp and short deceleration length would remain in place.	Addressed: • I-64 at Grand EB off ramp curvature increased and additional deceleration length • Potential crash reduction due to increased acceleration lane at Grand WB on ramp • Increase shoulder widths on impacted ramps • Elimination of left side entrance ramp to EB I-64 at Forest Park Ave. • Increasing the inside shoulder width between Theresa Ave. and Ewing Ave. • I-64 & Jefferson Ave. will be reconstructed as of 2023, which will address the safety concerns 1/	Addressed: • I-64 at Grand EB off ramp replaced with tangent section terminating at roundabout • Potential crash reduction due to increased acceleration lane at Grand WB on ramp • Increase shoulder widths on impacted ramps • Elimination of left side entrance ramp to EB I-64 at Forest Park Ave. • Increasing the inside shoulder width between Theresa Ave. and Ewing Ave. • I-64 & Jefferson Ave. will be reconstructed as of 2023, which will address the safety concerns 1/	Addressed: • I-64 at Grand EB off ramp replaced with tangent section terminating at roundabout • Potential crash reduction due to increased acceleration lane at Grand WB on ramp • Increase shoulder widths on impacted ramps • Elimination of left side entrance ramp to EB I-64 at Forest Park Ave. • Increasing the inside shoulder width between Theresa Ave. and Ewing Ave. • I-64 & Jefferson Ave. will be reconstructed as of 2023, which will address the safety concerns 1/

1/ Inclusion of this location is based upon crash data from 2017 thru 2020, prior to the reconstruction of this interchange

Criterion	Description	No Build (Maintenance Only)	Alternative #1	Alternative #2	Alternative #3
Potential Crash Reduction on I-64 (Hot Spots from existing conditions that would be resolved with Alternative improvements)	West End (Tower Grove/Boyle/Vandeventer)	Safety Concerns: • I-64 over Vandeventer Ave. in the area west of the double-decker section with horizontal and vertical curvature • I-64 & Boyle Ave., especially the westbound off ramp and the existing deceleration lane length • I-64 EB between Kingshighway Blvd. and Tower Grove Ave. weave • I-64 & Kingshighway Blvd., especially the eastbound off ramp	Addressed: • I-64 at Boyle WB off ramp increased deceleration length • Potential crash reduction due to increased acceleration lane at Papin EB on ramp • Increase shoulder widths on impacted ramps • Increasing the inside shoulder width between Tower Grove Ave. and Sarah St. Safety Concerns: • I-64 over Vandeventer Ave. in the area west of the double-decker section with horizontal and vertical curvature • I-64 EB between Kingshighway Blvd. and Tower Grove Ave. weave • I-64 & Kingshighway Blvd., especially the eastbound off ramp	Addressed: • I-64 at Boyle WB off ramp increased deceleration length • Potential crash reduction due to increased acceleration lane at Boyle EB on ramp • Increase shoulder widths on impacted ramps • Increasing the inside shoulder width between Tower Grove Ave. and Sarah St. Safety Concerns: • I-64 over Vandeventer Ave. in the area west of the double-decker section with horizontal and vertical curvature • I-64 EB between Kingshighway Blvd. and Tower Grove Ave. weave • I-64 & Kingshighway Blvd., especially the eastbound off ramp	Addressed: • I-64 at Boyle WB off ramp increased deceleration length • Potential crash reduction due to increased acceleration lane at Boyle EB on ramp • Increase shoulder widths on impacted ramps • Elimination of left side entrance ramp to WB I-64 at Vandeventer. • Increasing the inside shoulder width between Tower Grove Ave. and Sarah St. Safety Concerns: • I-64 over Vandeventer Ave. in the area west of the double-decker section with horizontal and vertical curvature • I-64 EB between Kingshighway Blvd. and Tower Grove Ave. weave • I-64 & Kingshighway Blvd., especially the eastbound off ramp
Interchange Spacing	The extent to which the alternative improves interchange spacing/gore separation	NA – no changes therefore no improvement	• Existing noncompliant gore spacing locations to remain in place – 1 • Existing compliant gore spacing locations to remain in place – 2 • Existing noncompliant gore spacing locations removed – 1 • Existing compliant gore spacing locations removed – 3 • New compliant gore spacing locations - 3	• Existing noncompliant gore spacing locations to remain in place – 1 • Existing compliant gore spacing locations to remain in place – 1 • Existing noncompliant gore spacing locations removed – 1 • Existing compliant gore spacing locations removed – 4 • New compliant gore spacing locations - 4	Removal of Market St./Compton Ave./Forest Park Ave. connections results in a spacing of 5,110', which is near compliance with design standards. • Existing noncompliant gore spacing locations to remain in place – 2 • Existing compliant gore spacing locations to remain in place – 3 • Existing noncompliant gore spacing locations removed – 2 • Existing compliant gore spacing locations removed – 7 • New compliant gore spacing locations - 6

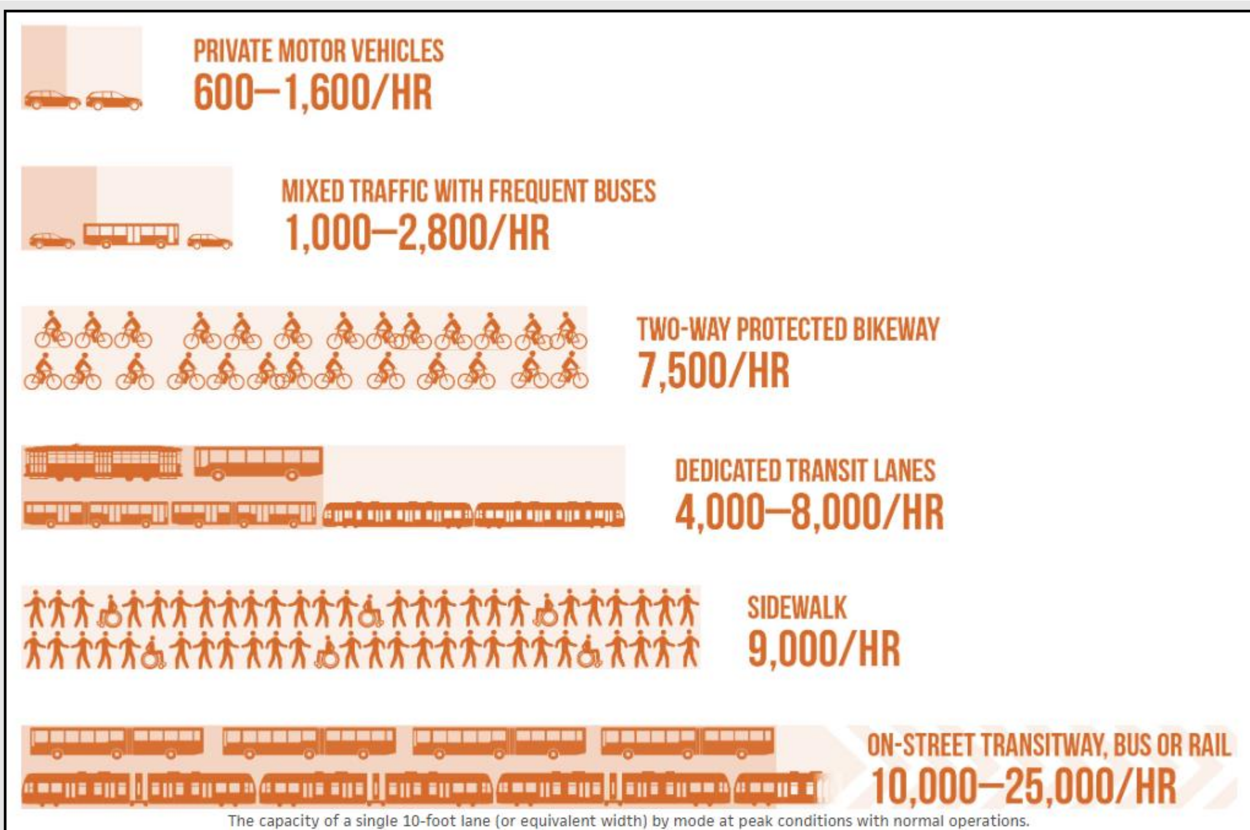
Criterion	Description	No Build (Maintenance Only)	Alternative #1	Alternative #2	Alternative #3
Acceleration/Deceleration Distances on ramps	Compliance with AASHTO standards	NA – no changes therefore no improvement Number of Compliant Accel Lengths -2 Number of Compliant Decel Lengths - 4	Improved Acceleration Lengths – WB On Ram from Papin St., WB On Ramp from Grand Blvd. Improved Deceleration Lengths – WB Off Ramp to Boyle Ave., EB Off Ramp to Grand Blvd. All other accel/decel lengths not changed or removed Number of Compliant Accel Lengths -3 Number of Compliant Decel Lengths - 4	Improved Acceleration Lengths – WB On Ram from Papin St., WB On Ramp from Grand Blvd. Improved Deceleration Lengths – WB Off Ramp to Boyle Ave., EB Off Ramp to Grand Blvd. All other accel/decel lengths not changed or removed Number of Compliant Accel Lengths -3 Number of Compliant Decel Lengths - 5	Improved Acceleration Lengths – WB On Ram from Papin St., WB On Ramp from Grand Blvd. Improved Deceleration Lengths – WB Off Ramp to Boyle Ave., EB Off Ramp to Grand Blvd. All other accel/decel lengths not changed or removed Number of Compliant Accel Lengths -3 Number of Compliant Decel Lengths - 3
Improved safety for pedestrians, cyclists and transit users	The extent to which the alternative improves safety for multimodal users	Planned bicycle and pedestrian improvements, including the Brickline Greenway, provide separated and safer connections through the study area.	Additional safety improvements including Tower Grove Ave. and Forest Park Ave. Approximately one mile of additional separated bike/ped facilities.	Additional safety improvements including Forest Park Ave. and Clayton Ave. Approximately one mile of additional separated bike/ped facilities plus 0.5 mile of calm street.	Additional safety improvements including Tower Grove Ave. and Forest Park Ave. Approximately one mile of additional separated bike/ped facilities.
Multimodal					
I-64 Crossings for Bike/Ped	Number of I-64 crossings that accommodate cyclists and/or pedestrians	15 crossings	16 crossings	16 crossings	16 crossings
Total Mileage of Bike/Pedway Facilities (not including sidewalks)	Quantify total mileage by facility type within the PEL Study Area	Bike Lane: 0.9 miles Buffered Bike Lane: 0.1 mile Separated Bike Lane:3.6 mile Shared Lane Markings: 2.7 mile Shared Use Path: 4.6 mile Total: 12.0 miles	Bike Lane: 1.0 miles Buffered Bike Lane: 0.1 miles Separated Bike Lane: 3.8 miles Shared Lane Markings: 2.4 miles Shared Use Path: 5.5 miles Total: 12.8 miles	Bike Lane: 1.2 miles Buffered Bike Lane: 0.1 miles Calm Street: 0.5 miles Separated Bike Lane: 3.7 miles Shared Lane Markings: 2.5 miles Shared Use Path: 5.5 miles Total: 13.5 miles	Bike Lane: 1.1 miles Buffered Bike Lane: 0.1 miles Separated Bike Lane: 3.8 miles Shared Lane Markings: 2.4 miles Shared Use Path: 5.5 miles Total: 12.9 miles

Criterion	Description	No Build (Maintenance Only)	Alternative #1	Alternative #2	Alternative #3
Pedestrian Connectivity	High, Low and Mean connectivity ratio	*Five Minute Walkshed*			
		Min: 8.2% Max: 60.9% Mean: 35.6%	Min: 8.4% Max: 83.0% Mean: 37.0%	Min: 8.4% Max: 61.0% Mean: 36.0%	Min: 8.5% Max: 100.0% Mean: 37.0%
		Ten Minute Walkshed			
		Min: 8.7% Max: 62.6% Mean: 41.7%	Min: 8.4% Max: 82.0% Mean: 45.0%	Min: 8.4% Max: 62.0% Mean: 43.0%	Min: 8.2% Max: 94.0% Mean: 46.0%
Bicycle Connectivity	High, Low and Mean connectivity ratio	*Ten-Minute Bikeshed*			
		Min: 39.1% Max: 68.8% Mean: 60.2%	Min: 40.5% Max: 75.0% Mean: 63.0%	Min: 41.0% Max: 80.0% Mean: 64.0%	Min: 43.0% Max: 78.0% Mean: 63.0%
Transit Performance	Quantify impacts (positive or negative) to transit service	Few measurable improvements beyond those already planned	Few measurable improvements beyond those already planned	Some travel time savings realized vs other more congested alternatives with the implementation of dedicated bus lanes and enhanced station amenities within 0.5 mile section of Grand Blvd.	Few measurable improvements beyond those already planned
	Quantity the peak hour travel times along Grand Blvd.	AM: NB = 43 sec, SB = 43 sec PM: NB = 55 sec, SB = 35 sec	AM: NB = 74 sec, SB = 88 sec PM: NB = 127 sec, SB = 92 sec	AM: NB = 75 sec, SB =48 sec PM: NB = 93 sec, SB = 74 sec	AM: NB = 59 sec, SB = 113 sec PM: NB = 76 sec, SB = 115 sec
Transit Accessibility	Quantify the amount of transit dependent population that can walk 10 mins or less to a transit line	7,765 persons	7,871 persons	7,742 persons	7,842 persons
	The extent the alternative adds or removes any constraints to transit stations, stops	Few measurable improvements beyond those already planned	Few measurable improvements beyond those already planned	Enhanced amenities added at two (2) transit stations in study area	Few measurable improvements beyond those already planned

The potential people capacity across I-64 is essential to reducing the barrier effect of the interstate within the study area. The PEL's purpose is to "renew and modify the transportation system to have safe and reliable facilities for all users that improve access to destinations and support community vitality for the long term". The alternatives, including the No Build (Maintenance Only) scenario, reduce the barrier effect by providing additional multimodal north-south connections for all modal users. These additional connections improve access to destinations for *all users* by giving more choices for safe and reliable movement. Multimodal facilities such as dedicated bus lanes, wide and/or protected bikeways and sidewalks offer greater capacity to move people than vehicles, as visually shown in this GIF from NACTO (NACTO Twitter Link).

