North Split Project

DES Nos. 1592385 and 1600808

SYSTEM-LEVEL ANALYSIS FOR DOWNTOWN INTERSTATES

May 2, 2018

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1 INTRODUCTION

The purpose of the North Split system-level analysis is to define the scope of the North Split Project and inform current public dialogue regarding the interstate system in downtown Indianapolis. Future options for the downtown interstate system have been reviewed at a system level to support this purpose. The system-level information developed in this analysis provides an initial baseline for public dialogue for potential major changes to downtown interstates. This analysis does not make a specific recommendation for a future downtown system. Rather, this analysis will be used to inform the project-level National Environmental Policy Act (NEPA) evaluation for the North Split Project. The objective at this stage is to advance the North Split Project to maintain the existing interchange in a safe, well-functioning condition for the traveling public, and to do so with an understanding of downtown interstate system options.

North Split Interchange Project Need: Based on the condition of existing infrastructure, the Indiana Department of Transportation (INDOT) determined that the North Split interchange (North Split) requires repair, and the construction effort needed for these repairs creates an opportunity to improve the function of the interchange. The North Split is the second-most heavily traveled interchange in Indiana, serving over 214,000 vehicles per day. The need for repairs in and near the North Split interchange is based on the deteriorated condition of the 32 bridges and existing pavement. Bridges located in or near the interchange require rehabilitation or replacement in the near future due to their structural condition (see **Figure 1-1**) and the existing pavement also requires replacement.

Figure 1-1: North Split Bridge

▲ *Many bridges in the project area show age-related wear such as rust and damage from leaking water. Photo Source: HNTB*

In addition to the poor physical condition of the interchange components, the interchange configuration is inefficient and poorly suited for the volumes of traffic it is serving. Reconstruction and reconfiguration will provide the opportunity to improve safety and reduce congestion by realigning ramps and merges in the interchange area and correcting existing weaving problems.

Downtown Interstates: I-65 and I-70 are unofficially known as the “inner loop” where they pass through downtown Indianapolis. The downtown interstates were constructed in the late 1960s and early 1970s, with the last section opening to traffic in October 1976. Construction of the interstates in Indianapolis had significant neighborhood impacts, displacing approximately 17,000 residents and separating neighborhoods.[1]

As I-65 approaches the downtown area from the north, it turns east at the Martin Luther King Boulevard/West Street interchange to the North Split interchange, forming the north leg of the inner loop. As I-70 approaches the downtown area from the east, it joins with I-65 at the North Split interchange where both routes turn south on a common roadway to the South Split interchange, forming the east leg of the inner loop. At the South Split interchange, I-65

[1] *https://www.indianapolismonthly.com/city-buzz/i-65-i-70-inner-loop-anniversary/*

continues south and I-70 turns west to West Street to form the south leg of the inner loop. West Street provides a local street connection from I-65 to the north and I-70 to the south.

North Split Interchange History: The North Split interchange was constructed in stages. The I-65 legs to the west and south were completed in 1968, and the east leg to I-70 was completed in 1976. The interchange was designed for an additional interstate highway to the north, called I-165 or the "Northeast Freeway." The Northeast Freeway was proposed to link the North Split interchange with I-69 near Castleton. Congress recognized the first three miles north of I-65 as a "spur" (designated I-165) in the official interstate system. The remaining six miles to Castleton were not recognized in the system. Binford Boulevard was to be upgraded to interstate standards with state and local funds. The I-165 project was abandoned in 1980 and the spur was removed from the interstate system.

Minor safety improvements were made to the North Split soon after it opened due to high crash rates, and various maintenance projects were accomplished over the years. In 2003, INDOT reconstructed the mainline pavement between the North Split and the South Split – a project known as HyperFix. Other projects have been completed near the North Split where specific ramps or bridges required immediate repair. However, as currently conceived, the North Split Project will be the first to comprehensively address the operational and maintenance needs of the ramps, connections, bridges, and pavement through the North Split since the interchange was originally constructed.

North Split Project Pre-NEPA Project Development: Spurred by worsening bridge and pavement conditions and longstanding operational problems, INDOT prepared a Project Intent Report in 2016 to outline a conceptual approach to improve traffic operations on I-65 from Vermont Street to Fall Creek Parkway and on I-70 from the North Split to the I-465 east leg. The Project Intent Report covered approximately 9 miles along I-65 and I-70. The purpose of the report was to support the programming process for individual projects and to provide a starting point for later, more detailed project-level studies. The North Split interchange was one of the projects in the 2016 Project Intent Report. It is currently the only active funded project identified in the Project Intent Report moving forward. The project is currently in the NEPA and preliminary engineering phase of project development.

North Split Project NEPA Development: During preliminary engineering, INDOT is developing an Environmental Assessment (EA), as required by NEPA. The NEPA process for this project began by identifying project needs and scoping potential alternatives to be evaluated in the environmental study.

The North Split project area boundary identified in NEPA early coordination extended south along I-65/I-70 to Washington Street, west along I-65 to Meridian Street, and east along I-70 to the bridge over Valley Avenue (see **Figure 1-2**). This boundary may be adjusted following this system-level analysis. The project area is surrounded primarily by residential and commercial developments with some recreational uses.

Preliminary project information focused on upgrades of the existing interchange and connecting roadways, with most construction to occur within existing right-of-way. The preliminary project needs and scope were shared with agencies and the public in initial project kick-off meetings in September 2017. As a next step in the NEPA process, a more detailed statement of the purpose and need for the North Split Project will be developed, as will potential design alternatives.

Initial Public Comments on Preliminary North Split Project Scope: After the preliminary project scope was presented in the initial kick-off meetings, several community groups submitted comments suggesting that INDOT consider a broader scope of all downtown interstates as the North Split project-level scope was being prepared. These comments suggested alternative proposals at a system level that include diverting traffic off the interstates to other routes and converting downtown interstates to boulevards, and/or depressing or tunneling the interstates to operate below ground level.

Figure 1-2: I-65/I-70 North Split Project Study Area

1.1 System-Level Analysis Process

The comments from community groups suggested a type of roadway and number of lanes, but they did not provide information or analysis to identify potential effectiveness in meeting mobility needs, probable cost, or traffic impacts downtown and in nearby neighborhoods. To provide this information, representative system-level concepts are defined in this document and analyzed at a system level of detail.

This analysis informs INDOT as it evaluates the North Split Project to determine if the project scope should be adjusted to address system-level issues. Representative system-level concepts are described with sufficient detail to provide an understanding of performance, impacts, and costs to guide INDOT's decision and to support the community dialogue. A more extensive analysis would be needed to fully define or to develop more detailed design of system-level alternatives.

The system-level analysis area is the full downtown interstate system, from the I-65/Martin Luther King Boulevard/West Street interchange at the northwest corner of the downtown area, east to the I-65/I-70 North Split interchange, south to the I-65/I-70 South Split interchange, and west to the I-70/West Street interchange at the southwest corner of the downtown area, as shown in **Figure 1-3**. Portions of the Indianapolis transportation network outside this analysis area are considered in the evaluation of potential traffic impacts to neighborhoods that would result from changes to the downtown interstate system.

Alternative concepts proposed by various groups were intended to enhance connectivity, sustainability, and economic vitality of downtown Indianapolis and surrounding neighborhoods. These concepts, as well as the Project Intent Report concept (Concept 3), and others are reviewed in this analysis. A description of the methodology used for this analysis is provided in **Chapter 3**.

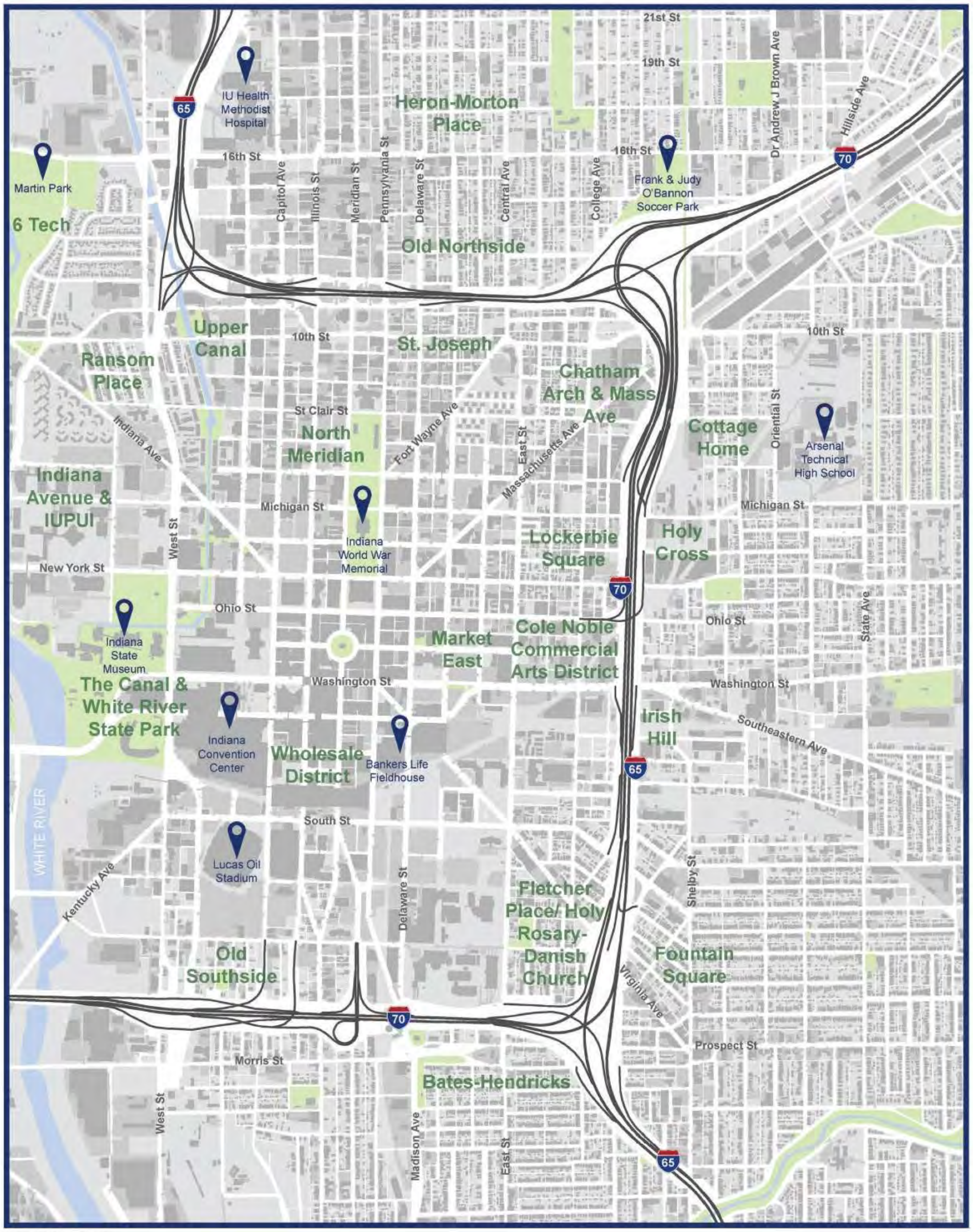
The alternative concepts included in this analysis are listed below.

1. No-Build (maintain existing configurations)
2. Transportation System Management (TSM), including diversion of through traffic to I-465 and/or transit*
3. Upgrade existing interstates for entire inner loop
4. Depress downtown interstates*
5. Replace interstates with at-grade boulevards*
6. Construct at-grade boulevards + interstates in tunnels*
7. Construct new interstate link – new I-65 west leg

   *Suggested by various groups

A detailed description of each of these alternative concepts is provided in **Chapters 4 through 10**.

Figure 1-3: System-Level Analysis Area



LEGEND

Building

Parking Lot

Existing Park/Open Space

Interstate Alignment (center-lines only)

0 0.2 0.4 Miles

2 CONCEPT REVIEW – DECOMMISSIONING EXISTING FREEWAYS

Comments submitted by local community organizations proposed major changes to interstate highways in downtown Indianapolis. Proposed concepts included removing freeways and replacing them with at-grade boulevards that control traffic with traffic signals or roundabouts. Other concepts called for surface boulevards coupled with freeways in tunnels to serve through traffic. These proposals are not unique to Indianapolis. Many cities across the country are considering major changes to downtown freeways as these facilities reach the end of their useful life and require replacement.

The potential effectiveness and feasibility of removing or replacing downtown interstates varies in every city, depending on local conditions. Performance, impacts, and costs of the proposals for Indianapolis have not been addressed in the presentations by local advocates. Those factors are evaluated in subsequent chapters of this analysis. This chapter provides a general overview of concepts being explored nationwide.

2.1 Decommissioning Background

Many U.S. cities are exploring opportunities for enhancing downtown vitality and connectivity severed by urban highways constructed in the 1950s and 1960s. Their goal is to "decommission" an array of elevated viaducts and six- and eight-lane freeways, often for less than the cost of rebuilding or significantly rehabilitating aging infrastructure, which may no longer well serve today's traffic demands.

Advocates maintain that highway decommissioning offers a once-in-a-generation opportunity to strengthen community sustainability by reconnecting their downtowns with nearby city districts and neighborhoods, spurring redevelopment and offering a more diverse array of mobility solutions. There is evidence to suggest that in the right situation, highway removal can offer a variety of substantial benefits, including better connectivity; increased property values; reduced noise and air pollution; decreased fuel consumption as auto trips decline; and improved public health from increased walking, biking, and transit.