The area surrounding I-64 is redeveloping from industrial to high density, walkable urban neighborhoods and employment districts. The addition of multimodal facilities both in the No Build (Maintenance Only) scenario and the three alternatives will enhance the diversity of options for people to move about and reach destinations, services, jobs, entertainment, etc. Figure 106 from NACTO's *Transit Street Design Guide* demonstrates that adding dedicated facilities for people walking, biking, and taking transit ultimately offers greater capacity for the movement of people to reach destinations.

Figure 106. Person Capacity by Travel Mode, NACTO Transit Street Design Guide



To illustrate this concept, the alternatives, including the Existing and No Build (Maintenance Only) scenarios, were compared with regards to the potential capacity for each scenario to move people across I-64, thereby reducing the "barrier" effect associated with the interstate through this area. For this exercise, the north-south crossings of I-64 between Kingshighway and Jefferson were considered with respect to their maximum multimodal capacity, as recommended by NACTO in Figure 106 for person throughput associated with various modes of travel. When a range was provided, the average was utilized; ex. 1,100 persons per hour for private motor vehicles.

For each alternative, the assumed person throughput for each north-south crossing was calculated based upon the provision of sidewalk, travel lanes (whether for vehicles only or mixed with buses), bikeways and/or dedicated transit lanes. **Table 49** compares the person capacity for each of the alternatives. For ease of comprehension, when there was an increase in person capacity between the Existing and No Build (Maintenance Only) scenarios, the cell was shaded orange so that it was evident that the gain in capacity was attributable to a change in the No Build (Maintenance Only) scenario. Similarly, when there was an increase in person capacity between the Existing/No Build (Maintenance Only) scenarios and the alternatives, the cell was shaded blue so that it was evident that the gain in capacity was attributable to a transportation improvement presented in the respective alternative. **Figure 107** and **Figure 108** visually depict the passenger capacity for each crossing, as divided into the east and west ends of the I-64 corridor.

As can be seen, all of the improvement alternatives afford additional people moving potential as compared to the No Build (Maintenance Only) alternative, with Alternative #2 outperforming the others by as much as 11,000 persons. Furthermore, even as roadways within the study area are improved, the corridors would continue to experience congestion due to induced vehicular demand that would be attracted as drivers feel incentivized to use the improved road due to the belief that added lanes would reduce congestion. Eventually, persons would adjust their travel behavior and take advantage of the diversity of options for people to cross I-64, move about and reach their destinations. As this occurs, it will be imperative for MoDOT to continue working with the City of St. Louis City and other local partner agencies to provide facilities for people walking and biking within the study area to cross I-64; i.e., two-way cycle tracks planned for Sarah Ave. and Compton Ave. as well as new trail crossing of I-64 at Spring Ave. between the Foundry and Armory.

Table 49. Potential People Throughput Across I-64 within PEL Study Area

North/South Crossing of I-64	Existing	No Build (Maint. Only)	Alternative #1	Alternative #2	Alternative #3
TOTAL	*262,700 persons*	*285,200 persons*	*311,000 persons*	*319,800 persons*	*308,800 persons*
Kingshighway Blvd.	*No Change - 29,400 persons*				
Taylor Ave.	*No Change – 21,800 persons*				
Newstead Ave.	*No Change - 20,200 persons*				
Tower Grove Ave.	*20,200 persons*	*20,200 persons*	*27,700 persons (+7,500)*	*27,700 persons (+7,500)*	*25,500 persons (+5,300)*
Boyle Ave.	*20,200 persons*	*20,200 persons*	*21,300 persons (+1,100)*	*21,300 persons (+1,100)*	*21,300 persons (+1,100)*
Sarah St.	*20,200 persons*	*27,700 persons (+7,500)*	*27,700 persons*	*27,700 persons*	*27,700 persons*
Vandeventer Ave.	*No Change - 22,400 persons*				
Spring Ave.	*0 persons*	*7,500 persons (+7,500)*	*7,500 persons*	*7,500 persons*	*7,500 persons*
Grand Blvd.	*33,100 persons*	*33,100 persons*	*40,600 persons (+7,500)*	*49,400 persons (+16,300)*	*40,600 persons (+7,500)*
Theresa Ave.	*0 persons*	*0 persons*	*9,700 persons (+9,700)*	*9,700 persons (+9,700)*	*9,700 persons (+9,700)*
Compton Ave.	*25,600 persons*	*33,100 persons (+7,500)*	*33,100 persons*	*33,100 persons*	*33,100 persons*
Ewing Ave	*No Change - 20,200 persons*				
Jefferson Ave.[1/]	*No Change – 29,400 persons*				

1/ Assumes Jefferson Interchange reconstruction is complete for Existing since this is how it was presented in the Existing Conditions Technical Report.

Note: Orange shading indicates increase in person capacity between Existing and No Build. Blue shading indicates increase in person capacity between Existing and/or No Build and Alternatives.

Figure 107. Potential People Throughput Across I-64 within PEL Study Area (West End)

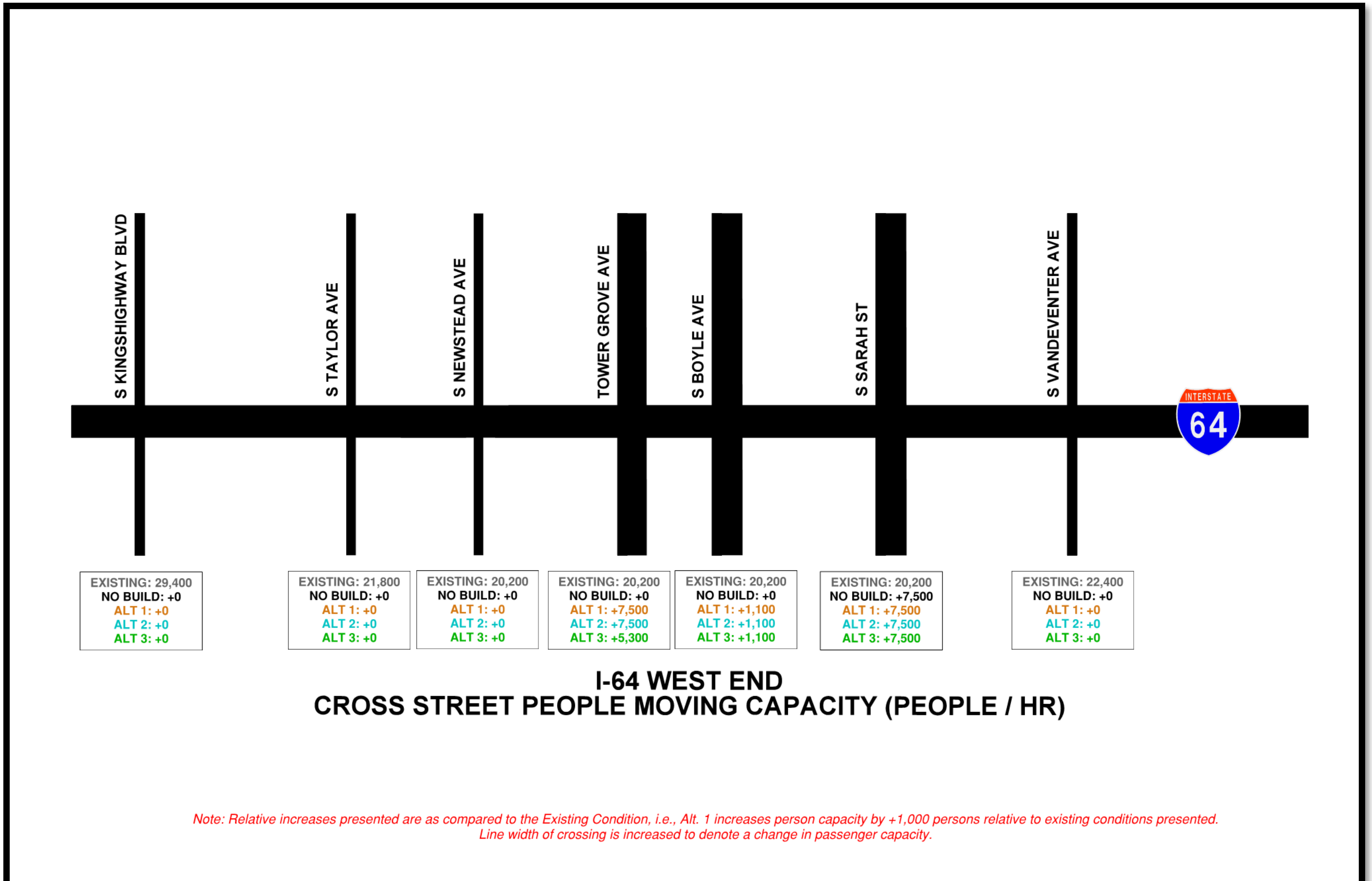
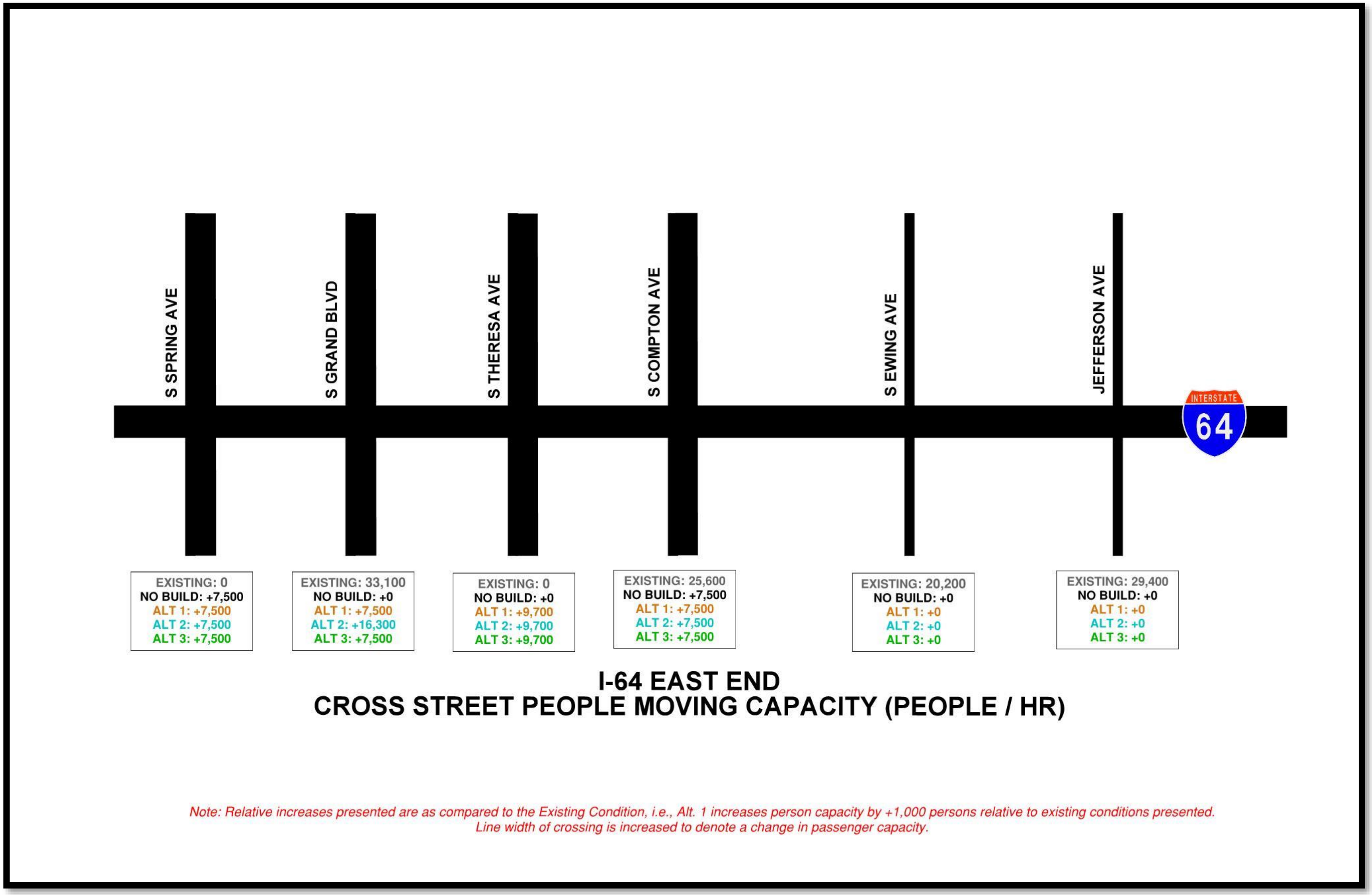


Figure 108. Potential People Throughput Across I-64 within PEL Study Area (East End)



Appendix A

YEAR 2050 NO BUILD (MAINTENANCE ONLY) TRAFFIC OPERATING CONDITIONS – VISSIM TIER 1, SYNCHRO TIER 1 & 2

Table A.1. Year 2050 No Build (Maintenance Only) VISSIM Link Segment Results – Tier 1

Link Number	Direction	Name	Type	AM			PM		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
1	EB	I-64 EB west of Kingshighway Blvd	Basic	D	30.8	57	C	21.3	59
2	EB	Kingshighway Blvd. EB off ramp Decel Lane	Diverge	D	31.0	46	B	17.7	56
3	EB	Btwn Kingshighway Blvd. EB off ramp & EB On ramp	Basic	D	26.6	57	B	17.1	59
4	EB	Btwn Kingshighway Blvd. EB On ramp & Tower Grove EB off ramp	Weave	D	32.2	44	B	16.6	58
5	EB	Btwn Tower Grove EB off ramp & Vandeventer Ave/Papin St. EB off ramp	Diverge	C	25.9	56	B	18.8	58
6	EB	Btwn Vandeventer Ave/Papin St. EB off ramp & Papin St. EB On ramp	Basic	D	30.1	58	C	21.7	59
7	EB	Papin St. EB On ramp Accel Lane	Merge	C	26.5	51	C	24.1	44
8	EB	Btwn Papin St. EB On ramp & Market St. EB off ramp	Basic	D	31.4	58	C	24.5	58
9	EB	Market St. EB off ramp Decel Lane	Diverge	C	23.4	58	B	18.2	58
10	EB	Btwn Market St. EB off ramp & Grand Blvd. EB off ramp	Basic	D	28.6	58	C	22.9	58
11	EB	Grand Blvd. EB off ramp Decel Lane	Diverge	C	23.0	54	B	18.4	54
12	EB	Btwn Grand Blvd. EB off ramp & Forest Park Ave. EB on ramp	Basic	C	25.5	58	C	20.5	59
13	EB	Btwn Forest Park Ave. EB on ramp & Jefferson Ave. EB off ramp	Weave	C	21.9	57	C	20.2	57
14	EB	Jefferson Ave. off ramp Decel Lane	Diverge	B	17.2	58	B	15.8	58
15	EB	Btwn Jefferson Ave. EB off ramp & 22nd St. EB off ramp	Diverge	B	18.3	59	B	15.1	59
16	EB	Btwn 22nd St. EB off ramp & EB on ramp	Basic	C	21.8	59	B	17.9	59
17	EB	I-64 EB east of 22nd St	Merge	B	16.9	58	B	16.0	59
18	WB	I-64 WB east of 22nd St	Diverge	C	24.4	55	B	15.8	59

Link Number	Direction	Name	Type	AM			PM		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
19	WB	Btwn 22nd St. WB off ramp & WB on ramp	Basic	D	30.5	45	C	19.3	59
20	WB	22nd St. WB on ramp Accel Lane	Merge	C	26.9	39	B	16.1	58
21	WB	Btwn 22nd St. WB on ramp & Jefferson Ave. WB on ramp	Basic	E	36.4	48	C	21.5	59
22	WB	Btwn Jefferson Ave. WB on ramp & Forest Park Ave. WB off ramp	Weave	D	32.5	47	C	20.6	57
23	WB	Btwn Forest Park Ave. WB off ramp & Market St. WB on ramp	Basic	E	42.9	33	C	22.8	59
24	WB	Market St. WB on ramp Accel Lane	Merge	E	46.9	36	C	20.5	57
25	WB	Btwn Market St. WB on ramp & Grand Blvd. WB on ramp	Basic	F	56.4	36	D	27.3	58
26	WB	Grand Blvd. WB on ramp Accel Lane	Merge	E	52.1	33	C	25.0	53
27	WB	Btwn Grand Blvd. WB on ramp & Boyle Ave. WB off ramp	Basic	F	69.6	28	D	30.5	57
28	WB	Boyle Ave. WB off ramp Decel Lane	Diverge	E	98.3	13	C	23.2	57
29	WB	Btwn Boyle Ave. WB off ramp & Vandeventer Ave/Papin St. on ramp	Basic	D	26.9	53	D	28.6	58
30	WB	Btwn Vandeventer Ave/Papin St. on ramp & Boyle Ave. WB on ramp	Basic	C	20.3	58	C	23.5	59
31	WB	Btwn Boyle Ave. WB on ramp & Kingshighway WB off ramp	Weave	B	17.5	58	C	23.3	53
32	WB	Btwn Kingshighway Blvd. WB off ramp & WB on ramp	Basic	B	17.6	59	C	23.8	57
33	WB	Kingshighway Blvd. WB on ramp Accel Lane	Merge	B	16.8	57	C	23.9	54
34	WB	I-64 WB west of Kingshighway Blvd	Basic	C	20.7	59	D	27.8	58

Table A.2. Year 2050 No Build (Maintenance Only) VISSIM Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Blvd. (signalized)		
Overall Intersection	**D (46.9)**	**D (54.2)**
Eastbound Approach	D (47.9) [117] <443>	E (58.5) [113] <366>
Westbound Approach	D (51.5) [73] <347>	E (59.8) [86] <283>
Northbound Approach	C (33.2) [159] <437>	D (41) [165] <404>
Southbound Approach	E (60) [235] <537>	E (60) [281] <556>
I-64 EB off ramp and Tower Grove Ave. (roundabout)		
Overall Intersection	**A (8.3)**	**A (3.5)**
Eastbound Approach	A (2.5) [1] <196>	A (5.2) [9] <201>
Northbound Approach	D (29.6) [73] <439>	A (2.5) [1] <94>
Southbound Approach	A (1.1) [0] <26>	A (1.4) [1] <120>
I-64 WB off ramp and Boyle Ave. (signalized)		
Overall Intersection	**D (38.3)**	**B (19.7)**
Westbound Approach	D (46.6) [1730] <2671>	C (26.9) [37] <210>
Northbound Approach	D (39.7) [124] <464>	A (8) [9] <161>
Southbound Approach	B (17.1) [27] <194>	C (21.6) [234] <585>
Clayton Ave. and Boyle Ave. (signalized)		
Overall Intersection	**F (109.6)**	**F (101.9)**
Eastbound Approach	F (262) [2647] <2880>	F (110.5) [2733] <2878>
Westbound Approach	D (50.4) [64] <225>	E (62.8) [304] <795>
Northbound Approach	C (23.1) [178] <530>	E (61) [181] <530>
Southbound Approach	F (326) [2189] <3125>	F (185.4) [3001] <3143>
I-64 EB on ramp and Papin St. (unsignalized)		
Overall Intersection	**A (1.1)**	**A (2.2)**
Eastbound Approach	A (1.1) [0] <63>	A (2.1) [1] <150>
Westbound Approach	A (0.6) [0] <25>	A (2.5) [1] <50>
I-64 EB off ramp and Papin St./Vandeventer Ave. (signalized)		
Overall Intersection	**C (31.1)**	**D (41.7)**
Eastbound Approach	E (57.6) [96] <273>	E (71.4) [121] <302>
Westbound Approach	B (17.9) [76] <474>	D (38) [59] <223>
Northbound Approach	D (42.3) [74] <497>	E (62.9) [101] <477>
Southbound Approach	C (28.4) [68] <364>	D (39.4) [224] <875>
I-64 WB on ramp and Grand Blvd. (unsignalized)		
Overall Intersection	**A (2.1)**	**A (3.3)**
Westbound Approach	B (12.7) [1] <53>	B (16.8) [3] <85>
Northbound Approach	A (1.7) [4] <228>	A (3.7) [10] <289>
Southbound Approach	A (1) [1] <110>	A (1.4) [7] <222>

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
I-64 EB off ramp and Grand Blvd. (signalized)		
Overall Intersection	B (17)	B (12.4)
Westbound Approach	D (38.2) [129] <628>	D (42.7) [122] <521>
Northbound Approach	B (16.5) [38] <513>	B (11.8) [19] <334>
Southbound Approach	A (8.3) [28] <400>	A (1.7) [6] <91>
I-64 EB off ramp at Market St. and Compton Ave. (signalized)		
Overall Intersection	D (37.7)	D (43.4)
Eastbound Approach	C (31.1) [64] <349>	C (32.8) [72] <392>
Westbound Approach	C (27.7) [13] <141>	C (29.6) [12] <128>
Northbound Approach	D (44.2) [185] <592>	D (53.6) [163] <531>
Southbound Approach	C (34.6) [75] <247>	C (29.9) [100] <359>
I-64 EB off ramps and Jefferson Ave. (signalized)		
Overall Intersection	B (13.2)	B (15.0)
Eastbound Approach	A (0.2) [0] <0>	A (0.1) [0] <0>
Northbound Approach	B (12.7) [35] <456>	C (23.2) [30] <236>
Southbound Approach	A (1.7) [4] <82>	A (5.8) [31] <207>
I-64 WB on ramps and Jefferson Ave. (signalized)		
Overall Intersection	B (14.6)	C (24.3)
Westbound Approach	D (41.9) [61] <220>	D (51.7) [46] <170>
Northbound Approach	A (3.5) [67] <214>	A (7.6) [78] <216>
Southbound Approach	C (32.1) [82] <313>	C (32.1) [253] <941>
22nd St. and WB Outer Road (signalized)		
Overall Intersection	B (19.8)	B (11.1)
Westbound Approach	C (31.3) [79] <329>	C (22.9) [28] <142>
Northbound Approach	B (12.9) [80] <291>	B (11.7) [40] <256>
Southbound Approach	A (4.8) [6] <127>	A (4.9) [13] <222>
Scott Ave. and Eastbound Outer Road (signalized)		
Overall Intersection	C (34.9)	B (18.4)
Eastbound Approach	D (45.9) [171] <581>	C (30.3) [107] <474>
Northbound Approach	B (14.4) [10] <121>	A (4.6) [6] <117>
Southbound Approach	B (11.1) [6] <105>	B (10.1) [17] <163>

Table A.3. Year 2050 No Build (Maintenance Only) Synchro Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Boulevard (signalized)		
Overall Intersection	**E (55.7)**	**D (50.4)**
Eastbound Approach	E (56.4) [313] <0.76>	E (63.6) [289] <0.78>
Westbound Approach	D (48.2) [195] <0.51>	E (56.6) [242] <0.64>
Northbound Approach	D (39.9) [255] <0.74>	D (44.8) [345] <0.83>
Southbound Approach	E (73.4) [#450] <1.17>	D (49.5) [527] <0.87>
I-64 EB off ramp and Tower Grove Avenue (roundabout, Sidra Results)		
Overall Intersection	**B (10.0)**	**A (6.01)**
Eastbound Approach	A (7.0) [143] <0.58>	A (6.9) [48] <0.27>
Northbound Approach	C (22.2) [155] <0.67>	A (6.1) [28] <0.21>
Southbound Approach	A (4.2) [<25] <0.03>	A (4.4) [<25] <0.22>
I-64 WB off ramp and Boyle Avenue (signalized)		
Overall Intersection	**D (36.6)**	**D (35.2)**
Westbound Approach	E (55.5) [#342] <1.05>	B (19.0) [114] <0.62>
Northbound Approach	C (25.1) [#186] <0.79>	A (7.7) [55] <0.52>
Southbound Approach	B (10.8) [95] <0.50>	D (44.6) [#757] <0.90>
I-64 EB on ramp and Papin Street (unsignalized, Sim Traffic Results)		
Eastbound Left-Turn	A (2.5) [30]	A (3.2) [78]
I-64 EB off ramp and Papin St/Vandeventer Avenue (signalized)		
Overall Intersection	**C (31.9)**	**C (27.6)**
Eastbound Approach	C (34.8) [200] <0.67>	D (40.7) [213] <0.69>
Westbound Approach	D (42.8) [124] <0.59>	D (43.6) [129] <0.61>
Northbound Approach	C (27.3) [176] <0.71>	C (25.9) [163] <0.70>
Southbound Approach	C (33.4) [225] <0.33>	B (19.8) [261] <0.57>
I-64 WB on ramp and Grand Boulevard (unsignalized)		
Westbound Approach	B (13.0) [<25] <0.01>	F (104.1) [70] <0.61>
Northbound Left-Turn	C (15.8) [73] <0.51>	C (21.3) [98] <0.60>
Southbound Left-Turn	B (11.0) [<25] <0.00>	B (10.7) [<25] <0.01>
I-64 EB off ramp and Grand Boulevard (signalized)		
Overall Intersection	**B (19.8)**	**B (13.4)**
Westbound Approach	E (61.9) [274] <0.79>	E (66.6) [303] <0.79>
Northbound Approach	A (8.0) [139] <0.37>	A (3.8) [103] <0.31>
Southbound Approach	A (5.9) [105] <0.39>	A (1.6) [<25] <0.39>
I-64 EB off ramp at Market Street and Compton Avenue (signalized)		
Overall Intersection	**C (33.5)**	**C (31.1)**
Eastbound Approach	C (32.0) [194] <0.35>	C (25.8) [176] <0.36>
Westbound Approach	C (27.0) [86] <0.32>	C (37.3) [248] <0.75>
Northbound Approach	D (33.1) [220] <0.84>	C (29.3) [117] <0.81>

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Southbound Approach	D (41.0) [142] <0.52>	C (31.7) [220] <0.51>
Market Street and Bernard Street (unsignalized, Sim Traffic Results)		
Eastbound Left-Turn	A (0.7) [<25]	A (0.0) [<25]
I-64 WB off ramp and Grand Boulevard/Forest Park Avenue (unsignalized, Sim Traffic Results)		
Westbound Approach	B (12.2) [115]	B (13.1) [153]
I-64 EB off ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (10.4)**	**C (31.9)**
Eastbound Approach	D (38.0) [218] <0.64>	E (78.9) [454] <0.86>
Northbound Approach	A (4.1) [143] <0.39>	B (15.3) [126] <0.33>
Southbound Approach	A (2.3) [m23] <0.26>	B (10.8) [443] <0.63>
I-64 WB on ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (19.8)**	**C (20.3)**
Westbound Approach	D (56.7) [190] <0.78>	D (50.8) [121] <0.59>
Northbound Approach	A (7.5) [150] <0.41>	A (9.4) [214] <0.32>
Southbound Approach	D (35.4) [162] <0.41>	C (23.9) [317] <0.74>
I-64 EB off ramps and 22nd Street (signalized)		
Overall Intersection	**B (19.6)**	**B (12.1)**
Westbound Approach	B (18.8) [118] <0.56>	C (23.0) [79] <0.47>
Northbound Approach	C (29.1) [328] <0.51>	B (18.4) [223] <0.36>
Southbound Approach	A (3.9) [36] <0.22>	A (2.7) [38] <0.34>
I-64 WB on ramps and 22nd Street (signalized)		
Overall Intersection	**C (20.3)**	**B (17.1)**
Eastbound Approach	C (27.5) [112] <1.15dl>	C (28.6) [164] <0.99dl>
Northbound Approach	A (6.2) [41] <0.09>	A (2.4) [30] <0.24>
Southbound Approach	A (5.4) [28] <0.11>	A (9.7) [182] <0.37>