Decommissioning advocates say it can also make the best of a bad situation. Transportation agencies are challenged to maintain infrastructure long past its design life. Agencies confronted by tight budgets and public resistance to tax increases face high costs of fixing or replacing highways designed to serve the needs of another era. Reconstruction in place does nothing to address unintended consequences of past, well-meaning urban and transportation planning based on a "move cars first" attitude.

Cities are addressing the impacts of urban highways through many forms, including:

1. **Surface Boulevards -** Can reconnect city street grids and improve local economic vibrancy. May disperse through traffic as people not needing city access choose other routes.
2. **Sunken Expressways -** Can mitigate sound impacts. Use bridges to maintain city street grid connections. May cut off neighborhoods and/or be expensive to maintain.
3. **Decked Highways -** May be an affordable optionwhen existing sunken highways are "roofed" (as proposed for Kansas City South Loop Deck). Roof may be constructed in phases as existing cross-over bridges are replaced at end of design life.
4. **Tunneled Highways -** Advantages similar to decked highways, but more expensive. Adequate planning for recovering upfront costs through value capture mechanisms required.
5. **Removal -** May be the least expensive option. Likely only viable in rare circumstances where nearby facilities can absorb displaced traffic.

However, a number of factors play a role in determining if decommissioning will be successful and not cause significant traffic concerns at other locations in the roadway network. The amount of traffic that needs to be served and the availability of alternative routes must be considered and evaluated before a decision is made to decommission a highway.

2.2 Why Cities want to Remove Highways

Many factors drive communities to decommissioning. The most important may be the hope of economic revitalization. At some locations, access controlled highways can make local mobility difficult and blight neighborhoods with noise or visual pollution, reducing their commercial and residential desirability. Removing an existing highway can also provide opportunities for communities to improve mobility by reconnecting severed streets and enabling the expansion of transit options, bikeways, and greenways.

For some communities, the reason stems from the rehabilitation or reconstruction expense associated with an older facility facing new demands that differ from the ones for which it was designed. As a result, local and state funding constraints combine with diminished, uncertain federal funding to become a decommissioning incentive.

2.3 Where Decommissioning Works

Decommissioning is a long-established practice that regained momentum in the 1980s as the federal interstate highway system began showing signs of age and as recognition of the drawbacks of some urban highways began emerging.

In 2003, for example, Milwaukee replaced Park East Freeway, a mile-long elevated highway, as a strategy for economic rejuvenation. Park East was a partial remnant of an abandoned larger freeway strategy. Running from I-43 to downtown, the Park East was just one part of a 1970s-era plan to encircle the central business district with an expressway, a plan that ultimately collapsed in the face of significant political and community opposition. Without the unbuilt segments, Park East failed to reach the levels of planned use and divided the downtown.

McKinley Avenue, the replacement of Park East, introduced a new, at-grade six-lane boulevard fully connected with the surrounding street grid. McKinley Avenue is credited with saving $75 million in construction costs, improving local traffic flow, expanding developable land in the urban core by 28 city blocks, and directly leading to five redevelopment projects worth $340 million of investment (all within three years after its opening). The plan did temporarily diminish the area’s parking supply because surrounding land, depressed in value prior to the Avenue opening, had been converted to surface parking lots.

A more dramatic example is the San Francisco Embarcadero Freeway, completed in 1959. Over time, the freeway came to be seen as a barrier between downtown San Francisco and its waterfront. But nothing was done about the double-deck, elevated highway because few could envision what would happen to the 60,000 cars it handled daily if it were demolished or replaced with a different kind of facility. In fact, residents had just voted down a demolition initiative when the 1989 Loma Prieta Earthquake struck. Confronted with the price tag for repair, and already aware that they could do without it, demolition opposition faded, and the Embarcadero was removed in 1991. It was replaced by a six-lane multi-modal “complete street” with light rail service, bike lanes, and pedestrian promenade.

A different type of example is the Central Artery project in Boston, known unofficially as the “Big Dig.” Rather than downgrading an existing facility, this project added system capacity. It replaced Boston’s six-lane elevated Central Artery (I-93) that ran through the center of downtown with an underground 8-lane to 10-lane highway, and added two new bridges over the Charles River. It also extended I-90 to Logan International Airport and created Route 1A, connecting downtown Boston to the waterfront. The project eliminated bottlenecks and resulted in large reductions in vehicle hours of travel and delay in Boston. At the same time, it opened up 300 acres of land, provided an opportunity for greenways and boulevards, and spurred economic development.

2.4 Will Decommissioning Work in Indianapolis?

Many of the potential benefits and examples described here have been cited on websites and presentations of advocates for decommissioning downtown freeways in Indianapolis. There are lessons to be learned from projects in other cities, but none of the examples match the conditions that exist here.

For example, the Park East Freeway in Milwaukee was part of a downtown loop that was never finished. It was a one-mile, elevated segment that ended at an arterial street, and served fewer than 54,000 vehicles per day. The North Split interchange serves more than 214,000 vehicles per day, and individual links of I-65 and I-70 in downtown Indianapolis carry 109,000 to 161,000 vehicles per day. More importantly, they surround downtown on three sides and serve the highest employment concentration in the state, with 25 entrance and exit ramps serving all sections of downtown.

The Embarcadero Freeway from Broadway to the Bay Bridge in San Francisco was also part of a larger freeway network that was never completed. Along the waterfront, the former freeway was replaced with a wide, palm-lined boulevard with Muni Light Rail tracks in the median. Operations are improved by "T" intersections which are possible due to the waterfront on one side. It has evolved to be one of America's great multi-modal corridors. The setting and opportunities in Indianapolis, as well as the function and traffic levels of downtown interstates, are quite different. Indianapolis interstates have significantly higher traffic volumes and are part of a larger interstate system that is relied upon for large-scale regional access.

The Central Artery/Tunnel project in Boston with its tunnels and boulevards, increased nearby property values, but it is also the most expensive single public highway project ever constructed in the U.S. The Big Dig was a massive project, with three tunnel sections and two long span bridges. Unlike most decommissioning projects, it increased rather than decreased interstate highway mileage in Boston. Originally estimated to cost $2.8 billion, its final cost was over $14.6 billion, with more than six years of construction.

Table 2-1 shows nine commonly cited examples of successful decommissioning projects and nine projects currently proposed for decommissioning in the U.S. The examples of completed projects are taken from "*30 Crossing Freeway Decommissioning*," a report released in February 2018 by the Arkansas Department of Transportation (ArDOT). ArDOT developed the report for a project on I-30 in Little Rock. The examples of proposed projects are taken from "*Freeways Without Futures 2017"* produced by the Center for New Urbanism (CNU). CNU has been exploring and reporting on decommissioning projects and converting freeways to boulevards since 2008, and has developed five editions of this report.

Based on literature review and the characteristics shown in **Table 2-1**, most candidates for decommissioning are experiencing low traffic volumes, are short sections of larger freeways that were never completed, are barriers to connecting waterfronts, are roadways remaining when freeways are realigned, or are routes with parallel freeways to serve diverted traffic. None of these conditions apply to the inner loop segments of I-65 and I-70 in Indianapolis.

Unlike any of the cities shown in **Table 2-1**, it is necessary to cross an interstate corridor from all directions except west to enter downtown Indianapolis. The downtown area is bounded on the west by the White River. Traffic volumes on I-65 and I-70 in downtown Indianapolis are much higher than most of the examples in **Table 2-1**. The Indianapolis inner loop is much longer than most of the examples in **Table 2-1**.

This review of decommissioning concepts and overview of potential peer cities is provided for general information and perspective. Ultimately, the question is not what can work elsewhere, but what can work in Indianapolis. Options are explored in terms of performance, cost, and impact in the remaining chapters of this analysis.

Table 2-1: Examples of Completed and Proposed Freeway Decommissioning

Freeway	City	Average Daily Traffic	Year	Project Length (mile)	Reason for Decommissioning: Low Demand	Road Rerouted, Infastructure remained	Route Closed, Infastructure remained	Future Development
I-65/I-70 Inner Loop (North, East, South Legs)	Indianapolis, IN	North 133,000 East 161,000 South 109,000		5.0				
Commonly Cited Decommissioning Examples[1]								
US 99W/Harbor Drive	Portland, OR	24,000	1974	3.0	X			
Park East Freeway	Milwaukee, WI	54,000	1999	1.0	X			X
I-490 Inner loop East	Rochester, NY	6,000	2016	0.7	X			X
State Route 59	Akron, OH	17,760	2014	1.1	X			
West Shoreway	Cleveland, OH	40,948	2016	2.0	X			X
I-375	Detroit, MI	80,000	2016	1.0				X
Route 34/Oak Street Connector	New Haven, CT	73,600	2014	0.8	X		X	X
I-40 Crosstown Expressway	Oklahoma City, OK	125,000	2005	2.3		X		X
Route 99/Alaskan Way Viaduct	Seattle, WA	110,000	2011	2.0		X		
Proposed Decommissioning, per CNU Freeways Without Futures 2017[2,3]								
Scajaquada Expressway	Buffalo, NY	65,000	proposed	3.6				
I-345	Dallas, TX	61,000	proposed	2.0				X
I-375	Detroit, MI	80,000	proposed	1.0	X			X
I-980	Oakland, CA	73,000	proposed	0.8				X
Route 710	Pasadena, CA	unk	proposed	0.5				X
I-490 Inner Loop North	Rochester, NY	25,000	proposed	1.5	X			X
I-280 Spur	San Francisco, CA	unk	proposed	1.2				X
I-81	Syracuse, NY	100,000	proposed	1.6				X
Route 29	Trenton, NJ	unk	proposed	3.2	X			X

1. Source: *30 Crossing Freeway Decommissioning* , Arkansas Department of Transportation, https://connectingarkansasprogram.com/know-the-facts-i30/#.WtZXcmeWyUm
2. I-70 in Denver was included in the CNU report, but CDOT is beginning construction of a depressed freeway and added lanes in summer, 2018.
3. Source: *Freeways Without Futures 2017*, Congress for the New Urbanism https://www.cnu.org/highways-boulevards/freeways-without-futures/2017

3 METHODOLOGY FOR REVIEW OF SYSTEM-LEVEL CONCEPTS

This chapter describes the methodologies used to analyze the system-level concepts described in **Chapters 4 through 10**. Procedures are described for reviewing performance, estimated cost, and impacts of each concept.

3.1 Performance

At a system level, planning for major transportation system changes is supported by travel demand models that have been applied effectively by the Indianapolis Metropolitan Planning Organization (IMPO) for the last 50 years. These models are the best tools available for testing the performance of major transportation projects. Travel demand models allow transportation planners to ask and test critical “what if” questions about potential alternatives.

Two travel demand models are used in this analysis. Both are based on the most current version of the nine-county TransCAD travel demand model of the IMPO. The IMPO model was used to evaluate regional movements, such as diversions from downtown interstates to I-465. The second model, referred to as a TransModeler subarea microsimulation model, provided greater detail regarding traffic operations within the immediate area of downtown Indianapolis. The microsimulation model was used to evaluate performance and traffic impacts of each concept.

The IMPO model uses geographic information system (GIS) data files to represent the transportation environment. These data sets provide assumptions on population, employment, income, roadways, and transit networks. The IMPO model’s components are calibrated to replicate the origin-destination pattern for current travelers. The IMPO’s model is a four-step model and is similar to models used by many other major metropolitan transportation planning agencies nationwide. It includes the following four steps:

- Trip Generation – How many trips are produced from regional land use and employment?
- Destination Choice – Where do persons travel to work, school, or shopping?
- Mode Choice – How many persons drive; how many take transit?
- Trip Assignment – What are the vehicle flows on the roadway and transit network links?

Generally, the model identifies trips by origin and destination, determines whether the trips are by roadway or transit, and assigns the trips to the roadway or transit network. For trip assignments, the model identifies the quickest path for each individual trip in the network based on facility type and speed. It then adjusts the speed on each link based on congestion, and the process is repeated multiple times to produce final estimates.

In both the IMPO model and the microsimulation model, the trips being served are tied directly to estimates of current or future population, employment, and other demographic measurements rather than to assumed traffic growth rates. In this analysis, current conditions are reviewed. Forecasting is not used.

Microsimulation models use more detailed definition of traffic controls in a smaller network to simulate the behavior of individual vehicles. They are used to predict the changes in localized traffic flow due to roadway or traffic control changes. The subarea for this analysis, referred to as the “traffic study area,” is roughly bordered by 38th Street to the north, Emerson Avenue to the east, Raymond Street to the south, and the White River to the west. This model was calibrated to existing traffic counts on the interstate and local roadway network and to existing time of day speed data for the interstate system.

While TransCAD models, such as the IMPO model, are primarily based on estimated travel times associated with individual roadway links in the model, TransModeler microsimulation models consider other factors such as operational effects of lane utilization; freeway merging, diverging, and weaving; and traffic signal operations, particularly during peak hours. The IMPO model provides results for three-hour peak periods, 6:00 AM to 9:00 AM, and 3:00 PM to 6:00 PM. TransModeler provides results for peak hours, 8:15 AM to 9:15 AM, and 5:30 PM to 6:30 PM.