Delay presented in vehicles per second

Table A.4. Year 2050 No Build (Maintenance Only) Synchro Traffic Operating Conditions – Tier 2

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Kingshighway & Forest Park Ave. (signalized)		
Overall Intersection	D	D
Kingshighway & Parkview Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Children's Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Barnes Jewish Hospital Plz. (signalized)		
Overall Intersection	C	C
Kingshighway & Oakland Ave. (signalized)		
Overall Intersection	B	C
Kingshighway & Rte. 100 (Choteau Ave/Manchester Ave) (signalized)		
Overall Intersection	F	F
Forest Park Ave. & Euclid Ave. (signalized)		
Overall Intersection	B	C
Forest Park Ave. & Taylor Ave. (signalized)		
Overall Intersection	C	D
Forest Park Ave. & Newstead Ave. (signalized)		
Overall Intersection	C	C
Forest Park Ave. & Boyle Ave. (signalized)		
Overall Intersection	B	C
Forest Park Ave. & Sarah St. (signalized)		
Overall Intersection	C	C
Forest Park Ave. & Vandeventer Ave. (signalized)		
Overall Intersection	D	D
Forest Park Ave. & Spring Ave. (signalized)		
Overall Intersection	B	C
Forest Park Ave. & Grand Blvd. (signalized)		
Overall Intersection	C	C
Clayton Ave. & Taylor Ave. (signalized)		
Overall Intersection	C	D
Clayton Ave. & Newstead Ave. (signalized)		
Overall Intersection	D	E
Clayton Ave. & Tower Grove Ave. (signalized)		
Overall Intersection	D	C
Clayton Ave. & Boyle Ave. (signalized)		
Overall Intersection	F	F
Clayton Ave. & Sarah St. (unsignalized, all-way STOP)		
Overall Intersection	A	C
Papin St. & Boyle Ave. (signalized)		

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	A	C
Papin St. & Sarah St. (signalized)		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & Taylor Ave. (signalized)		
Overall Intersection	D	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Newstead Ave. (signalized)		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Tower Grove Ave. (signalized)		
Overall Intersection	C	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Boyle Ave. (signalized)		
Overall Intersection	C	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Sarah St. (signalized)		
Overall Intersection	B	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Vandeventer Ave. (signalized)		
Overall Intersection	D	C
Vandeventer Ave. & Market St. (unsignalized, Sim Traffic Result)		
Overall Intersection	A	B
Vandeventer Ave. & Ikea Way/Foundry Way (signalized)		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & S 39th St. (signalized)		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Spring Ave. (signalized)		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & Grand Blvd. (signalized)		
Overall Intersection	C	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Compton Ave. (signalized)		
Overall Intersection	D	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Jefferson Ave. (signalized)		
Overall Intersection	E	E
Grand Blvd. & Council Plz. (signalized)		
Overall Intersection	A	A
Compton Ave. & Spruce St. (signalized)		
Overall Intersection	A	B
Jefferson Ave. & Scott Ave. (signalized)		
Overall Intersection	B	B
Jefferson Ave. & Clark Ave. (signalized)		
Overall Intersection	A	B
Jefferson Ave. & Market St. (signalized)		
Overall Intersection	C	D

Appendix B

YEAR 2050 ALTERNATIVE #1: TRAFFIC OPERATING CONDITIONS – VISSIM TIER 1, SYNCHRO TIER 1 & 2

Table B.1. Year 2050 Alternative #1 VISSIM Link Segment Results – Tier 1

Link Number	Direction	Name	Type	AM PEAK HOUR			PM PEAK HOUR		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
1	EB	I-64 EB west of Kingshighway Blvd	Basic	D	31.5	56	C	21.3	59
2	EB	Kingshighway Blvd. EB off ramp Decel Lane	Diverge	D	34.9	41	B	17.9	56
3	EB	Btwn Kingshighway Blvd. EB off ramp & EB on ramp	Basic	D	26.3	58	B	17.1	59
4	EB	Btwn Kingshighway Blvd. EB on ramp & Tower Grove EB off ramp	Weave	C	24.6	56	B	16.5	58
5	EB	Btwn Tower Grove EB off ramp & Vandeventer Ave/Papin St. EB off ramp	Diverge	C	25.6	57	B	18.8	58
6	EB	Btwn Vandeventer Ave/Papin St. EB off ramp & Papin St. EB on ramp	Basic	D	30.3	58	C	21.8	58
7	EB	Papin St. EB on ramp Accel Lane	Merge	C	23.7	57	B	19.4	58
8	EB	Btwn Papin St. EB on ramp & Market St. EB off ramp	Basic	D	31.6	58	C	25.8	58
9	EB	Grand Blvd. EB off ramp Decel Lane	Diverge	C	24.2	56	B	19.7	57
10	EB	Btwn Grand Blvd. EB off ramp & Grand Blvd. EB on ramp	Basic	C	25.9	58	C	21.7	59

Link Number	Direction	Name	Type	AM PEAK HOUR			PM PEAK HOUR		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
11	EB	Grand Blvd. EB on ramp Accel Lane	Merge	C	22.2	56	C	20.6	56
12	EB	Btwn Grand Blvd. EB on ramp & Jefferson Ave. EB off ramp	Basic	C	22.0	57	C	20.2	57
13	EB	Jefferson Ave. off ramp Decel Lane	Diverge	B	17.3	58	B	15.8	58
14	EB	Btwn Jefferson Ave. EB off ramp & 22nd St. EB off ramp	Diverge	B	18.4	59	B	15.4	59
15	EB	Btwn 22nd St. EB off ramp & EB on ramp	Basic	C	22.1	59	C	18.5	59
16	EB	I-64 EB east of 22nd St	Merge	B	17.1	58	B	16.4	59
17	WB	I-64 WB east of 22nd St	Diverge	C	20.5	59	B	15.8	59
18	WB	Btwn 22nd St. WB off ramp & WB on ramp	Basic	C	23.4	59	C	19.3	59
19	WB	22nd St. WB on ramp Accel Lane	Merge	B	18.5	57	B	16.1	58
20	WB	Btwn 22nd St. WB on ramp & Jefferson Ave. WB on ramp	Basic	C	24.7	58	C	21.6	58
21	WB	Btwn Jefferson Ave. WB on ramp & Forest Park Ave. WB off ramp	Weave	C	22.8	56	C	20.7	57
22	WB	Btwn Forest Park Ave. WB off ramp & Grand Blvd. WB off ramp	Basic	D	26.3	59	C	23.7	59
23	WB	Grand Blvd. WB off ramp Decel Lane	Diverge	B	19.7	59	B	18.0	58

Link Number	Direction	Name	Type	AM PEAK HOUR			PM PEAK HOUR		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
24	WB	Btwn Grand Blvd. WB off ramp & Grand Blvd. WB on ramp	Basic	C	24.9	58	C	22.9	59
25	WB	Grand Blvd. WB on ramp Accel Lane	Merge	C	24.5	54	C	22.2	57
26	WB	Btwn Grand Blvd. WB on ramp & Boyle Ave. WB off ramp	Basic	D	30.8	57	D	29.1	58
27	WB	Boyle Ave. WB off ramp Decel Lane	Diverge	C	22.5	58	C	21.7	58
28	WB	Btwn Boyle Ave. WB off ramp & Vandeventer Ave/Papin St. on ramp	Basic	C	25.6	58	D	27.3	58
29	WB	Btwn Vandeventer Ave/Papin St. on ramp & Boyle Ave. WB on ramp	Basic	C	21.2	59	C	22.7	59
30	WB	Btwn Boyle Ave. WB on ramp & Kingshighway WB off ramp	Weave	B	18.7	57	C	24.3	53
31	WB	Btwn Kingshighway Blvd. WB off ramp & WB on ramp	Basic	C	18.7	58	C	24.5	57
32	WB	Kingshighway Blvd. WB on ramp Accel Lane	Merge	B	17.8	57	C	24.8	53
33	WB	I-64 WB west of Kingshighway Blvd	Basic	C	21.7	58	D	28.4	58

Table B.2. Year 2050 Alternative #1 VISSIM Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Blvd. (signalized)		
Overall Intersection	**D (49.8)**	**D (54.5)**
Eastbound Approach	D (50.4) [122] <523>	E (59.3) [114] <383>
Westbound Approach	D (52.2) [83] <357>	E (61.2) [95] <309>
Northbound Approach	C (36.5) [139] <364>	D (42.1) [165] <407>
Southbound Approach	E (60.5) [248] <541>	E (60) [288] <570>
I-64 EB off ramp and Tower Grove Ave. (roundabout)		
Overall Intersection	**A (8.1)**	**A (2.1)**
Eastbound Approach	A (2.5) [2] <214>	A (3) [2] <167>
Northbound Approach	D (28.2) [70] <405>	A (1.7) [1] <79>
Southbound Approach	A (1.1) [0] <26>	A (0.7) [0] <26>
I-64 WB off ramp and Boyle Ave. (signalized)		
Overall Intersection	**B (16.9)**	**B (15.7)**
Westbound Approach	C (23.2) [67] <295>	E (65.2) [60] <180>
Northbound Approach	B (14.9) [35] <251>	B (12.7) [20] <168>
Southbound Approach	A (8.3) [31] <310>	A (9) [89] <517>
Clayton Ave. and Boyle Ave. (signalized)		
Overall Intersection	**D (38.8)**	**C (34.4)**
Eastbound Approach	C (27.7) [79] <501>	C (22.8) [304] <1177>
Westbound Approach	D (37.1) [57] <208>	C (26.3) [111] <592>
Northbound Approach	D (42.4) [178] <522>	D (49.2) [138] <348>
Southbound Approach	D (52.1) [96] <280>	E (55.8) [373] <1393>
I-64 EB on ramp and Papin St. (unsignalized)		
Overall Intersection	**A (1)**	**A (3.6)**
Eastbound Approach	A (1.1) [0] <64>	A (3.6) [6] <343>
Westbound Approach	A (0.5) [0] <18>	A (4) [1] <50>
I-64 EB off ramp and Papin St./Vandeventer Ave. (signalized)		
Overall Intersection	**C (33.6)**	**D (41.5)**
Eastbound Approach	A (8.8) [3] <83>	B (13.6) [2] <60>
Westbound Approach	D (36.9) [66] <258>	D (38.7) [60] <225>
Northbound Approach	D (42.3) [77] <500>	E (62.6) [102] <514>
Southbound Approach	C (31) [95] <545>	D (37) [213] <876>
I-64 WB on ramp and Grand Blvd. (signalized)		
Overall Intersection	**C (20.3)**	**C (34.2)**
Westbound Approach	E (55.7) [76] <232>	F (171.6) [237] <637>
Northbound Approach	B (10.3) [93] <447>	C (33.3) [173] <452>
Southbound Approach	C (32.8) [152] <351>	C (28.3) [190] <340>

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
I-64 EB off ramp and Grand Blvd. (signalized)		
Overall Intersection	C (28.6)	D (36.4)
Westbound Approach	D (37.8) [102] <420>	C (31.2) [71] <235>
Northbound Approach	D (36.1) [532] <1440>	E (68.5) [3789] <5528>
Southbound Approach	B (12.4) [54] <330>	B (12.8) [56] <272>
I-64 EB off ramp at Market St. and Compton Ave. (signalized)		
Overall Intersection	C (28.7)	C (25.3)
Eastbound Approach	C (33.7) [57] <286>	B (12.8) [18] <179>
Westbound Approach	C (27.4) [13] <142>	B (19.8) [8] <116>
Northbound Approach	C (27.9) [68] <327>	D (39.1) [60] <247>
Southbound Approach	B (16.8) [22] <178>	C (21.7) [50] <250>
I-64 EB off ramps and Jefferson Ave. (signalized)		
Overall Intersection	B (12.9)	B (15)
Eastbound Approach	C (26.8) [71] <262>	C (23.1) [64] <282>
Northbound Approach	B (12.3) [34] <449>	C (23.4) [33] <271>
Southbound Approach	A (1.6) [4] <85>	A (5.5) [32] <201>
I-64 WB on ramps and Jefferson Ave. (signalized)		
Overall Intersection	B (14.3)	C (24)
Westbound Approach	D (38.4) [55] <257>	D (44) [37] <181>
Northbound Approach	A (3.5) [66] <213>	A (7.8) [77] <211>
Southbound Approach	C (32.1) [81] <316>	C (31.7) [248] <945>
22nd St. and WB Outer Road (signalized)		
Overall Intersection	C (20.4)	B (11)
Westbound Approach	C (32.2) [84] <354>	C (22.7) [28] <140>
Northbound Approach	B (13.2) [83] <287>	B (11.5) [37] <257>
Southbound Approach	A (4.9) [7] <131>	A (4.8) [13] <223>
Scott Ave. and Eastbound Outer Road (signalized)		
Overall Intersection	D (36.1)	B (16.5)
Eastbound Approach	D (47.7) [184] <620>	C (27.4) [87] <442>
Northbound Approach	B (15) [10] <127>	A (4.4) [5] <113>
Southbound Approach	B (10.4) [6] <100>	A (9.6) [16] <179>
Forest Park Ave. and Grand Blvd. (signalized)		
Overall Intersection	C (31.7)	E (68.5)
Eastbound Approach	D (41.7) [83] <370>	F (105.9) [415] <524>
Westbound Approach	D (38.6) [166] <319>	D (39.5) [253] <325>
Northbound Approach	B (19.6) [122] <291>	D (41.4) [220] <298>
Southbound Approach	D (35.9) [95] <480>	F (101.4) [3620] <3745>
Forest Park Ave. and Theresa Ave. (unsignalized)		