Performance is measured in two primary ways for system-level concepts in this analysis. The first is an evaluation of how the system is operating as a whole. Travel simulation models provide estimates of total vehicle miles of travel (VMT), total vehicle hours of travel (VHT), and total delay for all roadways in the system. The performance of system changes is determined by comparing these values to the base (current) condition to see if operations are better or worse. TransModeler was used in this analysis to provide these estimates since it is more effective than the IMPO model in considering traffic control features.

VMT is a measure of vehicle use and trip length. One vehicle traveling one mile constitutes one vehicle-mile. Similarly, VHT is a measure of vehicle use and trip time. One vehicle traveling one hour constitutes one vehicle-hour. Delay, measured in hours, is the difference between a vehicle's time to complete a trip in a congested condition versus a free-flow condition. Free-flow represents the speed a vehicle would travel if there was no congestion on the roadway. For the delay calculation, the TransModeler subarea delay calculation also includes additional time waiting at congested traffic signals.

Outputs from TransModeler were used to review neighborhood traffic changes as part of the impact review of concepts as described in **Section 3.3.1**. Simulations from TransModeler were viewed to identify back-ups (queuing) on the interstates approaching downtown. The IMPO model was used to evaluate potential diversion from downtown interstates to I-465 or shifting of trips to transit in Concept 2, Transportation System Management. These model results are described in the review of performance for Concept 2.

Note that all travel demand modeling in this analysis assumes current traffic conditions, with the existing roadway network as a base. The transit system is assumed to be the existing IndyGo system, including enhancements in routes and frequency currently being implemented in accordance with the Marion County Transit Plan. Further consideration of these concepts should include more detailed evaluation using travel forecasts for roadways and transit available from the IMPO model.

3.2 Estimated Cost

Preliminary cost estimates were developed for the system-level concepts. The pricing is based on conceptual design information and should be considered as providing an order of magnitude regarding the accuracy of the estimates. Methodology in establishing the estimates is consistent among all concepts. Uniformity in the estimates creates an apples-to-apples comparison between the concepts. The following details outline the process utilized in the development of the estimates:

- Quantity Development – Primary quantities such as pavement surface area of roadway, bridges, concrete barrier, retaining walls, tunnels, and removals were established by overlaying the proposed concepts against the existing topography from Google Earth. Secondary quantities were developed by prorating and factoring these items based on historical data of similar projects.
- Unit Price Development – Applying costs to the estimated quantities involves a two-step process. The primary scope items with a defined quantity allow for unit price development based upon the quantity of installed materials and the duration of the construction activity. For secondary items, cost was applied based on historical data detailing the range of values these items will contribute to a similar project of this magnitude. The combination of this information results in the final conceptual estimate for the specific concept.
- Estimate Validation – This process involved the preparation of an independent estimate for each concept. The independent estimates followed the same process as described above, including construction durations. After all the construction activities were defined, an overhead cost was applied and all the costs

were combined to generate the final estimate. A comparison of the two estimates was then completed to identify any significant differences in the estimates and to agree on the final cost.

- Operation and Maintenance (O&M) Estimates – Yearly O&M estimates were developed by researching multiple county and state budgets for roadway maintenance and improvements. These estimates were spread against the miles of roadway and bridges to develop an average cost per mile. An independent check of the estimates was also conducted. The estimates considered the operations required for maintaining one mile of roadway per year. Effort was made to gauge the frequency of the maintenance operations and the manpower, equipment, and materials needed to support these activities.

The established cost estimates are considered conceptual in nature. Multiple key components have not yet been developed which will have a potential impact to final design and could impact the final cost estimates. The estimates only reflect construction and O&M cost for the specific concept. They do not include investments to city streets or other interstates that may be required as a result of implementing the concept.

3.3 Estimated Impacts

Key impacts are reviewed at an order of magnitude level for each system-level concept. Impact areas reviewed include traffic impacts to local and neighborhood streets, construction impacts, neighborhood connectivity and visual continuity, right-of-way and relocations, historic resources, parks and recreation areas, and natural resources. These are preliminary reviews of impacts at a very high level, but the information is useful in understanding the likely large-scale results of moving forward with each of the concepts. More detailed impact analysis and determinations would occur in a NEPA study for any project moving forward.

3.3.1 Local Street and Neighborhood Traffic Impacts

Section 3.1 describes the two travel demand models used in this analysis and how they were applied to describe the performance of each system-level concept. Those measures apply to the system as a whole and to the individual roadway facility being changed. The models are also used to identify the traffic changes to streets and highways throughout the network that result from the proposed facility changes.

The dynamics of how network components interact in serving total travel demand can be quite complex, particularly when a mix of interstate highways and local roads are considered. The nine-county IMPO model is used to review large-scale system changes related to diversion of inner loop traffic to I-465. The more detailed microsimulation model is used to evaluate the effectiveness and impacts of concepts for the downtown inner loop.

Model outputs have been reviewed for each system-level concept to identify changes in total system delay and to identify streets with extreme changes in traffic volumes. Both measures provide perspectives on how effective the transportation system is operating.

It is noted again that all travel demand modeling in this analysis reflects current traffic conditions, with the existing roadway network as a base. As indicated in **Section 3.1**, further consideration of implementing any of these concepts would require more detailed evaluation and modeling based on future conditions.

3.3.2 Construction Maintenance of Traffic Impacts

An approximate timeframe for construction was estimated for each system-level concept. Construction timeframe estimates are based upon metrics used in determining the portion of a project that can be efficiently produced month over month. The estimate is for actual time of construction, rather than project development time that includes NEPA studies, engineering, and right-of-way acquisition. Total project development time would be considerably longer for any of the concepts.

How a project is constructed can greatly impact the traffic flow through the work area. It can also affect the length of time for construction. Potential traffic-control strategies are described to provide a perspective regarding the estimation of the time required to construct the system-level concepts.

3.3.3 Neighborhood Connectivity and Visual Continuity

For this analysis, connectivity refers to the safe and effective movement in a community between and to residences, neighborhoods, parks, local businesses, and other local properties. A well-connected community has appropriate infrastructure (sidewalks, shared-use paths, neighborhood streets, and open space) in place to accommodate safe multi-modal connections between community destinations.

In the case of interstates or other major infrastructure within a community, connectivity is often refined to mean the ability to move between and through the neighborhoods on each side of the infrastructure. In these cases, the purpose is to reduce perception of the infrastructure as a barrier and to identify ways to minimize potential disruption to the community.

Many considerations are specific to the physical design of the infrastructure and will need to be addressed during final design. At this conceptual level, however, each concept was analyzed as to the general opportunity to provide for connectivity with the infrastructure. Specific elements analyzed in each concept include:

- The ability to retain local pedestrian and vehicular connections given the infrastructure type.
- The level of ease or difficulty in maintaining connections through the infrastructure.
- The potential barriers to connectivity.
- The potential for visual continuity with each concept.

3.3.4 Right-of-Way and Relocations

Construction of the system-level concepts may require land that is currently privately owned to be converted to transportation use. This is called right-of-way, and it includes the land needed for roadway pavement, shoulders, sidewalks, retaining walls, drainage treatments, and other similar features. The land use in the area currently includes residential, commercial, industrial, recreational, and religious. The approximate number of acres needed from each of these types of land use was calculated using GIS software to evaluate the right-of-way impacts for each system-level concept. Results are presented in order of magnitude ranges because of the preliminary nature of the alternative concepts. Land use types were estimated using Marion County parcel data.

Sometimes a project requires the removal of a building and the owners and tenants to relocate to a different property. The total number of buildings requiring relocation was estimated for the system-level concepts using GIS software, 2017 aerial photography, and Marion County parcel data. Results are presented in order of magnitude ranges because of the preliminary nature of the system-level concepts. Each building may contain one or more occupants. However, these were not quantified for the purposes of this analysis.

The right-of-way footprints for each concept are preliminary and right-of-way and relocation impacts may be revised during the NEPA process and design phase.

3.3.5 Historic Resources

Historic resources include properties that are currently listed on the National Register of Historic Places (National Register) or that are eligible for listing in the National Register. This analysis includes only those above-ground districts or individual properties listed in the National Register because that information is readily available. It does not include field surveys or determinations of eligibility for properties not currently listed in the National Register. It also does not include archaeological sites.

Potential impacts to National Register historic districts and individual historic properties were identified using GIS software. Approximate boundaries for National Register-listed historic districts were provided as GIS data from the Indiana Department of Natural Resources Division of Historic Preservation and Archaeology (IDNR DHPA). Approximate boundaries for individually listed properties were digitized in GIS based on the National Register nominations. The right-of-way footprints for each concept are preliminary and impacts to historic resources may be reduced during the NEPA process and design phase.

3.3.6 Parks, Recreational Areas, and Trails

Potential impacts to parks, recreational areas and trails from the system-level concepts were identified using GIS software. GIS data from the IndianaMap website (Managed_lands_IDNR_IN, Recreational_Facilities_IDNR_IN and Trails_IDNR_IN) were used in the analysis.

3.3.7 Natural Resources

Potential natural resource impacts from the system-level concepts were evaluated using GIS software and 2017 aerial photography.

4 CONCEPT 1: NO-BUILD

The No-Build Concept would maintain the existing interstate system with no operational (capacity and/or congestion or weaving) improvements. The number of lanes and their locations in the system would remain the same as existing. The existing ramp connections to local streets would not change.

Due the age and deterioration of the existing system, the No-Build Concept would require periodic maintenance and rehabilitation projects to maintain the integrity of the interstate facility and local street connections. The types of projects to be scheduled would include the following:

- Existing pavement replacement and/or rehabilitation
- Existing bridge rehabilitation and/or replacements
- Drainage, signing, and lighting maintenance

The No-Build Concept assumes other programmed projects in the region would be implemented. The regional program of projects is listed in the Indianapolis Regional Transportation Improvement Program (IRTIP) maintained by the IMPO (http://www.indympo.org/).

4.1 Concept 1 Configuration

The layout of downtown interstates is shown in **Figure 4-1**. I-65 approaches the downtown area from the north, turns east at the Martin Luther King Boulevard/West Street interchange, and extends to the North Split interchange, forming the north leg of the inner loop. I-70 approaches the downtown area from the east and joins with I-65 at the North Split interchange, where both routes turn south on a common roadway to the South Split interchange. This is the east leg of the inner loop. At the South Split interchange, I-65 continues south and I-70 turns west. The link between the South Split and West Street interchange is the south leg of the inner loop.

All pavement in the downtown interstate system is original construction except for two sections of the east leg. A section of mainline pavement was reconstructed in 2003 in the HyperFix project, and a short section near Virginia Street was recently replaced to increase the clearance under Virginia Avenue, Calvary Street, and Fletcher Avenue. Periodic maintenance has been completed, including asphalt mill and overlay and thin concrete overlay.

A description of the current (No-Build) configuration of the downtown interstate system is provided for the north leg, east leg, and south leg below.

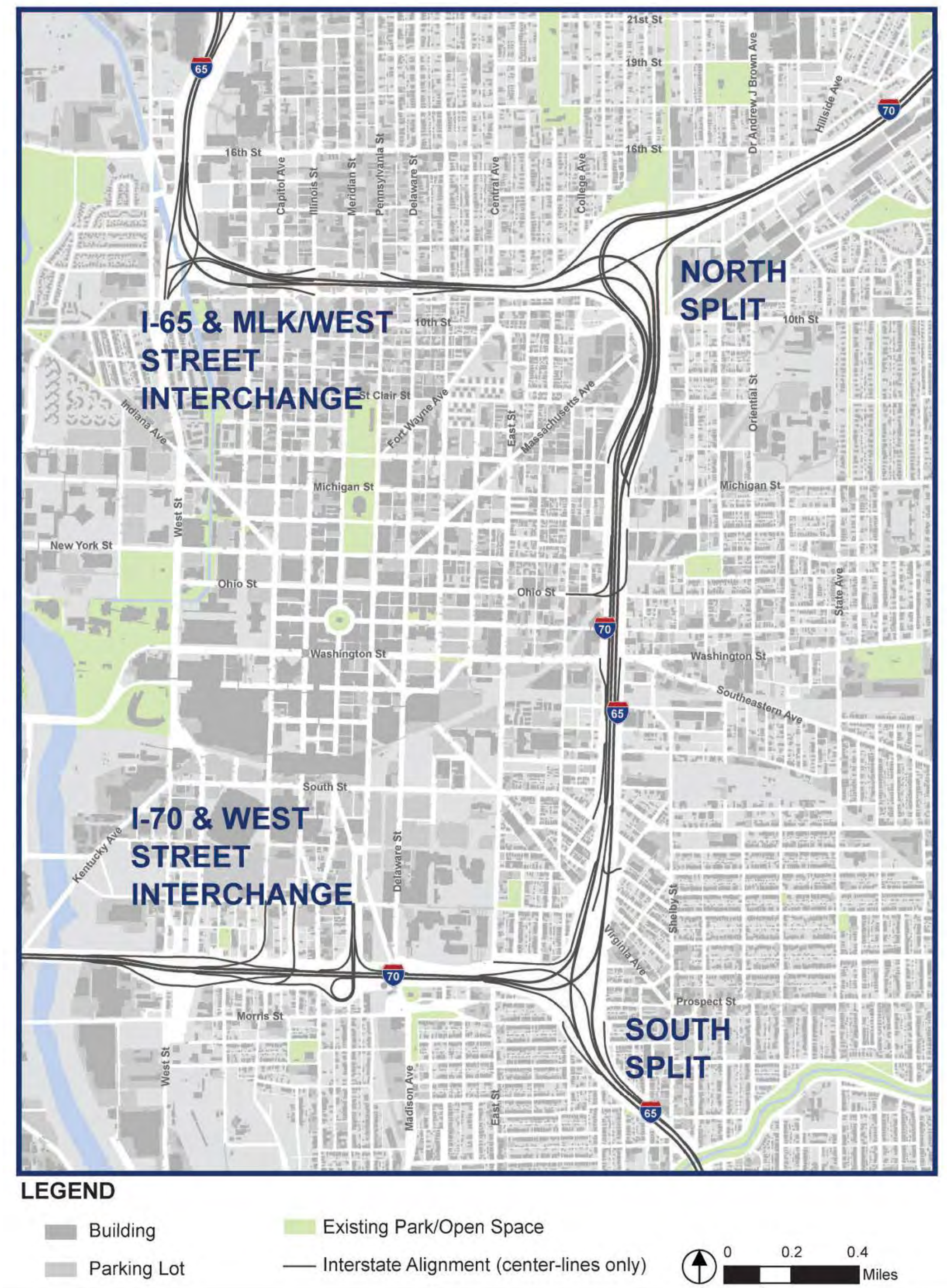
North Leg

I-65, as it approaches the Martin Luther King Boulevard/West Street interchange from the north, is comprised of four 12-foot lanes in each direction including auxiliary lanes. The north leg is constructed on fill or bridge structure over the full length. The Martin Luther King Boulevard/West Street interchange provides full exit and entrance ramps to and from I-65 and serves Martin Luther King Boulevard, West Street, and 11th Street.

I-65 has three through lanes in each direction along the north leg to the North Split interchange. I-65 is constructed on a continuous bridge from Senate Avenue to Pennsylvania Street to provide unimpeded flow at eight local street crossings. This section of I-65 is bordered by frontage roads to the north and south (11th and 12th Streets) which provide access to and from I-65 along with access to the intersecting local road system.

The North Split interchange is a three-legged interchange that provides access to and from I-70, I-65, and the local road network of downtown. I-70 on the east leg of the interchange is comprised of five 12-foot through lanes in each direction.

Figure 4-1: Existing Downtown Interstate System (Inner Loop)



East Leg

I-65/I-70 on the east leg is comprised of three 12-foot through lanes southbound and four 12-foot through lanes northbound. A collector-distributor (C-D) roadway is located on the west side of I-65/I-70. C-D roadways parallel interstates and are provided specifically to serve entry and exit ramps, so that traffic flow on the mainline is not disrupted. This C-D roadway serves local traffic on the east and southeast side of downtown. The east leg corridor is crossed by the CSX Railroad, which passes under I-65/I-70 near Ohio Street. North of the railroad, a frontage road (Pine Street) on the east side provides access to northbound I-65 and eastbound I-70. South of the railroad crossing, an entrance ramp from Washington Street provides access to southbound I-65 and westbound I-70.

An exit ramp from northbound I-65 and eastbound I-70 provides access to Washington Street. South of Washington Street, additional southbound exit ramps provide access to Fletcher Avenue and Pine Street. An entrance ramp from Calvary Street provides access to northbound I-65 and eastbound I-70.

North of Washington Street, I-65/I-70 is constructed on fill with several bridges for local street crossings. South of Washington Street, I-65/I-70 is depressed below street level. This is the only section of the downtown interstate system that is depressed.

The South Split interchange is a three-legged interchange that provides access to and from I-70 and I-65. At the south end of this interchange, a partial interchange provides access from northbound I-65 to Morris and Prospect Streets, and an entrance ramp provides access to southbound I-65. I-65 is comprised of three 12-foot through lanes in each direction south of the interchange.

South Leg

I-70 on the south leg is comprised of three 12-foot through lanes each way. A partial interchange at Madison Avenue provides access to and from I-70. A full interchange at Missouri and West Streets provides access to and from the local street network, including Capital Avenue and Illinois Street, on the south side of downtown.

4.2 Concept 1 Performance

As described in **Section 3.1**, the IMPO regional travel demand model is used to measure the performance of the system as a whole compared to existing conditions within the nine-county central area included in the model. The microsimulation model created as a derivative of the IMPO model simulates a smaller area in proximity of downtown, referred to as the traffic study area. The microsimulation model provides greater detail by considering localized traffic operations in addition to the route capacity factors considered in the IMPO model. Both models provide useful information for reviewing performance.

Table 4-1 shows the total estimated vehicle miles of travel (VMT) and vehicle hours of travel (VHT) in the traffic study area with the no-build conditions of Concept 1 during the morning peak hour. These values are used as a base of comparison for reviewing the performance of Concepts 3 through 7 in subsequent chapters of this report. Differences between the values shown in **Table 4-1** and values for the concepts reflect the change in total travel distance, total travel time, and total delay for all motorists in the traffic study area in and around downtown.

Table 4-2 shows the VMT and VHT in the traffic study area with no-build conditions of Concept 1 during the afternoon peak hour. These values are used as a base of comparison for reviewing the performance of Concepts 3 through 7 during the afternoon peak hour.

Another method of measuring system performance is the volume of traffic served. The inner loop in downtown Indianapolis and the interstate legs that feed it serve the highest traffic volumes in Central Indiana. Current volumes served by interstates downtown are shown in **Figure 4-2**.

Figure 4-2: Downtown Interstates Daily Traffic Volumes

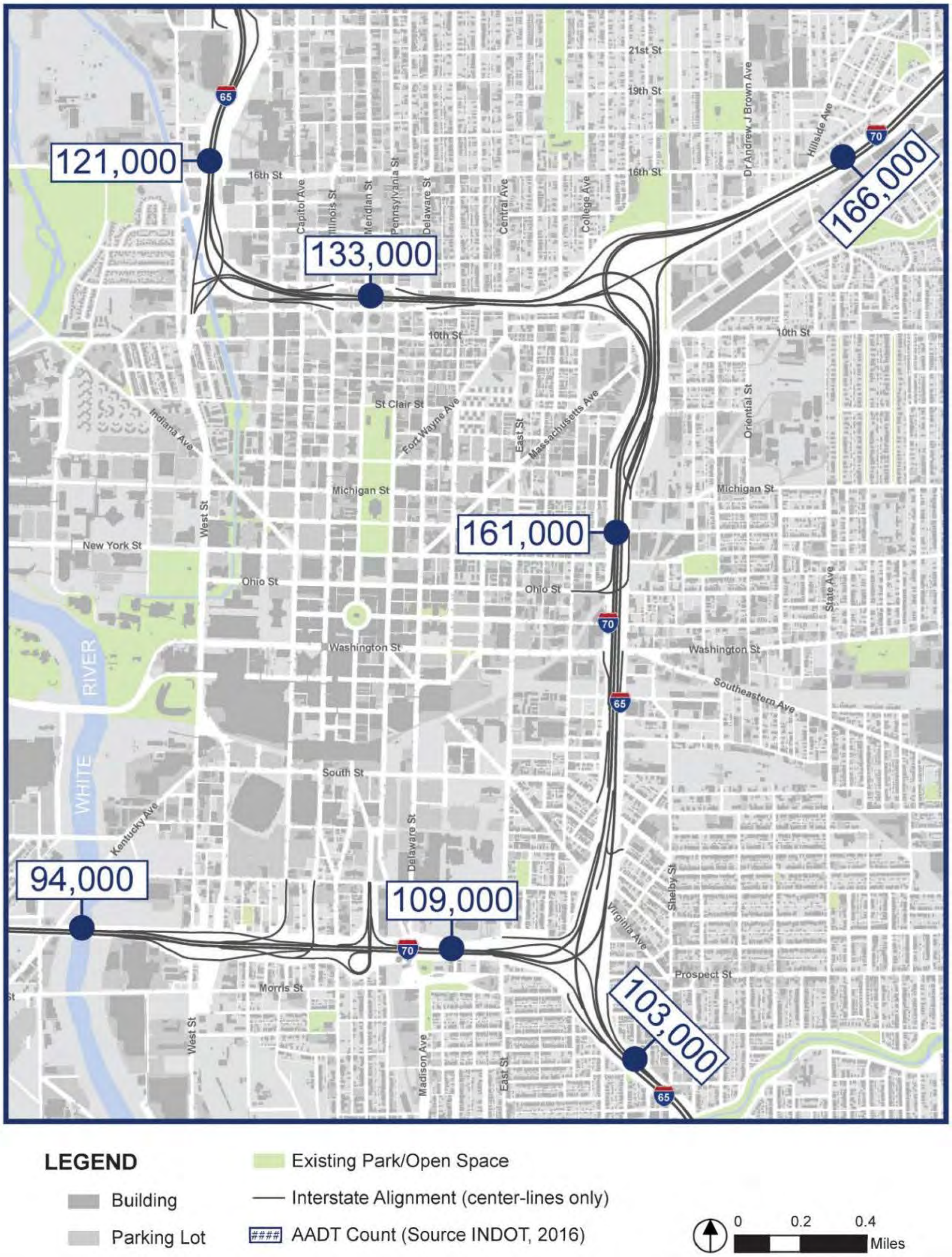


Table 4-1: Concept 1 System-Level Performance Measures, AM Peak (Base Condition)

AM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)
Vehicle Miles of Travel (VMT)	311,565
Vehicle Hours of Travel (VHT)	43,880
Total Delay (hours)	21,346

Table 4-2: Concept 1 System-Level Performance Measures, PM Peak (Base Condition)

PM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)
Vehicle Miles of Travel (VMT)	351,685
Vehicle Hours of Travel (VHT)	48,711
Total Delay (hours)	23,471

An additional measure of performance relates to daily traffic back-ups (queuing) of stop-and-go traffic that occurs on interstates as they approach downtown. Queuing commonly occurs in every direction today from the downtown interstates, with the following approximate back-of-queue limits for the worst case of the morning or afternoon peak hour. As with other measures, these estimates form a basis for comparison with other concepts.

- North: 2-4 miles (30th Street to 38th Street)
- East: 2-4 miles (Rural Street to Arlington Avenue)
- South: 1-3 miles (Raymond Street to Keystone Avenue)
- West: 0-1 mile (West Street to Harding Street)

4.3 Concept 1 Estimated Cost

The basis for cost estimating for system-level concepts is provided in **Section 3.2**. By definition as the no-build condition, Concept 1 includes no capital improvements. There will, however, be a need to invest in the system over time to retain the integrity of the existing infrastructure. An estimate of a 30-year cost is provided here as a point of reference.

For the purposes of cost estimating, the following assumptions were used to develop an estimate for maintaining the existing five-mile system of Concept 1 over the next 30 years:

1. Assume all bridge deck concrete will be replaced.
2. Assume 25% of bridges will be fully replaced.
3. Assume 2-inch mill and resurface for full roadway.

Based on these factors, it is estimated that the cost to maintain the inner loop represented by Concept 1 over the next 30 years would be approximately $437 million.

4.4 Concept 1 Estimated Impacts

There would be no impacts due to capital improvement projects with Concept 1, but there would be impacts associated with maintenance activities as the infrastructure continues to age and deteriorate, and requires replacement or reconstruction of system components. These impacts would include traffic disruption associated with ramp and mainline interstate closures to replace bridges or pavement, and other impacts ordinarily experienced with construction activities.

5 CONCEPT 2: TRANSPORTATION SYSTEM MANAGEMENT

In this analysis, transportation system management refers to actions to reduce traffic demand on the downtown interstate system. Reduced demand could provide greater flexibility to consider improvements with lower cost and impact or to allow major changes such as decommissioning, as described in **Chapter 2**. Three potential actions are reviewed for Concept 2:

- Diversion of through interstate trips to I-465
- Diversion of downtown interstate trips to transit
- Diversion of downtown interstate trips with tolling

The intent here is not to fully define or evaluate these actions. Rather it is to evaluate whether these actions would be likely to reduce downtown interstate traffic volumes to a degree that would significantly change the review of function, cost, or impact of Concepts 3 through 7. Each potential action is reviewed below.

5.1 Potential Diversion to I-465

Diverting through trips that currently use the downtown interstates to the I-465 beltway has been suggested as a way to significantly reduce traffic demand on I-65 and I-70 in the downtown area. The amount of potential diversion depends on how many trips using the inner loop are through trips. Trips that begin or end downtown, or in the large band around downtown inside the inner loop are not considered through trips, though they might pass through the inner loop. They would not have the option of using I-465 to complete their trip.

Several techniques are used in this analysis to estimate the number of through trips that could potentially be diverted to I-465. These techniques consider through trips in the morning and afternoon peak periods since traffic levels at these times determine the required capacity of the system. This through traffic could potentially be diverted to I-465 by implementing either incentive or enforcement policies.

The first technique used to estimate the number of through trips that might divert to I-465 is the IMPO nine-county travel demand model, which simulates current (2016) conditions. Existing regional through traffic (with both origin and destination outside of I-465) was analyzed by considering all interstates in the Indianapolis metropolitan area (I-65, I-69, I-70, I-74, and I-865) as these through interstate trips would be the most likely to divert to I-465.