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	**A (0.4)**	**B (10.6)**
Eastbound Approach	A (0.3) [0] <16>	A (0.8) [1] <30>
Westbound Approach	A (0.4) [0] <36>	C (21.7) [81] <445>
Northbound Approach	A (6.7) [1] <69>	C (18.4) [1] <77>
Theresa Ave. and Spruce St. (unsignalized)		
Overall Intersection	**A (2.4)**	**A (3.7)**
Westbound Approach	A (7.1) [1] <66>	A (7) [2] <73>
Northbound Approach	A (0.2) [0] <0>	A (0.2) [0] <0>
Southbound Approach	A (0.6) [0] <15>	A (0.4) [0] <10>

Table B.3. Year 2050 Alternative #1 Synchro Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Boulevard (signalized)		
Overall Intersection	**E (55.7)**	**D (50.4)**
Eastbound Approach	E (56.4) [313] <0.76>	E (63.6) [289] <0.78>
Westbound Approach	D (48.2) [195] <0.51>	E (56.6) [242] <0.64>
Northbound Approach	D (39.9) [255] <0.74>	D (44.8) [345] <0.83>
Southbound Approach	E (73.4) [#450] <1.17>	D (49.5) [527] <0.87>
I-64 EB off ramp and Tower Grove Avenue (roundabout, Sidra Results)		
Overall Intersection	**B (10.0)**	**A (6.01)**
Eastbound Approach	A (7.0) [143] <0.58>	A (6.9) [48] <0.27>
Northbound Approach	C (21.8) [155] <0.67>	A (6.1) [28] <0.21>
Southbound Approach	A (4.2) [<25] <0.03>	A (4.4) [<25] <0.22>
I-64 WB off ramp and Boyle Avenue (signalized)		
Overall Intersection	**A (9.6)**	**B (16.5)**
Westbound Approach	A (9.4) [66] <0.62>	E (56.9) [118] <0.69>
Northbound Approach	B (14.1) [118] <0.54>	B (15.3) [89] <0.48>
Southbound Approach	A (5.3) [39] <0.28>	A (9.2) [m207] <0.69>
I-64 EB on ramp and Papin Street (unsignalized, Sim Traffic Results)		
Eastbound Left-Turn	A (2.5) [30]	A (3.2) [78]
I-64 EB off ramp and Papin St/Vandeventer Avenue (signalized)		
Overall Intersection	**C (29.3)**	**C (27.6)**
Eastbound Approach	C (34.8) [200] <0.67>	D (40.7) [213] <0.69>
Westbound Approach	D (42.8) [124] <0.59>	D (43.6) [129] <0.61>
Northbound Approach	C (21.0) [268] <0.71>	C (25.9) [163] <0.70>
Southbound Approach	C (33.4) [225] <0.33>	B (19.8) [261] <0.57>
I-64 WB Ramps and Grand Boulevard (signalized)		
Overall Intersection	**C (30.2)**	**C (29.1)**
Westbound Approach	D (50.1) [#193] <0.75>	B (18.6) [64] <0.53>
Northbound Approach	D (36.4) [#671] <0.98>	A (8.9) [m142] <0.88>
Southbound Approach	B (19.4) [282] <0.53>	D (41.8) [#607] <0.93>
I-64 EB off ramp and Grand Boulevard (signalized)		
Overall Intersection	**C (29.3)**	**D (41.7)**
Westbound Approach	D (43.2) [259] <0.77>	E (78.9) [#266] <1.05>
Northbound Approach	C (25.5) [553] <0.74>	E (69.0) [#547] <1.03>
Southbound Approach	C (22.0) [242] <0.68>	A (7.6) [m88] <0.71>
Market Street and Compton Avenue (signalized)		
Overall Intersection	**C (25.7)**	**C (25.0)**
Eastbound Approach	D (35.4) [m201] <0.34>	B (13.2) [m88] <0.36>
Westbound Approach	C (31.1) [113] <0.31>	C (35.7) [234] <0.45>

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Northbound Approach	C (22.1) [331] <0.53>	C (31.2) [135] <0.42>
Southbound Approach	B (15.8) [89] <0.22>	C (21.1) [182] <0.39>
I-64 EB off ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (10.4)**	**C (31.8)**
Eastbound Approach	D (38.0) [218] <0.64>	E (78.9) [454] <0.86>
Northbound Approach	A (4.1) [143] <0.39>	B (15.2) [126] <0.34>
Southbound Approach	A (2.3) [m23] <0.26>	B (10.6) [443] <0.63>
I-64 WB on ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (19.7)**	**C (20.3)**
Westbound Approach	D (56.7) [190] <0.78>	D (50.8) [121] <0.59>
Northbound Approach	A (7.5) [150] <0.41>	A (9.4) [214] <0.32>
Southbound Approach	D (35.1) [162] <0.41>	C (24.0) [321] <0.74>
I-64 EB off ramps and 22nd Street (signalized)		
Overall Intersection	**B (19.6)**	**B (12.1)**
Westbound Approach	B (18.8) [118] <0.56>	C (23.0) [79] <0.47>
Northbound Approach	C (29.1) [328] <0.51>	B (18.4) [223] <0.36>
Southbound Approach	A (3.9) [36] <0.22>	A (2.7) [38] <0.34>
I-64 WB on ramps and 22nd Street (signalized)		
Overall Intersection	**C (20.3)**	**B (17.1)**
Eastbound Approach	C (27.5) [112] <1.15dl>	C (28.6) [164] <0.99dl>
Northbound Approach	A (6.2) [41] <0.09>	A (2.4) [30] <0.24>
Southbound Approach	A (5.4) [28] <0.11>	A (9.7) [182] <0.37>

Delay presented in vehicles per second

Table B.4. Year 2050 Alternative #1 Synchro Traffic Operating Conditions – Tier 2

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Kingshighway & Forest Park Ave. (signalized)		
Overall Intersection	D	D
Kingshighway & Parkview Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Children's Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Barnes Jewish Hospital Plz. (signalized)		
Overall Intersection	C	C
Kingshighway & Oakland Ave. (signalized)		
Overall Intersection	B	C
Kingshighway & Rte. 100 (Choteau Ave/Manchester Ave) ***(signalized)***		
Overall Intersection	F	F
Forest Park Ave. & Euclid Ave. ***(signalized)***		
Overall Intersection	B	B
Forest Park Ave. & Taylor Ave. ***(signalized)***		
Overall Intersection	C	D
Forest Park Ave. & Newstead Ave. ***(signalized)***		
Overall Intersection	C	C
Forest Park Ave. & Boyle Ave. ***(signalized)***		
Overall Intersection	B	C
Forest Park Ave. & Sarah St. ***(signalized)***		
Overall Intersection	C	C
Forest Park Ave. & Vandeventer Ave. ***(signalized)***		
Overall Intersection	D	D
Forest Park Ave. & Spring Ave. ***(signalized)***		
Overall Intersection	B	B
Forest Park Ave. & Reinert Hall Access Dr. ***(unsignalized, side-street STOP)***		
Overall Intersection	A	A
Forest Park Ave. & Grand Blvd. ***(signalized)***		
Overall Intersection	D	F
Forest Park Ave. & Council Towers Access Dr. ***(unsignalized, side-street STOP)***		
Overall Intersection	A	A
Forest Park Avenue and Theresa Avenue (***unsignalized, side-street STOP***)		
Overall Intersection	A	A
Clayton Ave. & Taylor Ave. ***(signalized)***		
Overall Intersection	C	D
Clayton Ave. & Newstead Ave. ***(signalized)***		

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	C	C
*Clayton Ave. & Tower Grove Ave. **(signalized)***		
Overall Intersection	B	C
*Clayton Ave. & Boyle Ave. **(signalized)***		
Overall Intersection	D	E
*Clayton Ave. & Sarah St. **(unsignalized, all-way STOP)***		
Overall Intersection	A	C
*Papin St. & Boyle Ave. **(signalized)***		
Overall Intersection	B	C
Papin St. & Sarah St. (signalized)		
Overall Intersection	A	A
*Rte. 100 (Chouteau Ave/Manchester Ave) & Taylor Ave. **(signalized)***		
Overall Intersection	D	D
*Rte. 100 (Chouteau Ave/Manchester Ave) & Newstead Ave. **(signalized)***		
Overall Intersection	B	B
*Rte. 100 (Chouteau Ave/Manchester Ave) & Tower Grove Ave. **(signalized)***		
Overall Intersection	C	C
*Rte. 100 (Chouteau Ave/Manchester Ave) & Boyle Ave. **(signalized)***		
Overall Intersection	C	C
*Rte. 100 (Chouteau Ave/Manchester Ave) & Sarah St. **(signalized)***		
Overall Intersection	B	C
*Rte. 100 (Chouteau Ave/Manchester Ave) & Vandeventer Ave. **(signalized)***		
Overall Intersection	D	C
*Vandeventer Ave. & Market St. **(unsignalized, Sim Traffic Result)***		
Overall Intersection	A	B
*Vandeventer Ave. & Ikea Way/Foundry Way **(signalized)***		
Overall Intersection	A	A
*Rte. 100 (Chouteau Ave/Manchester Ave) & S 39th St. **(signalized)***		
Overall Intersection	B	B
*Rte. 100 (Chouteau Ave/Manchester Ave) & Spring Ave. **(signalized)***		
Overall Intersection	A	A
*Rte. 100 (Chouteau Ave/Manchester Ave) & Grand Blvd. **(signalized)***		
Overall Intersection	D	D
*Rte. 100 (Chouteau Ave/Manchester Ave) & Compton Ave. **(signalized)***		
Overall Intersection	C	C
*Rte. 100 (Chouteau Ave/Manchester Ave) & Jefferson Ave. **(signalized)***		
Overall Intersection	E	E
*Grand Blvd. & Council Plz. **(unsignalized, RI/RO)***		
Overall Intersection	A	A

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Spruce Street and Theresa Avenue (***unsignalized, side-street STOP***)		
Overall Intersection	A	A
Compton Ave. & Spruce St. ***(signalized)***		
Overall Intersection	A	B
Jefferson Ave. & Scott Ave. ***(signalized)***		
Overall Intersection	B	B
Jefferson Ave. & Clark Ave. ***(signalized)***		
Overall Intersection	A	B
Jefferson Ave. & Market St. ***(signalized)***		
Overall Intersection	C	D

Appendix C

YEAR 2050 ALTERNATIVE #2: TRAFFIC OPERATING CONDITIONS – VISSIM TIER 1, SYNCHRO TIER 1 & 2

Table C.1. Year 2050 Alternative #2 VISSIM Link Segment Results – Tier 1

Link Number	Direction	Name	Type	Alt 2 AM			Alt 2 PM		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
1	EB	I-64 EB west of Kingshighway Blvd	Basic	D	31.5	56	C	21.3	59
2	EB	Kingshighway Blvd. EB off ramp Decel Lane	Diverge	D	34.9	41	B	17.9	56
3	EB	Btwn Kingshighway Blvd. EB off ramp & EB on ramp	Basic	D	26.3	58	B	17.1	59
4	EB	Btwn Kingshighway Blvd. EB on ramp & Tower Grove EB off ramp	Weave	C	26.6	52	B	16.6	58
5	EB	Btwn Tower Grove EB off ramp & Vandeventer Ave/Papin St. EB off ramp	Diverge	C	25.9	56	B	18.8	58
6	EB	Btwn Vandeventer Ave/Papin St. EB off ramp & Boyle Ave. EB on ramp	Basic	D	30.1	58	C	21.7	59
7	EB	Boyle Ave. EB on ramp Accel Lane	Merge	C	23.6	58	B	19.5	58
8	EB	Boyle Ave. EB on ramp & Spruce St/Grand Ave. EB off ramp	Basic	D	31.7	57	C	25.9	58
9	EB	Spruce St/Grand Ave. EB off ramp Decel Lane	Diverge	C	23.8	57	B	19.3	58
10	EB	Btwn Spruce St/Grand Ave. EB off ramp & Grand Ave. EB on ramp	Basic	C	25.9	58	C	21.8	58
11	EB	Btwn Grand Ave. EB on ramp & Jefferson Ave. EB off ramp	Weave	C	21.7	58	C	20.8	58
12	EB	Jefferson Ave. off ramp Decel Lane	Diverge	B	17.3	58	B	16.5	58
13	EB	Btwn Jefferson Ave. EB off ramp & 22nd St. EB off ramp	Diverge	B	18.4	59	B	15.8	59
14	EB	Btwn 22nd St. EB off ramp & EB on ramp	Basic	C	21.9	59	C	18.7	59
15	EB	I-64 EB east of 22nd St	Merge	B	17.1	58	B	16.6	59
16	WB	I-64 WB east of 22nd St	Diverge	C	20.5	59	B	15.8	59
17	WB	Btwn 22nd St. WB off ramp & WB on ramp	Basic	C	23.6	58	C	19.3	59

Link Number	Direction	Name	Type	Alt 2 AM			Alt 2 PM		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
18	WB	22nd St. WB on ramp Accel Lane	Merge	B	18.7	57	B	16.1	57
19	WB	Btwn 22nd St. WB on ramp & Jefferson Ave. WB on ramp	Basic	C	25.1	57	C	21.6	58
20	WB	Btwn Jefferson Ave. WB on ramp & Forest Park Ave. WB off ramp	Weave	C	23.1	55	C	20.7	57
21	WB	Btwn Forest Park Ave. WB off ramp & Grand Ave. WB on ramp	Basic	C	24.8	58	C	22.8	59
22	WB	Grand Blvd. WB on ramp Accel Lane	Merge	C	24.4	54	C	23.8	55
23	WB	Btwn Grand Blvd. WB on ramp & Boyle Ave. WB off ramp	Basic	D	30.3	58	D	30.2	58
24	WB	Boyle Ave. WB off ramp Decel Lane	Diverge	C	22.3	59	C	22.4	58
25	WB	Btwn Boyle Ave. WB off ramp & Vandeventer Ave./Papin St. on ramp	Basic	C	25.5	59	D	28.3	58
26	WB	Btwn Vandeventer Ave./Papin St. on ramp & Boyle Ave. WB on ramp	Basic	C	21.2	59	C	23.4	59
27	WB	Btwn Boyle Ave. WB on ramp & Kingshighway WB off ramp	Weave	B	18.5	58	C	25.0	52
28	WB	Btwn Kingshighway Blvd. WB off ramp & WB on ramp	Basic	C	18.5	59	C	25.3	57
29	WB	Kingshighway Blvd. WB on ramp Accel Lane	Merge	B	17.6	57	C	26.0	51
30	WB	I-64 WB west of Kingshighway Blvd	Basic	C	21.6	59	D	29.3	57

Table C.2. Year 2050 Alt 2 VISSIM Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Blvd. (signalized)		
Overall Intersection	**D (49.6)**	**D (55.0)**
Eastbound Approach	D (49.6) [119] <520>	E (58.8) [118] <428>
Westbound Approach	D (52.3) [84] <373>	E (68.1) [98] <318>
Northbound Approach	C (36.5) [139] <361>	D (41.4) [164] <397>
Southbound Approach	E (60) [244] <536>	E (60.1) [293] <563>
I-64 EB off ramp and Tower Grove Ave. (roundabout)		
Overall Intersection	**A (9.1)**	**A (2.2)**
Eastbound Approach	A (2.7) [2] <206>	A (3.2) [3] <163>
Northbound Approach	D (32.6) [84] <446>	A (1.9) [1] <80>
Southbound Approach	A (1) [0] <19>	A (0.8) [0] <48>
I-64 WB off ramp and Boyle Ave. (signalized)		
Overall Intersection	**B (16.8)**	**B (15.1)**
Westbound Approach	C (23.1) [68] <313>	D (52.5) [50] <168>
Northbound Approach	B (15) [35] <243>	A (8.3) [13] <181>
Southbound Approach	A (8) [30] <272>	B (10.6) [93] <513>
Clayton Ave. and Boyle Ave. (signalized)		
Overall Intersection	**C (30.3)**	**C (27.5)**
Eastbound Approach	C (27.8) [69] <423>	C (27.2) [811] <1868>
Westbound Approach	C (32.9) [55] <195>	B (17.8) [74] <471>
Northbound Approach	C (29.7) [151] <437>	B (16.9) [55] <216>
Southbound Approach	D (36.6) [76] <270>	D (40.8) [233] <928>
Boyle Ave. and I-64 EB on ramp (Signalized)		
Overall Intersection	**A (2.5)**	**A (6.8)**
Northbound Approach	A (2.3) [9] <184>	A (7.2) [20] <204>
Southbound Approach	A (2.8) [4] <136>	A (6.6) [50] <347>
I-64 EB off ramp and Papin St./Vandeventer Ave. (signalized)		
Overall Intersection	**C (31.8)**	**D (42.7)**
Eastbound Approach	A (8.6) [2] <70>	B (13.4) [2] <65>
Westbound Approach	B (17.9) [76] <474>	D (38.1) [59] <223>
Northbound Approach	D (41.7) [76] <489>	E (62.7) [103] <499>
Southbound Approach	C (29.9) [92] <534>	D (37.7) [226] <926>
I-64 WB on ramp and Grand Blvd. (signalized)		
Overall Intersection	**B (18.3)**	**B (18.8)**
Northbound Approach	C (30.2) [195] <522>	C (28.6) [270] <538>
Southbound Approach	A (7.2) [49] <243>	B (10.7) [117] <265>
I-64 EB off ramp and Grand Blvd. (signalized)		

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	**B (10.6)**	**D (37.7)**
Westbound Approach	D (36.8) [92] <260>	D (44.9) [91] <255>
Northbound Approach	A (6.5) [38] <505>	D (41.5) [488] <1228>
Southbound Approach	A (4.1) [13] <236>	C (31.9) [189] <551>
Spruce St. & I-64 EB off ramp (roundabout)		
Overall Intersection	**A (7.3)**	**A (9)**
Eastbound Approach	D (30.1) [55] <396>	C (17) [66] <577>
Westbound Approach	A (1.9) [0] <30>	A (2.2) [0] <50>
Northbound Approach	A (4) [1] <66>	A (5) [1] <87>
Southbound Approach	A (1.9) [2] <225>	A (5) [14] <346>
Market St. and Compton Ave. (signalized)		
Overall Intersection	**C (33.7)**	**C (31.3)**
Eastbound Approach	B (19.5) [32] <181>	C (25.9) [44] <236>
Westbound Approach	B (14) [6] <102>	C (21.6) [9] <114>
Northbound Approach	E (56.2) [148] <477>	D (46.3) [82] <314>
Southbound Approach	C (24.2) [35] <168>	B (19.8) [46] <231>
I-64 EB off ramps and Jefferson Ave. (signalized)		
Overall Intersection	**B (13.4)**	**B (16.1)**
Eastbound Approach	A (0.2) [0] <0>	A (0.2) [0] <0>
Northbound Approach	C (28.5) [68] <279>	C (24) [73] <360>
Southbound Approach	A (1.6) [4] <77>	A (6.1) [35] <196>
I-64 WB on ramps and Jefferson Ave. (signalized)		
Overall Intersection	**B (14.2)**	**C (23.8)**
Westbound Approach	D (37.8) [54] <235>	D (44.6) [37] <180>
Northbound Approach	A (3.5) [68] <212>	A (7.6) [81] <208>
Southbound Approach	C (32) [81] <318>	C (32.1) [252] <950>
22nd St. and WB Outer Road (signalized)		
Overall Intersection	**B (19)**	**B (11.1)**
Westbound Approach	C (29.8) [76] <269>	C (22.9) [28] <136>
Northbound Approach	B (12.6) [80] <286>	B (11.7) [43] <262>
Southbound Approach	A (4.7) [7] <123>	A (4.9) [12] <196>
Scott Ave. and Eastbound Outer Road (signalized)		
Overall Intersection	**C (35)**	**B (17.8)**
Eastbound Approach	D (45.7) [189] <667>	C (28.8) [103] <471>
Northbound Approach	B (14.8) [10] <125>	A (4.6) [6] <117>
Southbound Approach	B (10.8) [6] <105>	B (10) [17] <198>
Forest Park Ave. and Grand Blvd. (signalized)		
Overall Intersection	**C (33.8)**	**D (47.1)**

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
Eastbound Approach	D (52.5) [120] <360>	E (68.2) [293] <502>
Westbound Approach	C (27.5) [124] <304>	C (33.5) [220] <321>
Northbound Approach	C (31.7) [141] <282>	D (36.1) [163] <275>
Southbound Approach	C (32.7) [66] <281>	D (52.9) [285] <1110>
Forest Park Ave. and Theresa Ave. (signalized)		
Overall Intersection	**B (13.9)**	**B (13)**
Eastbound Approach	A (6.1) [9] <204>	B (19) [110] <619>
Westbound Approach	B (16.7) [88] <712>	B (10.2) [56] <675>
Northbound Approach	B (12.4) [31] <229>	A (8.4) [10] <170>
Theresa Ave. and Spruce St. (signalized)		
Overall Intersection	**B (16.6)**	**B (18.6)**
Eastbound Approach	C (20.6) [76] <270>	C (20.8) [80] <320>
Southbound Approach	A (6.8) [12] <177>	B (16.2) [53] <242>

Table C.3. Year 2050 Alternative #2 Synchro Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Boulevard (signalized)		
Overall Intersection	**E (55.7)**	**D (50.4)**
Eastbound Approach	D (56.4) [313] <0.76>	E (63.6) [289] <0.78>
Westbound Approach	D (48.2) [195] <0.51>	E (56.6) [242] <0.64>
Northbound Approach	D (39.9) [255] <0.74>	D (44.8) [345] <0.83>
Southbound Approach	E (73.4) [#450] <1.17>	D (49.5) [527] <0.87>
I-64 EB off ramp and Tower Grove Avenue (roundabout, Sidra Results)		
Overall Intersection	**B (10.0)**	**A (6.01)**
Eastbound Approach	A (7.0) [143] <0.58>	A (6.9) [48] <0.27>
Northbound Approach	C (21.8) [155] <0.67>	A (6.1) [28] <0.21>
Southbound Approach	A (4.2) [<25] <0.03>	A (4.4) [<25] <0.22>
I-64 WB off ramp and Boyle Avenue (signalized)		
Overall Intersection	**B (13.3)**	**B (12.1)**
Westbound Approach	A (8.8) [87] <0.55>	B (18.7) [114] <0.62>
Northbound Approach	C (25.2) [#173] <0.79>	B (13.5) [104] <0.47>
Southbound Approach	A (8.5) [50] <0.40>	B (10.6) [m247] <0.72>
I-64 EB on ramp and Boyle Avenue (signalized)		
Overall Intersection	**A (3.0)**	**A (6.5)**
Northbound Approach	A (4.3) [52] <0.28>	A (7.3) [61] <0.29>
Southbound Approach	A (0.4) [<25] <0.16>	A (6.2) [205] <0.72>
I-64 EB off ramp and Papin St/Vandeventer Avenue (signalized)		
Overall Intersection	**C (32.1)**	**C (27.6)**
Eastbound Approach	C (34.8) [200] <0.67>	D (40.7) [213] <0.69>
Westbound Approach	D (42.8) [124] <0.59>	D (43.6) [129] <0.61>
Northbound Approach	C (27.9) [182] <0.71>	C (25.9) [163] <0.70>
Southbound Approach	C (33.4) [225] <0.33>	B (19.8) [261] <0.57>
I-64 WB on ramp and Grand Boulevard (signalized)		
Overall Intersection	**A (9.4)**	**B (13.8)**
Northbound Approach	A (3.3) [m18] <0.75>	B (16.0) [486] <0.87>
Southbound Approach	B (15.6) [503] <0.45>	B (12.4) [m629] <0.82>
Grand Boulevard and Bernard Street (signalized)		
Overall Intersection	**C (32.7)**	**D (34.9)**
Westbound Approach	E (55.9) [266] <0.83>	E (64.2) [238] <0.76>
Northbound Approach	C (27.7) [#898] <0.84>	C (33.2) [648] <0.74>
Southbound Approach	C (26.4 [463] <0.75>	C (27.7) [#449] <0.88>
I-64 EB off ramp and Bernard Street (roundabout, Sidra Results)		
Overall Intersection	**B (14.2)**	**B (10.2)**
Eastbound Approach	A (9.7) [47] <0.37>	B (11.8) [115] <0.55>

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Westbound Approach	A (2.8) [<25] <0.01>	A (3.1) [<25] <0.05>
Northbound Approach	A (7.0) [<25] <0.01>	A (7.5) [<25] <0.13>
Southbound Approach	C (15.9) [315] <0.79>	B (10.0) [129] <0.59>
Market Street and Compton Avenue (signalized)		
Overall Intersection	**D (36.9)**	**C (27.7)**
Eastbound Approach	C (29.3) [91] <0.83>	B (15.3) [105] <0.32>
Westbound Approach	C (32.2) [138] <0.39>	D (41.6) [252] <0.47>
Northbound Approach	E (71.1) [381] <0.80>	D (37.8) [167] <0.45>
Southbound Approach	C (23.0) [111] <0.35>	B (18.6) [172] <0.44>
I-64 WB off ramp and Grand Boulevard/Forest Park Avenue (unsignalized, Sim Traffic Results)		
Westbound Approach	B (12.2) [115]	B (13.1) [153]
I-64 EB off ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (10.6)**	**C (31.8)**
Eastbound Approach	D (38.0) [218] <0.64>	E (78.9) [454] <0.86>
Northbound Approach	A (4.1) [143] <0.39>	B (15.3) [126] <0.34>
Southbound Approach	A (2.9) [36] <0.26>	B (10.6) [443] <0.63>
I-64 WB on ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (19.7)**	**C (20.3)**
Westbound Approach	E (59.4) [#205] <0.78>	D (50.8) [121] <0.59>
Northbound Approach	A (7.3) [150] <0.41>	A (9.4) [214] <0.32>
Southbound Approach	C (34.1) [153] <0.40>	C (24.0) [321] <0.74>
I-64 EB off ramps and 22nd Street (signalized)		
Overall Intersection	**B (19.6)**	**B (12.1)**
Westbound Approach	B (18.8) [118] <0.56>	C (23.0) [79] <0.47>
Northbound Approach	C (29.1) [328] <0.51>	B (18.4) [223] <0.36>
Southbound Approach	A (3.9) [36] <0.22>	A (2.7) [38] <0.34>
I-64 WB on ramps and 22nd Street (signalized)		
Overall Intersection	**C (20.3)**	**B (17.1)**
Eastbound Approach	C (27.5) [112] <1.15dl>	C (28.6) [164] <0.99dl>
Northbound Approach	A (6.2) [41] <0.09>	A (2.4) [30] <0.24>
Southbound Approach	A (5.4) [28] <0.11>	A (9.7) [182] <0.37>