Using the “selected link” feature of the IMPO model, through traffic was identified by tracing trips on interstate highways that cross I-465 towards downtown, pass through downtown, then exit the region on any interstate highway at another point on I-465. All potential interstate through trips were simulated in this manner and the trips through the North Split were totaled. The results of the simulations, in terms of total percent of inner loop traffic, are shown in **Table 5-1**. The IMPO model indicates no more than 10% of morning peak period trips are through trips, and 11% of afternoon peak period trips are through trips.

Table 5-1: Percent Through Traffic at the North Split (Modeled)

	Morning Peak	Afternoon Peak
West Leg	6%	6%
East Leg	5%	6%
South Leg	10%	11%

The second technique used to estimate through trips in the inner loop was an analysis using a service called StreetLight InSight. The results are based on location based services (LBS) data from smart phones. The sample size of LBS data is roughly 12% of the adult U.S. population. The data used in this analysis is from travel during average weekdays over a three-month period, from April 2017 to June 2017.

The LBS data provides the opportunity to identify specific locations of individual vehicles as they pass through the area. The trip data was sampled to identify vehicles that crossed I-465 towards downtown on any interstate, passed through the North Split interchange, and crossed I-465 again on any interstate to exit the area. The through trips identified in this manner could potentially be diverted to I-465 for their trip.

The results of the StreetLight InSight analysis are presented in **Table 5-2**. These results are comparable to the results of the IMPO model analysis. Of the trips that use I-65/I-70 in downtown Indianapolis during peak periods on an average weekday, fewer than 10% could be diverted to I-465.

Table 5-2: Percent Through Traffic at the North Split (Smart Phone Data)

Time Period	Percent Through Traffic
All Day (12am-12am)	5.3%
Early AM (12am-7am)	7.3%
Peak AM (7am-9am)	5.2%
Mid-Day (9am-4pm)	5.3%
Peak PM (4pm-6pm)	6.2%
Late PM (6pm-12am)	6.8%

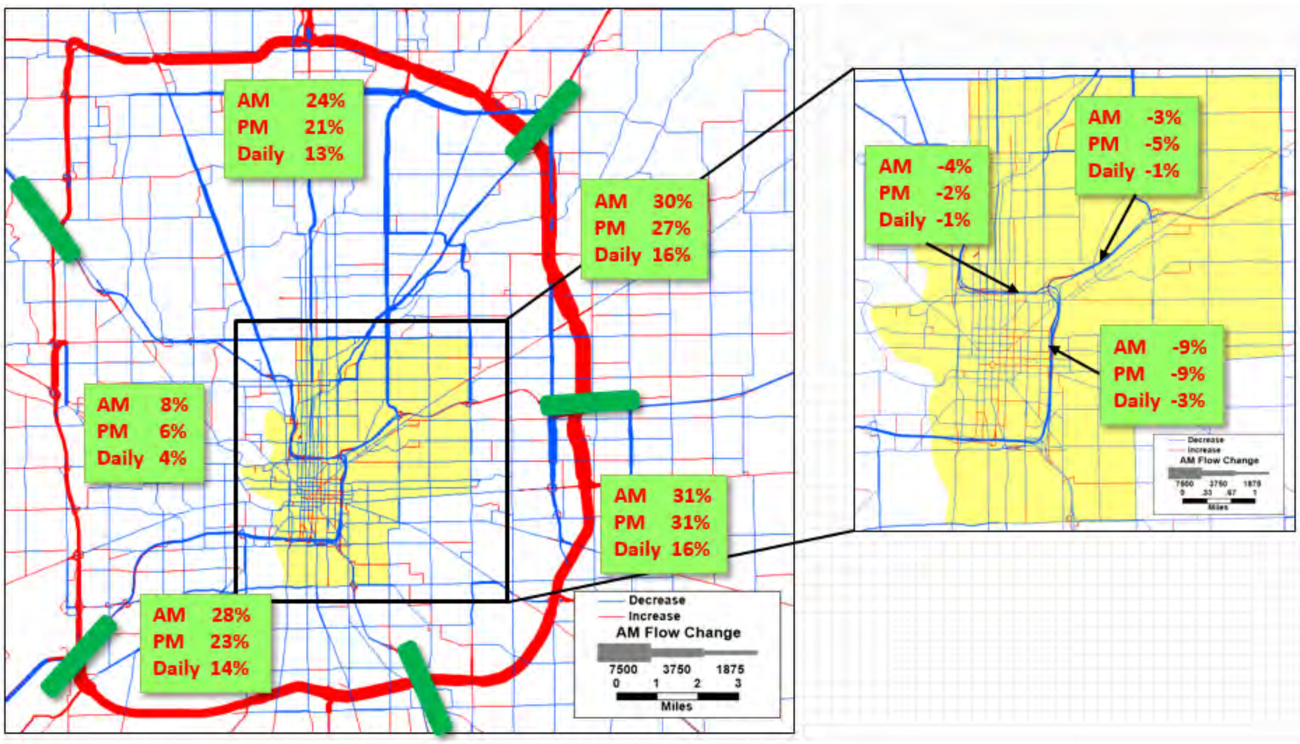
The project team also modeled an "I-465 Unlimited Capacity" scenario to test how a more favorable I-465 might attract inner loop traffic. In this analysis, sufficient capacity along I-465 was artificially added in the IMPO model to allow free-flow traffic conditions. Ten travel lanes were coded for each direction along I-465 in the IMPO Model 2016 base network. All I-465 interchange ramps were coded as five lanes to provide unconstrained access to I-465. **Figure 5-1** shows traffic volume changes by comparing the "I-465 Unlimited Capacity" scenario to Option 1 (No-Build). The red lines on the figure indicate an increase in traffic volume. Blue lines indicate a decrease in traffic volume. I-465 is divided into sections for presenting the percent change in volume with the green lines.

As shown in **Figure 5-1**, the reduction in traffic volumes through the North Split as traffic diverts to a greatly expanded I-465 would be no more than 9% during each of the peak periods, which is consistent with the findings of the other two analysis techniques. Another observation from **Figure 5-1** is the high level of diversion from local routes to an expanded I-465, as indicated by the extensive blue lines on the map. This is an indication of the impact added interstate capacity can have on reducing traffic levels on local streets.

These estimates do not imply that 90% of peak period traffic is destined to downtown. Many trips pass through downtown to destinations inside I-465. These are not identified as through trips here because they do not begin and end outside I-465.

The conclusion of this analysis is that there is potential to divert some through traffic to I-465 by implementing either incentive or enforcement policies, but the impact on overall traffic levels in the inner loop would be small. This strategy is not likely to be a major component of strategies to modify downtown interstates.

Figure 5-1: Traffic Volume Change with Unlimited Capacity on I-465



5.2 Potential Diversion to Transit

The Indianapolis Public Transportation Corporation (IndyGo) provides fixed-route services on 32 routes in the Indianapolis region. They also provide flexible-route paratransit service for eligible riders. According to state law, IndyGo only operates within Marion County, although communities outside of Marion County that desire service are permitted to contract with IndyGo to extend service across the county border. Greenwood currently has such an agreement with IndyGo for service on two routes. IndyGo's ridership for 2017 was approximately 8.7 million. On an average weekday in 2016 (the most recent year that data is available from the National Transit Database), IndyGo provided just under 32,000 trips.

Guided by the Marion County Transit Plan, expansion of IndyGo's service is underway, including expanded frequency and hours of service for its fixed route, local bus service and provision of a regional Bus Rapid Transit (BRT) system. The expanded system was defined in a multi-year study known as Indy Connect, led by the IMPO, Central Indiana Regional Transit Authority (CIRTA), and IndyGo. Three BRT lines (Red, Blue, and Purple) will provide the core of the system.

BRT is a high-quality bus-based transit system that delivers fast and cost-effective services, with dedicated lanes, high quality stations, off-board fare collection, and fast and frequent operations. Because BRT contains features similar to light rail transit, it is much more reliable, convenient, and faster than regular bus service. The Red Line will be implemented first, with Phase 1 service from the University of Indianapolis to Broad Ripple to be operational in 2019. The Purple Line on 38th and Meridian Streets, and the Blue Line on Washington Street, will follow in the next few years.

Figure 5-2 is a map of the IndyGo system as planned for 2022, including full implementation of all local and rapid transit services. While regional connections have been discussed, especially as they relate to the BRT lines, the Marion County Transit Plan assumes that IndyGo will continue to operate primarily within Marion County borders.

An additional transit line, called the Green Line, was considered for implementation in the northeast corridor of the region. Using either BRT or light rail, the Green Line would link downtown Indianapolis with Fishers and Noblesville. The Green Line was originally envisioned as a way to shift regional trips from automobile to transit, but ultimately, it was removed from the Marion County Transit Plan due to changed funding priorities.

Preparation of a Draft Environmental Impact Statement for the Green Line was in the final stages before the line was removed from the plan. Based on that unofficial document the expected ridership of the Green Line would have been about 10,000 riders per day. It is estimated that the Red Line will carry approximately 11,000 riders per day. Early ridership estimates for the Blue and Purple Lines are approximately 8,000 riders per day for each line.

Transit will be increasingly useful in diverting traffic from roadways as the system continues to expand. The expansion of IndyGo's service is incorporated into the base system of the IMPO nine-county travel demand model. As a result, expanded fixed route bus service is already assumed in all modeling of traffic in this analysis. The three BRT lines are included in the 2045 IMPO model, but they are not included in the model of current conditions used in this study. As a result, potential diversion of trips from the inner loop to BRT lines is reviewed separately.

The potential effect of the three planned BRT lines on inner loop traffic was estimated using parts of the 2016 and the 2045 IMPO model. As described in **Section 3.1**, the IMPO model identifies roadway and transit trips in the mode choice step, then assigns these trips to the roadway network and the transit network, respectively. In this analysis, the 2045 BRT trips were assigned to the existing roadway network to determine what routes the passengers would use if they were driving. The results were reviewed to see how many of these drivers used the inner loop.

It was found that if the three BRT lines were operational, they would reduce the traffic levels on the inner loop by less than 1%. This is not surprising considering the markets the BRT lines will serve. Most of the Red Line ridership will be north of downtown along Capital Avenue, Meridian Street, and College Avenue. Most of these riders would use local streets to make the same trip. The same would be true for Purple Line riders to and from East 38th Street. Because the Blue Line on Washington Street would parallel I-70, it probably accounts for most of the reduction that would occur on the inner loop. Overall, most of the traffic relief from the BRT lines will be on local streets.

The Green Line, if it was reintroduced in the future, would have the potential to reduce interstate travel on portions of the route outside I-465, but even this impact would be minimal based on preliminary ridership estimates.

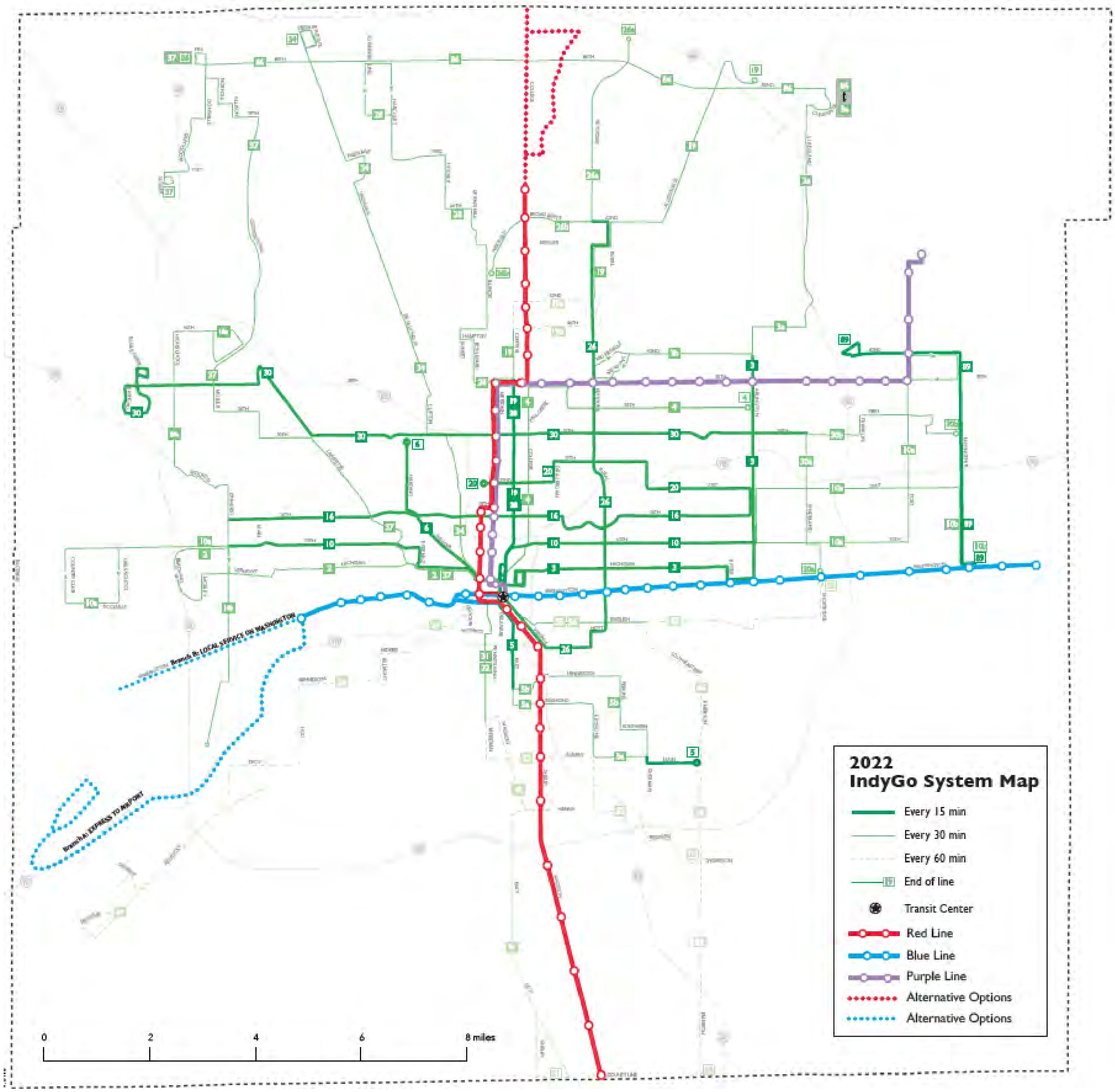
The conclusion of this analysis is that some of the traffic that currently uses the downtown interstate system will be diverted to transit as major improvements are made to the existing IndyGo system and as BRT lines are implemented. Based on the outputs of the models used for this analysis, transit improvements are not likely to significantly change the information developed in the concepts reviewed here for downtown interstates.