Delay presented in vehicles per second

Table C.4. Year 2050 Alternative #2 Synchro Traffic Operating Conditions – Tier 2

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Kingshighway & Forest Park Ave. (signalized)		
Overall Intersection	D	D
Kingshighway & Parkview Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Children's Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Barnes Jewish Hospital Plz. (signalized)		
Overall Intersection	C	C
Kingshighway & Oakland Ave. (signalized)		
Overall Intersection	B	C
Kingshighway & Rte. 100 (Choteau Ave/Manchester Ave) ***(signalized)***		
Overall Intersection	F	F
Forest Park Ave. & Euclid Ave. ***(signalized)***		
Overall Intersection	B	C
Forest Park Ave.& Taylor Ave. ***(signalized)***		
Overall Intersection	C	D
Forest Park Ave. & Newstead Ave. ***(signalized)***		
Overall Intersection	C	C
Forest Park Ave. & Boyle Ave. ***(signalized)***		
Overall Intersection	B	C
Forest Park Ave. & Sarah St. ***(signalized)***		
Overall Intersection	C	C
Forest Park Ave. & Vandeventer Ave. ***(signalized)***		
Overall Intersection	D	D
Forest Park Ave. & Spring Ave. ***(signalized)***		
Overall Intersection	B	B
Forest Park Ave. & Reinert Hall Access Dr. ***(unsignalized, side-street STOP)***		
Overall Intersection	A	A
Forest Park Ave. & Grand Blvd. ***(signalized)***		
Overall Intersection	D	E
Forest Park Ave. & Council Towers Access Dr. ***(unsignalized, side-street STOP)***		
Overall Intersection	A	A
Forest Park Ave. & Theresa Ave. ***(signalized)***		
Overall Intersection	B	A
Bernard Street / Spruce Street and Theresa Avenue (signalized)		
Overall Intersection	B	C
Clayton Ave. & Taylor Ave. ***(signalized)***		

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	C	D
Clayton Ave. & Newstead Ave. ***(signalized)***		
Overall Intersection	C	D
Clayton Ave. & Tower Grove Ave. ***(signalized)***		
Overall Intersection	B	C
Clayton Ave. & Boyle Ave. ***(signalized)***		
Overall Intersection	C	D
Papin St. & Sarah St. (signalized)		
Overall Intersection	A	A
Papin St. & Boyle Ave. ***(unsignalized, side-street STOP)***		
Overall Intersection	B	A
Papin St. & Sarah St. ***(unsignalized, all-way STOP)***		
Overall Intersection	A	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Taylor Ave. ***(signalized)***		
Overall Intersection	D	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Newstead Ave. ***(signalized)***		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Tower Grove Ave. ***(signalized)***		
Overall Intersection	C	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Boyle Ave. ***(signalized)***		
Overall Intersection	C	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Sarah St. ***(signalized)***		
Overall Intersection	B	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Vandeventer Ave. ***(signalized)***		
Overall Intersection	D	C
Vandeventer Ave. & Market St. ***(unsignalized, Sim Traffic Result)***		
Overall Intersection	A	B
Vandeventer Ave. & Ikea Way/Foundry Way ***(signalized)***		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & S 39th St. ***(signalized)***		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Spring Ave. ***(signalized)***		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & Grand Blvd. ***(signalized)***		
Overall Intersection	C	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Theresa Ave. ***(unsignalized, side-street STOP)***		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & Compton Ave. ***(signalized)***		

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	C	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Jefferson Ave. ***(signalized)***		
Overall Intersection	E	E
Compton Ave. & Spruce St. ***(signalized)***		
Overall Intersection	A	C
Jefferson Ave. & Scott Ave. ***(signalized)***		
Overall Intersection	B	B
Jefferson Ave. & Clark Ave. ***(signalized)***		
Overall Intersection	A	B
Jefferson Ave. & Market St. ***(signalized)***		
Overall Intersection	C	D

Appendix D

YEAR 2050 ALTERNATIVE #3: TRAFFIC OPERATING CONDITIONS – VISSIM TIER 1, SYNCHRO TIER 1 & 2

Table D.1. Year 2050 Alternative #3 VISSIM Link Segment Results – Tier 1

Link Number	Direction	Name	Type	Alt 3 AM			Alt 3 PM		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
1	EB	I-64 EB west of Kingshighway Blvd	Basic	D	31.1	57	C	21.3	59
2	EB	Kingshighway Blvd. EB off ramp Decel Lane	Diverge	D	32.1	44	B	18.1	55
3	EB	Btwn Kingshighway Blvd. EB off ramp & EB on ramp	Basic	D	26.4	58	B	17.1	59
4	EB	Btwn Kingshighway Blvd. EB on ramp & Tower Grove EB off ramp	Weave	C	23.8	58	B	16.5	59
5	EB	Btwn Tower Grove EB off ramp & Vandeventer Ave/Boyle Ave. EB on ramp	Basic	D	30.1	58	C	21.8	59
6	EB	Boyle Ave. EB on ramp Accel Lane	Merge	C	25.1	56	C	21.4	56
7	EB	Btwn Boyle Ave. EB on ramp & Spruce St. EB off ramp	Basic	D	33.2	57	D	28.0	57
8	EB	Spruce St. EB off ramp Decel Lane	Diverge	C	24.3	58	C	20.6	58
9	EB	Btwn Spruce St. EB off ramp & Grand Blvd. EB on ramp	Basic	D	27.0	58	C	23.7	58
10	EB	Btwn Grand Blvd. EB on ramp & Jefferson Ave. EB off ramp	Basic	C	21.3	59	C	20.2	59
12	EB	Jefferson Ave. off ramp Decel Lane	Diverge	B	18.5	56	0	0.0	0
13	EB	Btwn Jefferson Ave. EB off ramp & 22nd St. EB off ramp	Diverge	C	23.2	47	B	16.4	58
14	EB	Btwn 22nd St. EB off ramp & EB on ramp	Basic	C	22.1	59	B	15.7	59
15	EB	I-64 EB east of 22nd St	Merge	B	17.2	58	C	18.6	59
16	WB	I-64 WB east of 22nd St	Diverge	C	20.6	59	B	16.5	59
17	WB	Btwn 22nd St. WB off ramp & WB on ramp	Basic	C	23.6	59	B	15.8	59
18	WB	22nd St. WB on ramp Accel Lane	Merge	B	18.6	57	C	19.3	59
19	WB	Btwn 22nd St. WB on ramp & Jefferson Ave. WB on ramp	Basic	C	25.0	58	B	16.1	58

Link Number	Direction	Name	Type	Alt 3 AM			Alt 3 PM		
				LOS	Density (veh/mi/ln)	Speed (mph)	LOS	Density (veh/mi/ln)	Speed (mph)
20	WB	Jefferson Ave. WB on ramp Accel Lane	Merge	C	23.9	54	C	21.6	58
21	WB	Btwn Jefferson Ave. WB on ramp & Grand Blvd. WB off ramp	Basic	D	29.7	58	C	20.9	56
22	WB	Grand Blvd. WB off ramp Decel Lane	Diverge	C	24.1	53	D	26.8	58
23	WB	Btwn Grand Blvd. WB off ramp & Grand Blvd. WB on ramp	Basic	C	25.2	58	C	20.6	57
24	WB	Grand Blvd. WB on ramp Accel Lane	Merge	C	23.5	55	C	23.0	58
25	WB	Btwn Grand Blvd. WB on ramp & Boyle Ave. WB off ramp	Basic	D	30.1	58	C	23.2	56
26	WB	Boyle Ave. WB off ramp Decel Lane	Diverge	C	22.2	59	D	30.0	58
27	WB	Btwn Boyle Ave. WB off ramp & Vandeventer Ave/Papin St. on ramp	Basic	C	25.3	59	C	22.3	59
28	WB	Btwn Vandeventer Ave/Papin St. on ramp & Boyle Ave. WB on ramp	Basic	C	21.1	58	D	28.2	58
29	WB	Btwn Boyle Ave. WB on ramp & Kingshighway WB off ramp	Weave	B	18.2	58	C	23.4	58
30	WB	Btwn Kingshighway Blvd. WB off ramp & WB on ramp	Basic	C	18.4	59	C	22.1	58
31	WB	Kingshighway Blvd. WB on ramp Accel Lane	Merge	B	17.4	58	C	24.4	58
32	WB	I-64 WB west of Kingshighway Blvd	Basic	C	21.4	59	C	23.7	56

Table D.2. Year 2050 Alt 3 VISSIM Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Blvd. (signalized)		
Overall Intersection	**D (49.6)**	**D (55.4)**
Eastbound Approach	D (50.6) [122] <480>	E (59.4) [116] <392>
Westbound Approach	D (51.2) [83] <355>	E (66.3) [100] <315>
Northbound Approach	C (37) [140] <342>	D (41.8) [165] <397>
Southbound Approach	E (59.6) [241] <546>	E (60.9) [290] <572>
I-64 EB off ramp and Tower Grove Ave. (unsignalized)		
Overall Intersection	**A (6.6)**	**A (1.6)**
Eastbound Approach	A (3.9) [14] <204>	A (0.7) [0] <0>
Northbound Approach	C (21.2) [71] <411>	A (6.2) [5] <122>
I-64 WB off ramp and Boyle Ave. (signalized)		
Overall Intersection	**C (21.4)**	**C (31.1)**
Westbound Approach	D (38.1) [111] <523>	E (60.6) [57] <188>
Northbound Approach	B (16.2) [115] <342>	B (10.1) [28] <214>
Southbound Approach	A (8.9) [29] <252>	C (33.8) [337] <587>
Clayton Ave. and Boyle Ave. (signalized)		
Overall Intersection	**C (22.9)**	**D (47.9)**
Eastbound Approach	C (27.5) [37] <167>	E (62.5) [2572] <2791>
Westbound Approach	D (42) [67] <201>	E (59.2) [358] <782>
Northbound Approach	B (17) [151] <529>	C (24.6) [129] <522>
Southbound Approach	D (48.1) [96] <276>	D (39.7) [170] <1075>
Boyle Ave. and I-64 EB on ramp (signalized)		
Overall Intersection	**D (38.4)**	**C (30.3)**
Northbound Approach	D (52.8) [152] <562>	C (24.3) [42] <334>
Southbound Approach	D (45.2) [68] <222>	C (31.7) [168] <361>
I-64 EB off ramp and Papin St./Vandeventer Ave. (signalized)		
Overall Intersection	C (30.4)	D (39.1)
Eastbound Approach	A (7.8) [2] <73>	A (9) [1] <46>
Westbound Approach	B (17.9) [76] <474>	C (35) [57] <210>
Northbound Approach	D (42.5) [76] <504>	E (62.1) [105] <500>
Southbound Approach	C (25.8) [97] <543>	D (41.4) [532] <1111>
I-64 WB Ramps and Grand Blvd. (signalized)		
Overall Intersection	**B (11.5)**	**B (15.7)**
Westbound Approach	C (34.1) [79] <274>	D (38.2) [75] <251>
Northbound Approach	C (25.9) [136] <317>	C (26.9) [141] <319>
Southbound Approach	C (23.8) [105] <349>	C (33.1) [205] <363>
I-64 EB on ramp and Grand Blvd. (signalized)		

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	**B (13.5)**	**B (18.2)**
Northbound Approach	B (13.5) [89] <688>	C (24.8) [181] <777>
Southbound Approach	B (13.5) [92] <300>	B (11.8) [107] <313>
I-64 EB off ramp at Market St. and Compton Ave. (signalized)		
Overall Intersection	**C (29.8)**	**C (22.5)**
Eastbound Approach	B (14.8) [26] <189>	A (6.3) [11] <130>
Westbound Approach	B (15.8) [7] <109>	A (9.7) [4] <90>
Northbound Approach	D (52.9) [136] <436>	D (54.9) [86] <276>
Southbound Approach	C (26.3) [35] <179>	C (27.1) [63] <271>
I-64 EB off ramps and Jefferson Ave. (signalized)		
Overall Intersection	**B (13.6)**	**B (15.7)**
Eastbound Approach	A (3.2) [26] <95>	A (0.2) [0] <0>
Northbound Approach	C (29.3) [76] <264>	C (24.5) [77] <475>
Southbound Approach	A (1.6) [4] <80>	A (5.7) [33] <201>
I-64 WB on ramps and Jefferson Ave. (signalized)		
Overall Intersection	**B (14.2)**	**C (23.7)**
Westbound Approach	D (37.5) [53] <258>	D (43.8) [37] <179>
Northbound Approach	A (3.5) [67] <219>	A (7.6) [77] <206>
Southbound Approach	C (32.1) [81] <298>	C (31.9) [252] <947>
22nd St. and WB Outer Road (signalized)		
Overall Intersection	**C (20.5)**	**B (11.2)**
Westbound Approach	C (32.7) [86] <406>	C (23.1) [28] <134>
Northbound Approach	B (13.1) [81] <298>	B (11.9) [44] <264>
Southbound Approach	A (4.8) [7] <126>	A (4.9) [13] <208>
Scott Ave. and Eastbound Outer Road (signalized)		
Overall Intersection	**D (39.4)**	**B (18.5)**
Eastbound Approach	D (52.8) [218] <603>	C (30) [111] <488>
Northbound Approach	B (14.6) [10] <122>	A (4.6) [6] <121>
Southbound Approach	B (11.2) [6] <90>	B (10.3) [18] <199>
Forest Park Ave. and Grand Blvd. (signalized)		
Overall Intersection	**C (34)**	**D (43.3)**
Eastbound Approach	D (46.4) [67] <257>	D (50.4) [108] <370>
Westbound Approach	D (48) [221] <316>	D (49.1) [198] <312>
Northbound Approach	C (21.6) [123] <276>	C (28.6) [125] <280>
Southbound Approach	D (39.6) [86] <340>	D (49.9) [322] <1120>
Forest Park Ave. and Theresa Ave. (signalized)		
Overall Intersection	**A (9.7)**	**A (9)**
Eastbound Approach	A (6) [7] <102>	A (5.4) [9] <141>

Intersection & Movements	LOS (Delay, sec) [Average Queue Length, feet] <Maximum Queue Length, feet>	
	AM Peak Hour	PM Peak Hour
Westbound Approach	B (10.9) [24] <269>	A (9.7) [34] <364>
Northbound Approach	A (9.7) [22] <180>	B (11.4) [17] <159>
Theresa Ave. and Spruce St. (roundabout)		
Overall Intersection	**A (1.4)**	**A (1.8)**
Eastbound Approach	A (1.4) [0] <85>	A (1.8) [2] <184>
Westbound Approach	(0) [0] <0>	A (0.3) [0] <0>
Northbound Approach	(0) [0] <0>	A (2.8) [0] <28>
Southbound Approach	(0) [0] <0>	A (2.7) [0] <76>

Table D.3. Year 2050 Alternative #3 Synchro Traffic Operating Conditions – Tier 1

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
I-64 and Kingshighway Boulevard (signalized)		
Overall Intersection	**D (55.7)**	**D (50.4)**
Eastbound Approach	D (56.4) [313] <0.76>	E (63.6) [289] <0.78>
Westbound Approach	D (48.2) [195] <0.51>	E (56.6) [242] <0.64>
Northbound Approach	D (39.9) [255] <0.74>	D (44.8) [345] <0.83>
Southbound Approach	E (73.4) [#450] <1.17>	D (49.5) [527] <0.87>
I-64 WB off ramp and Boyle Avenue (signalized)		
Overall Intersection	**B (16.0)**	**B (18.0)**
Westbound Approach	C (26.6) [234] <0.73>	B (18.4) [112] <0.60>
Northbound Approach	B (12.1) [253] <0.79>	A (5.4) [48] <0.61>
Southbound Approach	A (9.9) [111] <0.31>	C (22.6) [m275] <0.80>
I-64 EB on ramp and Boyle Avenue (signalized)		
Overall Intersection	**C (23.2)**	**C (25.3)**
Eastbound Approach	B (15.5) [287] <0.66>	C (28.1) [215] <0.64>
Northbound Approach	D (47.8) [#348] <0.86>	C (28.8) [249] <0.59>
Southbound Approach	D (36.0) [144] <0.76>	C (21.9) [m#270] <0.92>
I-64 EB off ramp and Papin St/Vandeventer Avenue (signalized)		
Overall Intersection	**C (31.3)**	**C (28.6)**
Eastbound Approach	C (32.6) [200] <0.67>	D (38.3) [213] <0.67>
Westbound Approach	D (42.8) [124] <0.59>	D (43.6) [129] <0.61>
Northbound Approach	C (30.9) [202] <0.71>	C (26.0) [163] <0.70>
Southbound Approach	C (28.6) [217] <0.48>	C (24.0) [282] <0.70>
I-64 WB Ramps and Grand Boulevard (signalized)		
Overall Intersection	**C (20.8)**	**C (22.7)**
Westbound Approach	D (37.5) [198] <0.88>	C (25.8) [160] <0.78>
Northbound Approach	A (7.6) [302] <0.73>	C (24.1) [#501] >0.90>
Southbound Approach	C (23.1) [m325] <0.50>	C (20.9) [m263] <0.80>
Grand Boulevard and I-64 EB On Ramp (signalized)		
Overall Intersection	**A (5.9)**	**B (15.9)**
Northbound Approach	A (2.4) [80] <0.52>	C (25.0) [518] <0.76>
Southbound Approach	B (10.2) [213] <0.63>	A (7.5) [478] <0.69>
I-64 EB off ramp and Theresa Avenue / Spruce Street (roundabout, Sidra Results)		
Overall Intersection	**A (7.7)**	**A (7.8)**
Eastbound Approach	A (7.6) [454] <0.81>	A (8.0) [156] <0.63>
Westbound Approach	B (12.7) [<25] <0.02>	B (11.5) [<25] <0.04>
Northbound Approach	B (12.6) [<25] <0.01>	A (8.8) [<25] <0.05>
Southbound Approach	A (6.8) [<25] <0.00>	A (4.1) [<25] <0.05>
Market Street and Compton Avenue (signalized)		

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	**C (33.8)**	**C (33.3)**
Eastbound Approach	C (28.9) [95] <0.82>	C (34.8) [68] <0.91>
Westbound Approach	C (33.5) [138] <0.48>	D (42.2) [242] <0.65>
Northbound Approach	D (54.6) [373] <0.79>	C (33.7) [168] <0.47>
Southbound Approach	C (26.6) [117] <0.35>	C (20.9) [170] <0.42>
I-64 EB off ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (10.4)**	**C (31.8)**
Eastbound Approach	D (38.0) [218] <0.64>	E (78.9) [454] <0.86>
Northbound Approach	A (4.1) [143] <0.39>	B (15.2) [126] <0.34>
Southbound Approach	A (2.3) [m23] <0.26>	B (10.6) [443] <0.63>
I-64 WB on ramps and Jefferson Avenue (signalized)		
Overall Intersection	**B (19.7)**	**C (20.3)**
Westbound Approach	D (56.7) [190] <0.78>	D (50.8) [121] <0.59>
Northbound Approach	A (7.5) [150] <0.41>	A (9.4) [214] <0.32>
Southbound Approach	D (35.1) [162] <0.41>	C (24.0) [321] <0.74>
I-64 EB off ramps and 22nd Street (signalized)		
Overall Intersection	**B (19.6)**	**B (12.1)**
Westbound Approach	B (18.8) [118] <0.56>	C (23.0) [79] <0.47>
Northbound Approach	C (29.1) [328] <0.51>	B (18.4) [223] <0.36>
Southbound Approach	A (3.9) [36] <0.22>	A (2.7) [38] <0.34>
I-64 WB on ramps and 22nd Street (signalized)		
Overall Intersection	**C (20.3)**	**B (17.2)**
Eastbound Approach	C (27.5) [112] <1.15dl>	C (28.6) [164] <0.99dl>
Northbound Approach	A (6.2) [41] <0.09>	A (2.4) [30] <0.24>
Southbound Approach	A (5.4) [28] <0.11>	A (9.7) [182] <0.37>

Delay presented in vehicles per second

Table D.4. Year 2050 Alternative #3 Synchro Traffic Operating Conditions – Tier 2

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Kingshighway & Forest Park Ave. (signalized)		
Overall Intersection	D	D
Kingshighway & Parkview Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Children's Pl (signalized)		
Overall Intersection	A	A
Kingshighway & Barnes Jewish Hospital Plz. (signalized)		
Overall Intersection	C	C
Kingshighway & Oakland Ave. (signalized)		
Overall Intersection	B	C
Kingshighway & Rte. 100 (Choteau Ave/Manchester Ave) (signalized)		
Overall Intersection	F	F
Forest Park Ave. & Euclid Ave. (signalized)		
Overall Intersection	B	C
Forest Park Ave. & Taylor Ave. (signalized)		
Overall Intersection	C	D
Forest Park Ave. & Newstead Ave. (signalized)		
Overall Intersection	C	C
Forest Park Ave. & Boyle Ave. (signalized)		
Overall Intersection	B	C
Forest Park Ave. & Sarah St. (signalized)		
Overall Intersection	C	C
Forest Park Ave. & Vandeventer Ave. (signalized)		
Overall Intersection	D	D
Forest Park Ave. & Spring Ave. (signalized)		
Overall Intersection	C	C
Forest Park Ave. & Reinert Hall Access Dr. (unsignalized, side-street STOP)		
Overall Intersection	A	A
Forest Park Ave. & Grand Blvd. (signalized)		
Overall Intersection	D	D
Forest Park Ave. & Council Towers Access Dr. (unsignalized, side-street STOP)		
Overall Intersection	A	A
Forest Park Ave. & Theresa Ave. (signalized)		
Overall Intersection	A	B
Clayton Ave. & Taylor Ave. (signalized)		
Overall Intersection	C	D
Clayton Ave. & Newstead Ave. (signalized)		
Overall Intersection	C	C

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Clayton Ave. & Tower Grove Ave. (signalized)		
Overall Intersection	A	B
Clayton Ave. & Boyle Ave. (signalized)		
Overall Intersection	C	D
Clayton Ave. & Sarah St. (unsignalized, all-way STOP)		
Overall Intersection	A	C
Papin St. & Boyle Ave. (unsignalized, side-street STOP)		
Overall Intersection	A	A
Papin St. & Sarah St. (signalized)		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & Taylor Ave. (signalized)		
Overall Intersection	D	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Newstead Ave. (signalized)		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Tower Grove Ave. (signalized)		
Overall Intersection	C	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Boyle Ave. (signalized)		
Overall Intersection	C	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Sarah St. (signalized)		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Vandeventer Ave. (signalized)		
Overall Intersection	D	C
Vandeventer Ave. & Market St. (unsignalized, Sim Traffic Result)		
Overall Intersection	A	B
Vandeventer Ave. & Ikea Way/Foundry Way (signalized)		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & S 39th St. (signalized)		
Overall Intersection	B	B
Rte. 100 (Chouteau Ave/Manchester Ave) & Spring Ave. (signalized)		
Overall Intersection	A	A
Rte. 100 (Chouteau Ave/Manchester Ave) & Grand Blvd. (signalized)		
Overall Intersection	D	D
Rte. 100 (Chouteau Ave/Manchester Ave) & Compton Ave. (signalized)		
Overall Intersection	C	C
Rte. 100 (Chouteau Ave/Manchester Ave) & Jefferson Ave. (signalized)		
Overall Intersection	E	E
Compton Ave. & Spruce St. (signalized)		
Overall Intersection	A	C
Jefferson Ave. & Scott Ave. (signalized)		

Intersection & Movements	LOS (Delay, sec) [Queue Length, feet] <v/c ratio>	
	AM Peak Hour	PM Peak Hour
Overall Intersection	B	B
Jefferson Ave. & Clark Ave. ***(signalized)***		
Overall Intersection	A	B
Jefferson Ave. & Market St. ***(signalized)***		
Overall Intersection	C	D

Appendix E

I-64 THROUGHPUT YEAR 2050 VOLUMES

Table E.1. I-64 Throughput 2050 Volumes From VISSIM Model

Location	NB AM	Alt 1 AM	Alt 2 AM	Alt 3 AM	NB PM	Alt 1 PM	Alt 2 PM	Alt 3 PM
I-64 WB between Boyle and KH	4979	5356	5313	5314	6223	6372	6545	6441
I-64 EB between Boyle and Kingshighway	6899	6892	6894	6895	4748	4831	4828	4826
I-64 WB between Grand and Boyle	4919	5266	5227	5213	5176	5048	5237	5230
I-64 EB between Grand and Boyle	5434	5466	5465	5637	4312	4501	4497	4800
I-64 WB between Compton and Grand	4182	4612	4358	5138	3943	4189	4018	4701
I-64 EB between Compton and Grand	4485	5023	4516	5011	3642	4597	3816	4756
I-64 WB between Jefferson and Compton	5010	5133	5135	5135	4629	4707	4701	4702
I-64 EB between Jefferson and Compton	4995	5024	5027	5008	4642	4597	4804	4755

Table E.2. I-64 Forecasted 2050 Volumes

Location	NB AM	Alt 1 AM	Alt 2 AM	Alt 3 AM	NB PM	Alt 1 PM	Alt 2 PM	Alt 3 PM
I-64 WB between Boyle and Kingshighway	5363	5363	5363	5363	6548	6548	6548	6548
I-64 EB between Boyle and Kingshighway	6936	6936	6936	6936	4816	4816	4816	4816
I-64 WB between Grand and Boyle	5253	5253	5253	5253	5244	5244	5236	5246
I-64 EB between Grand and Boyle	5460	5460	5460	5622	4485	4485	4474	4830
I-64 WB between Compton and Grand	4340	4594	4340	5115	4014	4180	4008	4697
I-64 EB between Compton and Grand	4513	5038	4513	5037	3804	4803	3804	4803
I-64 WB between Jefferson and Compton	5010	5115	5117	5115	4698	4698	4698	4697
I-64 EB between Jefferson and Compton	5038	5038	5050	5037	4805	4805	4805	4803

Table E.3. I-64 VISSIM Throughput Volumes vs Forecasted Volumes Deviation in Percentage Terms

Location	NB AM	Alt 1 AM	Alt 2 AM	Alt 3 AM	NB PM	Alt 1 PM	Alt 2 PM	Alt 3 PM
I-64 WB between Boyle and Kingshighway	-7%	0%	-1%	-1%	-5%	-3%	0%	-2%
I-64 EB between Boyle and Kingshighway	-1%	-1%	-1%	-1%	-1%	0%	0%	0%
I-64 WB between Grand and Boyle	-6%	0%	0%	-1%	-1%	-4%	0%	0%
I-64 EB between Grand and Boyle	0%	0%	0%	0%	-4%	0%	1%	-1%
I-64 WB between Compton and Grand	-4%	0%	0%	0%	-2%	0%	0%	0%
I-64 EB between Compton and Grand	-1%	0%	0%	-1%	-4%	-4%	0%	-1%
I-64 WB between Jefferson and Compton	0%	0%	0%	0%	-1%	0%	0%	0%
I-64 EB between Jefferson and Compton	-1%	0%	0%	-1%	-3%	-4%	0%	-1%