5.3 Potential Diversion due to Tolling

It has been suggested that traffic could be discouraged from using downtown interstates by instituting selective tolling strategies. Presumably, tolls could be placed on I-65 and I-70 inside I-465, which could induce through traffic to follow I-465 instead of driving through downtown on the inner loop. As shown in **Section 5.1**, I-65 and I-70 through trips during peak periods are not high enough to have a great impact even if all these trips were diverted, so tolls would not be effective for this purpose.

INDOT is currently studying interstate tolling. No decision or timelines on tolling implementation have been made.

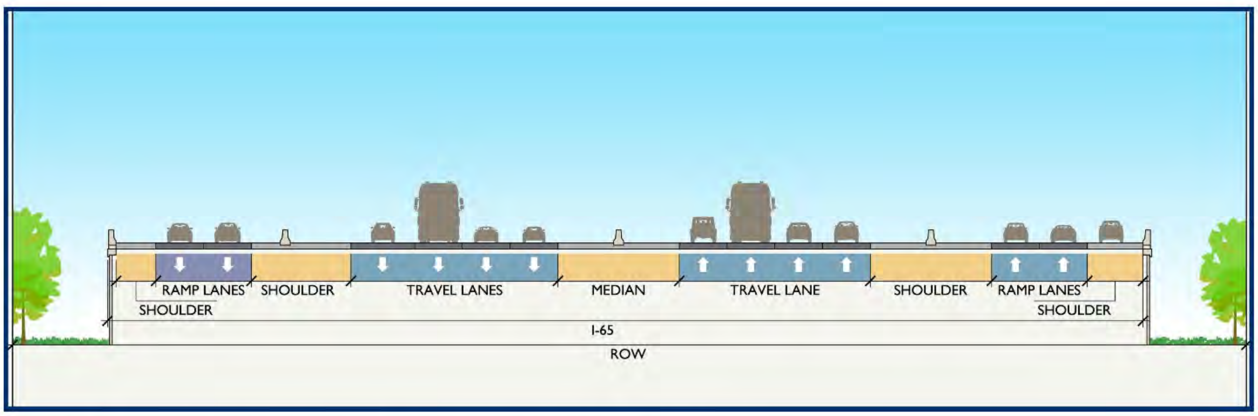
Figure 5-2: 2022 IndyGo Service, per Marion County Transit Plan



6 CONCEPT 3: UPGRADED INTERSTATES

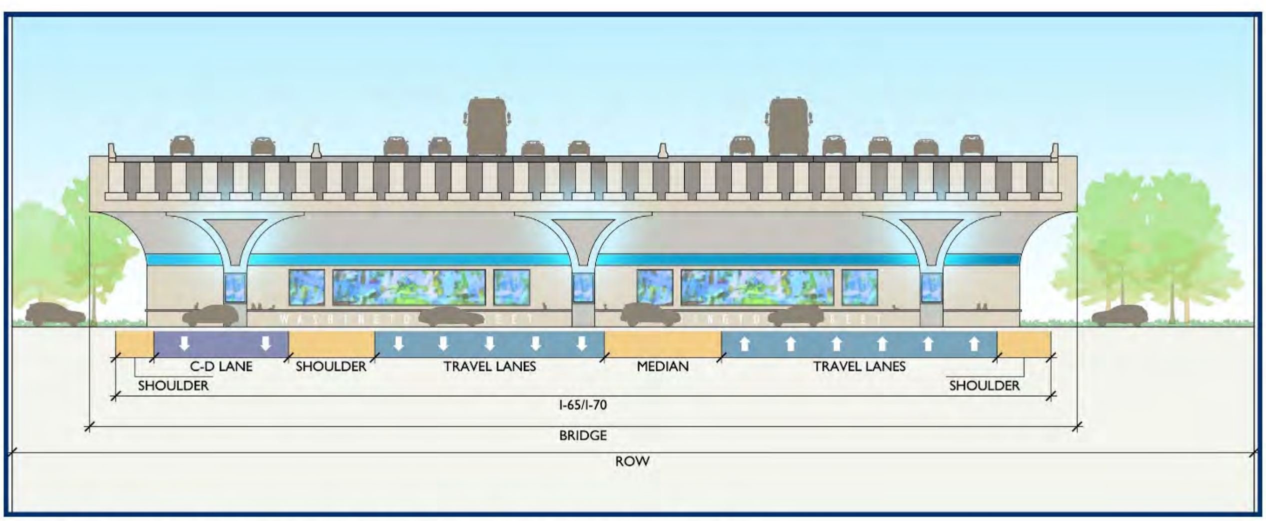
This concept involves full reconstruction of mainline I-65 and I-70, and the Martin Luther King Boulevard/West Street, North Split, and South Split interchanges. The existing roadways, bridges, and connections to local streets would be reconstructed to meet future traffic demands, improve traffic flow, eliminate operational deficiencies, and improve safety. These improvements include replacement or rehabilitation of roadway and bridges, realignment of I-65 and I-70 mainline and ramps at some locations, and the addition of new lanes where needed to improve traffic flow. Assumed typical sections for Concept 3 are provided in **Figure 6-1** and **Figure 6-2**.

Figure 6-1: Concept 3 Upgrade Existing Interstates at Pennsylvania Street



UPGRADE EXISTING INTERSTATES FOR DOWNTOWN INTERSTATE SYSTEM
I-65 at Central Avenue

Figure 6-2: Concept 3 Upgrade Existing Interstates over New York Street



UPGRADE EXISTING INTERSTATES FOR DOWNTOWN INTERSTATE SYSTEM
I-65/I-70 at New York Street

Downtown interstates would continue to be elevated at most locations, as they are today, with the same local streets passing under or over the interstates to access the downtown area. Geometric improvements would be made as aging pavement and bridges are replaced. Design considerations would include minimization efforts and mitigation opportunities.

With Concept 3, improvements would be made to ramp and C-D roadways providing local street connections. The pavement and bridges would be replaced as most are nearing the end of their service life. In certain locations, the mainline or ramp roadways would be realigned or relocated to reduce or eliminate operational deficiencies. The North Split interchange would be reconfigured to eliminate existing weaving problems and to provide a more direct and compact design that is better suited to connecting three interstates rather than the four that were originally planned.

As with all concepts being reviewed in this analysis, the upgraded interstates option is intended to be a representative configuration rather than a final design. Refinements would be made in a more extended study based on the results of initial testing, public input, and many other factors related to localized constraints and opportunities. A rendering of how Concept 3 might appear at Meridian Street is provided in **Figure 6-3**.

Figure 6-3: Rendering Concept 3 Upgrade Interstates Option

View of Meridian Street Looking East

6.1 Concept 3 Configuration

Following is a description of the assumed representative layout for Concept 3 used in this analysis. The description includes references to five map sheets provided at the end of this chapter. The map sheet section begins with a key map to show the location of each map sheet.

North Leg

The north leg of Concept 3 from the Martin Luther King Boulevard/West Street interchange to the North Split interchange is shown in Sheets 1 and 2 at the end of this chapter. Concept 3 would include the following major changes:

- One lane for I-65 northbound and southbound would be added from the Martin Luther King Boulevard/West Street interchange north to the 29th/30th Street interchange and from the Martin Luther King Boulevard/West Street interchange to the North Split interchange.
- Southbound I-65 would be realigned to the Martin Luther King Boulevard/West Street exit ramp to the east, and the exit ramp traffic to southbound West Street would be separated from westbound 11th Street.
- The northbound West Street to southbound I-65 left-hand entrance ramp would be eliminated. It would be replaced with a new ramp that parallels I-65 on the south side and connects to southbound I-65 just east of Meridian Street (right-hand entrance ramp).
- The I-65 northbound left-hand exit ramp to West Street would be eliminated and replaced with a new exit ramp that parallels I-65 on the north side, goes over I-65, and connects to the existing intersection of 11th Street and West Street. The new exit ramp would provide separation of exit ramp traffic to southbound West Street and westbound 11th Street.
- The entrance ramp from 11th Street to southbound I-65 and eastbound I-70 would be combined into a C-D system to access I-65 and I-70, eliminating the existing weaving movements. C-D roads would be located parallel to mainline interstate lanes and would be used for ramp connections.
- The northbound I-65 and eastbound I-70 to Pennsylvania Avenue exit ramp would be separated into a C-D system, eliminating the existing weaving movements.
- Westbound I-70 to northbound I-65 traffic movements would be separated to provide dedicated lanes to I-65 North and to the Pennsylvania Avenue exit ramp, eliminating the existing weaving movements.

East Leg

As shown in the Sheets 2, 3, and 4 at the end of this chapter, the North Split and east leg portions of the downtown interstate system would be redesigned to eliminate existing operational issues. This concept assumes the following major improvements:

- Dedicated lanes would be added to improve the merge of southbound I-65 and westbound I-70.
- One lane would be added in each direction to serve I-65/I-70 through movements.
- One lane would be added to the north-south downtown C-D system.

South Leg

As shown in Sheets 4 and 5 at the end of this chapter, the South Split and I-70 south leg portion of the system would be redesigned to eliminate operational issues, and would consist of the following major improvements:

- Northbound I-65 to westbound I-70 traffic would be separated into through lanes and a C-D system.
- Eastbound and westbound I-70 entrance/exit ramps between West Street and Madison Avenue would be separated into a C-D system parallel to the mainline.
- Southbound I-65/I-70 lanes would be separated into through lanes and a C-D system, one for westbound I-70 exit ramps to Madison Avenue and West Street, and one for the southbound I-65 exit ramp to Raymond Street.
- A new eastbound I-70 exit ramp to northbound Meridian Street over I-70 would be constructed.
- I-70 would be widened over the White River Bridge to accommodate the addition of the eastbound and westbound C-D lanes.

6.2 Concept 3 Performance

As described in **Section 3.1**, a subarea microsimulation model derived from the IMPO regional travel demand model is used to measure the performance of the system-level concepts within a designated traffic study area in proximity of downtown. The microsimulation model considers localized traffic operations in addition to the route capacity factors considered in the IMPO model.

Table 6-1 shows expected changes in total vehicle miles of travel (VMT) and total vehicle hours of travel (VHT) in the traffic study area during the morning peak if Concept 3 is implemented. The total VMT in the subarea would be about 1% higher, indicating motorists would drive further to complete their trips. Trips would take less time, however, as indicated by a 4% reduction in VHT, and there would be about 10% less total delay. These values indicate that some motorists would use a less direct path to utilize the higher speed of improved interstates. Overall travel time and delay would be reduced with Concept 3 and the downtown area would be less congested.

Table 6-1: Concept 3 System-Level Performance Measures, AM Peak

AM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 3 (Upgrades)	Percent Change
Vehicle Miles of Travel (VMT)	311,565	314,337	1%
Vehicle Hours of Travel (VHT)	43,880	42,051	-4%
Total Delay (hours)	21,346	19,156	-10%

Figure 6-4 illustrates the general pattern of traffic changes in the morning peak with Concept 3. Roads with traffic increases are shown in red and those with decreases are shown in blue. Some existing one-way streets on the east side of downtown show increased traffic levels, probably due to a shift of local traffic to the interstate system as capacity is added and conflicts are resolved on I-65 and I-70. Generally, traffic levels increase at some locations and decrease at others, but changes throughout the network are relatively small.

Table 6-2 shows the system-level performance of Concept 3 during the afternoon peak hour. The total VMT in the subarea would be slightly less than the No-Build during the afternoon peak hour in and near downtown. Total VHT would be reduced by 4% due to system upgrades of Concept 3, and total delay would be reduced by 6% during the afternoon peak. This indicates that, on average, downtown motorists would be using a slightly shorter path and would complete their trips quicker with less congestion in and out of downtown during the afternoon peak.

Figure 6-4: Concept 3 - AM Traffic Flow Compared to No-Build

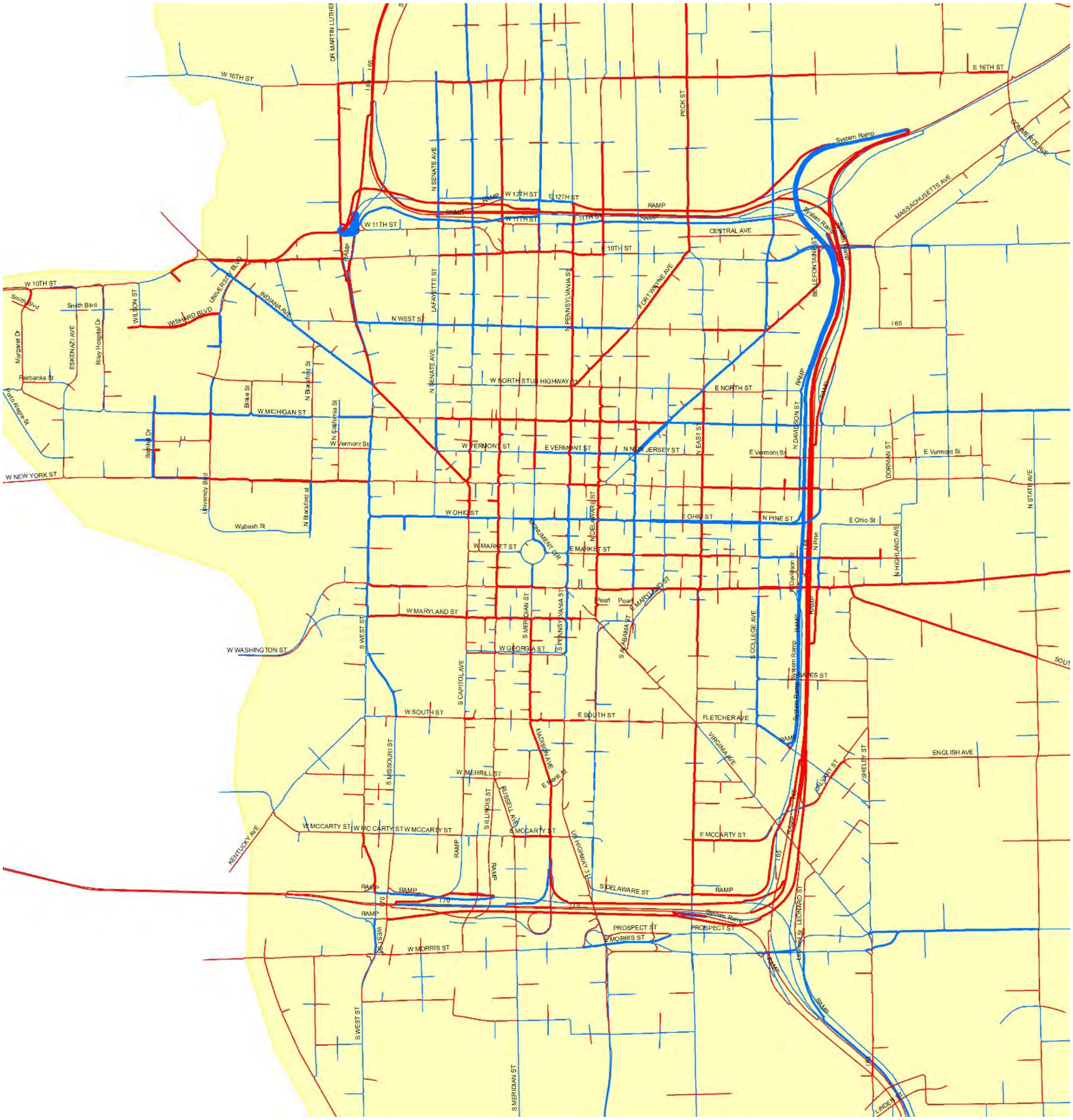


Table 6-2: Concept 3 System-Level Performance Measures, PM Peak

PM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 3 (Upgrades)	Percent Change
Vehicle Miles of Travel (VMT)	351,685	349,398	-1%
Vehicle Hours of Travel (VHT)	48,711	46,962	-4%
Total Delay (hours)	23,471	22,034	-6%

The general pattern of traffic in the downtown area during afternoon peak is shown in **Figure 6-5**. Roads with traffic increases are shown in red and those with decreases are shown in blue. There is a reduction in travel on many downtown streets. Exceptions are generally on routes leading to the I-65 and I-70. Interstate traffic levels increase slightly at most locations in response to the improvements to those roadways with this concept.

In summary, motorists would drive about the same distance to reach their destinations if the downtown interstates were improved as described in Concept 3. They would be making the trips faster and overall congestion in and around the downtown area would be reduced in both the morning and afternoon peak hours. The microsimulation model also indicates that there would be no significant queuing on interstates with Concept 3.

6.3 Concept 3 Estimated Cost

The basis for cost estimating for system-level concepts is provided in **Section 3.2**. Estimated construction cost is provided in a range because of the level of uncertainty at this conceptual stage. For the purposes of cost estimating, Concept 3 is generally described as follows:

Concept 3 would cover approximately seven miles of I-65 and I-70. The scope includes removal and reconstruction of existing roadway pavement for I-65 and I-70, added interstate travel lanes, reconfiguration of three interchanges allowing for more efficient traffic flow between interstates, as well as improved access and egress to and from surface streets. Removal and reconstruction of existing bridge structures and construction of the I-70 Bridge over the White River are assumed.

Following are primary factors that could cause the cost of Concept 3 to be higher or lower within a range:

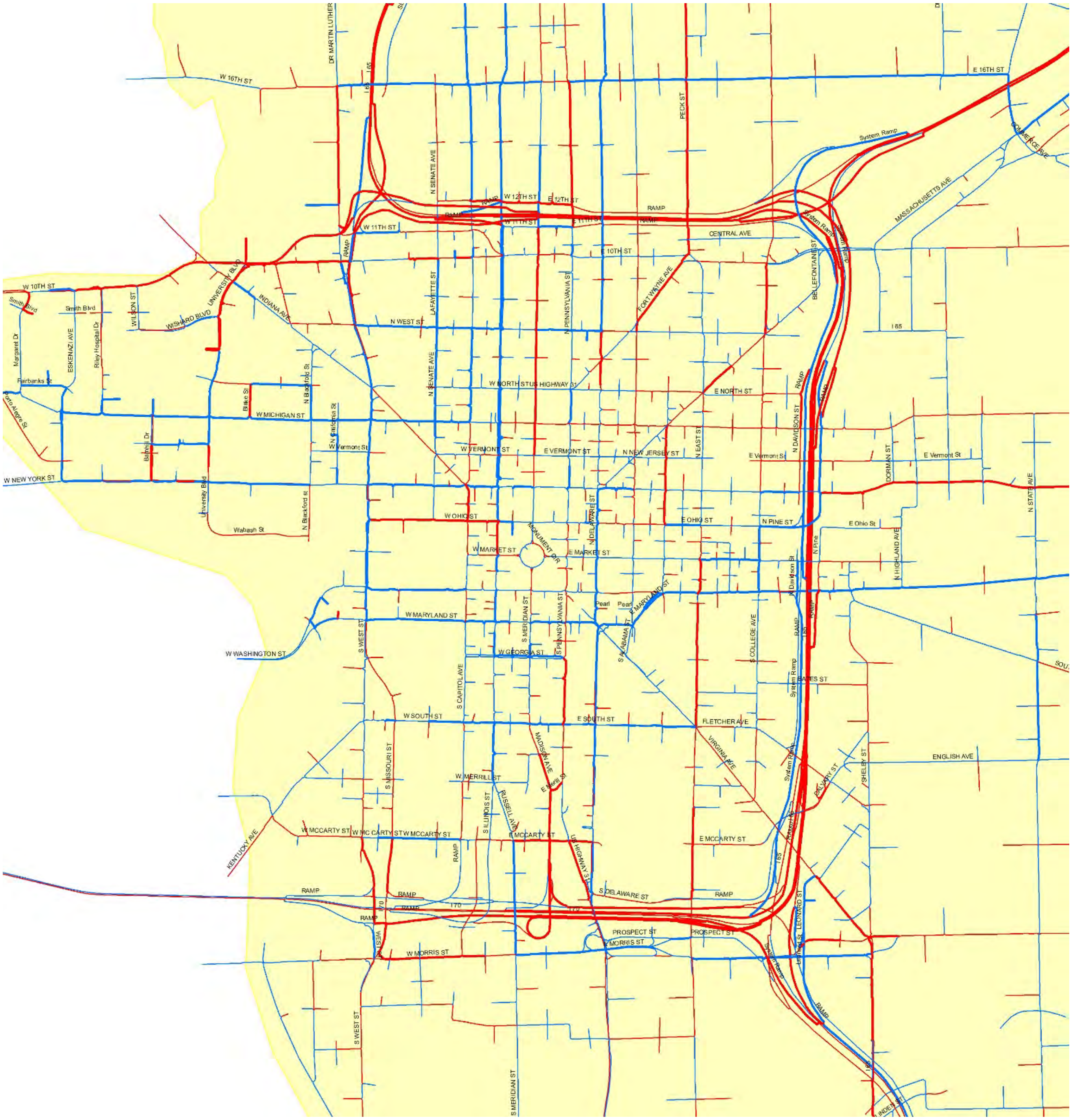
- Phasing. Allowing for complete shutdown of interstate sections in minimum of one-mile segments would allow the contractor unimpeded project access likely reducing construction time, and as a result cost.
- Interchange design. Utilization of earth fill in lieu of walls and designing an alignment allowing for basic column and cap structures would reduce cost.
- Overall design. Keeping construction within the existing right-of-way would help to control cost.

Based on the above assumptions and primary factors, a range of estimated cost and an estimate of yearly O&M cost is presented for Concept 3, as follows:

Estimated Project Cost = $900 million to $1.6 billion

Estimated Annual O&M Cost = $3 million

Figure 6-5: Concept 3 - PM Traffic Flow Compared to No-Build



6.4 Concept 3 Estimated Impacts

Potential impacts are estimated below for traffic on neighborhood and downtown streets, construction impacts, neighborhood connectivity, right-of-way and relocations, historic resources, parks and recreation areas, and natural resources.

6.4.1 Local Street and Neighborhood Traffic Impacts

Traffic changes in and near downtown with the implementation of Concept 3 are shown in **Figure 6-6** for the morning peak and **Figure 6-7** for the afternoon peak. Traffic increases are shown in red and decreases are shown in blue. Changes on the interstates and West Street are solid arrows. The open arrows represent total traffic on local streets that cross each leg of the inner loop or West Street to enter or leave downtown.

Traffic on interstate links would generally be higher than existing, which is expected since Concept 3 would increase interstate capacity. West Street would be lower by 6% in the morning and 11% in the afternoon. Total traffic on streets that cross the inner loop or West Street outside the downtown area would not change significantly. The greatest change would be to and from the north, where traffic would be reduced by 5% to 6%.

Traffic on streets inside the inner loop that cross the legs of the inner loop or West Street would increase in all directions in the morning peak and would decrease at all but the south leg in the afternoon peak. The greatest increase in traffic would be at the south leg, with a 17% increase in the morning peak and a 9% increase in the afternoon peak, as traffic is drawn to the south leg due to the improvements in Concept 3.

In terms of the largest changes on individual routes, most changes would be modest. In general, increases would occur on streets used to access the interstate near the improvements.

6.4.2 Construction and Maintenance of Traffic Impacts

The estimated construction duration for Concept 3 is five years. Maintenance of traffic (MOT) strategies during construction for this concept would vary depending on the location. Due to the number of C-D and ramp lanes, a reasonable MOT strategy would be to shift mainline traffic to the middle, construct on the outside, and incrementally close specific C-D roads and ramps. With construction complete on the outside, traffic would be shifted for construction in the middle. Local streets would be kept open with their own phasing and lane and sidewalk closures would occur as needed to accommodate construction for the bridges above.

Within the three major interchanges, new sections would be constructed first, then selected movements would be closed while others are left open to complete the interchange construction incrementally. This would minimize detours and impacts to local streets, but would create a longer duration of construction. Closing the major interchanges entirely, while likely not all at the same time, would create more detours and impacts to local streets, but would enable construction to be completed more quickly.

For all locations, challenges would include maintaining existing utilities, lighting, signing, and drainage while also relocating and constructing the roadway infrastructure. Some of these features may be constructed in advance to avoid adding to the overall construction duration.

Figure 6-6: Concept 3 / 4 Traffic Volume Changes (AM peak)

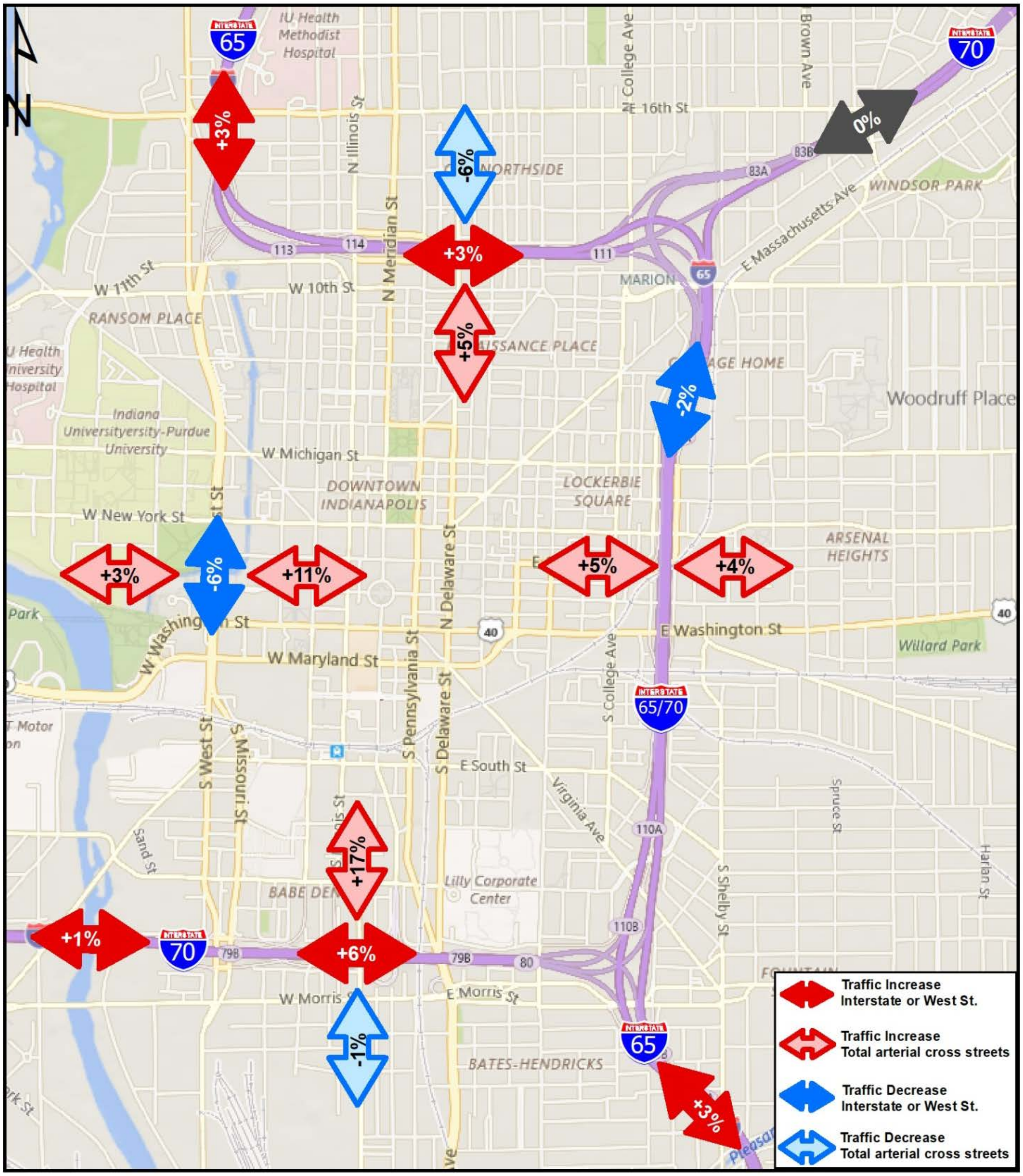
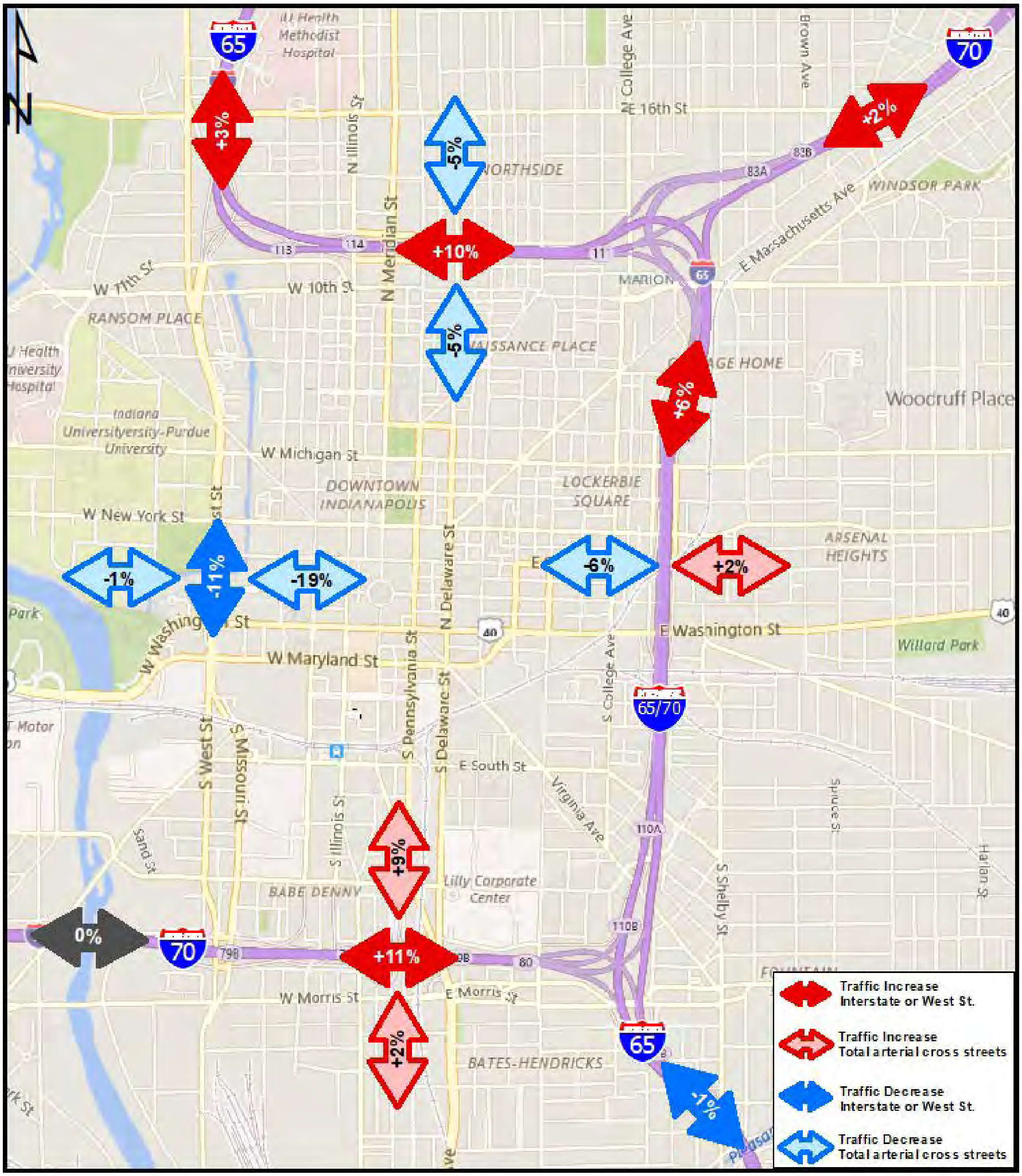


Figure 6-7: Concept 3 / 4 Traffic Volume Changes (PM peak)



6.4.3 Neighborhood Connectivity and Visual Continuity

The elevated nature of the current system provides both opportunities and constraints for connectivity and visual continuity. The north leg, built entirely on structure, allows open areas underneath the interstate for local streets, sidewalks, transit routes, and other local connections. The open nature underneath also provides visual continuity through the interstate at street level.

The east leg of the interstate, by contrast, is constructed on fill directly south of the North Split and in a depressed section further south, with only certain bridges/underpasses at specific locations allowing people and cars to pass over or through the interstate corridor. Because of this constraint, connections are more limited and directed. The fill sections also create a visual barrier that limits views through the interstate. Creating appropriate-width pedestrian facilities on all streets that pass under the interstate, widening the width of the openings, ensuring that all streets that currently pass under the interstate remain open, and concentrating efforts on design features that help users feel safer would improve connectivity.

6.4.4 Right-of-Way and Relocations

Concept 3 is estimated to impact one to five acres of new right-of-way, which is primarily commercial, industrial, railroad, utility, and vacant land uses. It is also estimated to require five to 10 relocations which are primarily commercial, industrial, and residential properties. Right-of-way impacts and relocations may be avoided or minimized during the design phase.

6.4.5 Historic Resources

Concept 3 may require the acquisition of strip right-of-way from the Old Northside Historic District north of I-65, and the St. Joseph Neighborhood Historic District south of I-65. It may also require the acquisition of right-of-way from the Holy Rosary-Danish Church Historic District and right-of-way from the Horace Mann Public School No. 13 northwest of the South Split interchange. Concept 3 would cross the Indianapolis Park and Boulevard System Historic District on the I-70 bridge over the White River. It may be possible to avoid direct impacts to historic properties during NEPA alternative development and design phases. Visual and noise effects are possible adjacent to historic properties and would be determined as part of the Section 106 consultation for this concept.

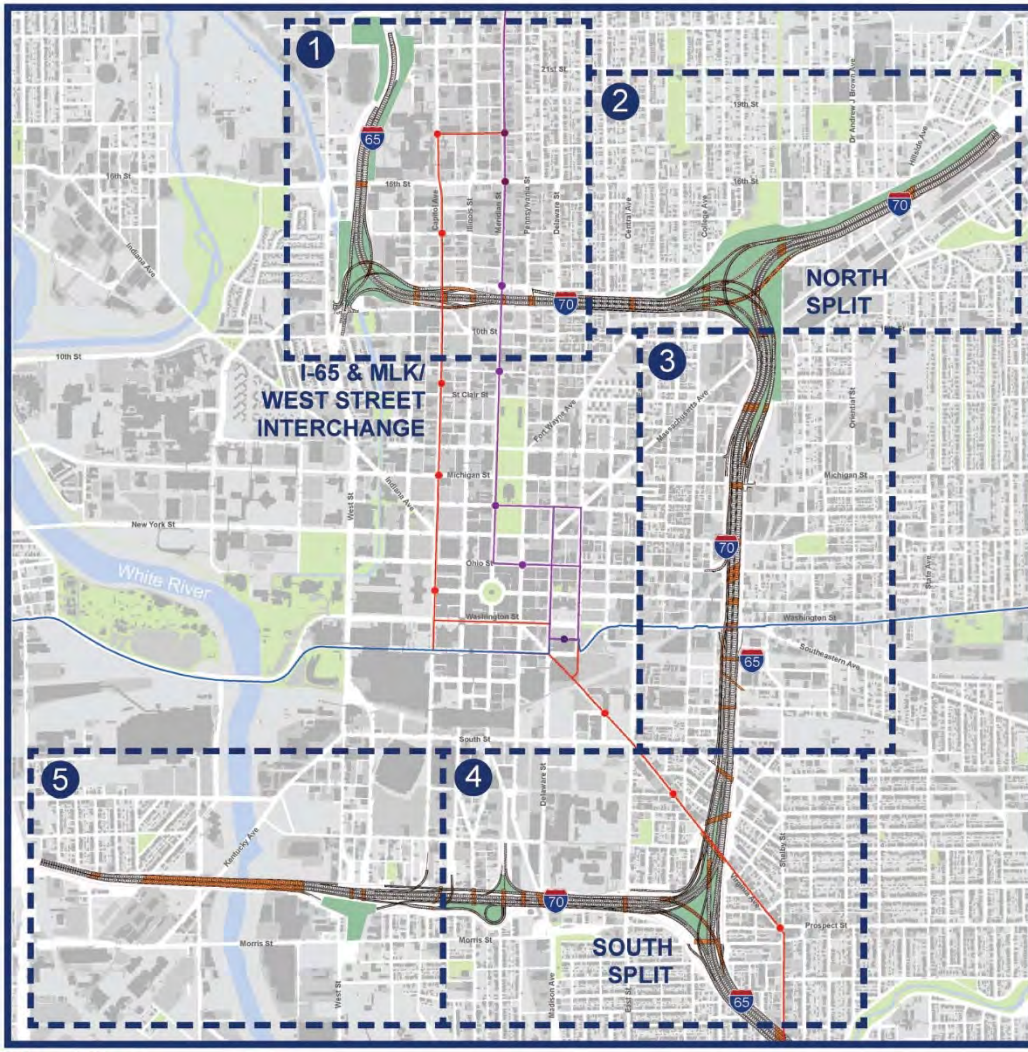
6.4.6 Parks, Recreational Areas, and Trails

Temporary impacts to the Monon Trail, Cultural Trail at 10^{th} Street and Virginia Avenue, Pogues Run Trail, and White River Wapahani Trail would occur during construction over or near the trails. Permanent impacts to the trails would not be anticipated.

6.4.7 Natural Resources

Concept 3 would impact trees within the existing right-of-way planted by local community groups and neighborhoods as well as volunteer trees that have grown naturally. Widening or reconstructing the I-70 White River bridge would potentially result in impacts to the White River due to causeways. Impacts to the White River floodway could also occur.

Concept 3 Map Sheets
Upgraded Interstates



CONCEPT 3: OVERVIEW

- Replace or rehabilitate roadway and bridges
- Realign ramps to reduce conflicts
- Add one lane each way on north and east leg
- Add collector-distributor roads on south leg

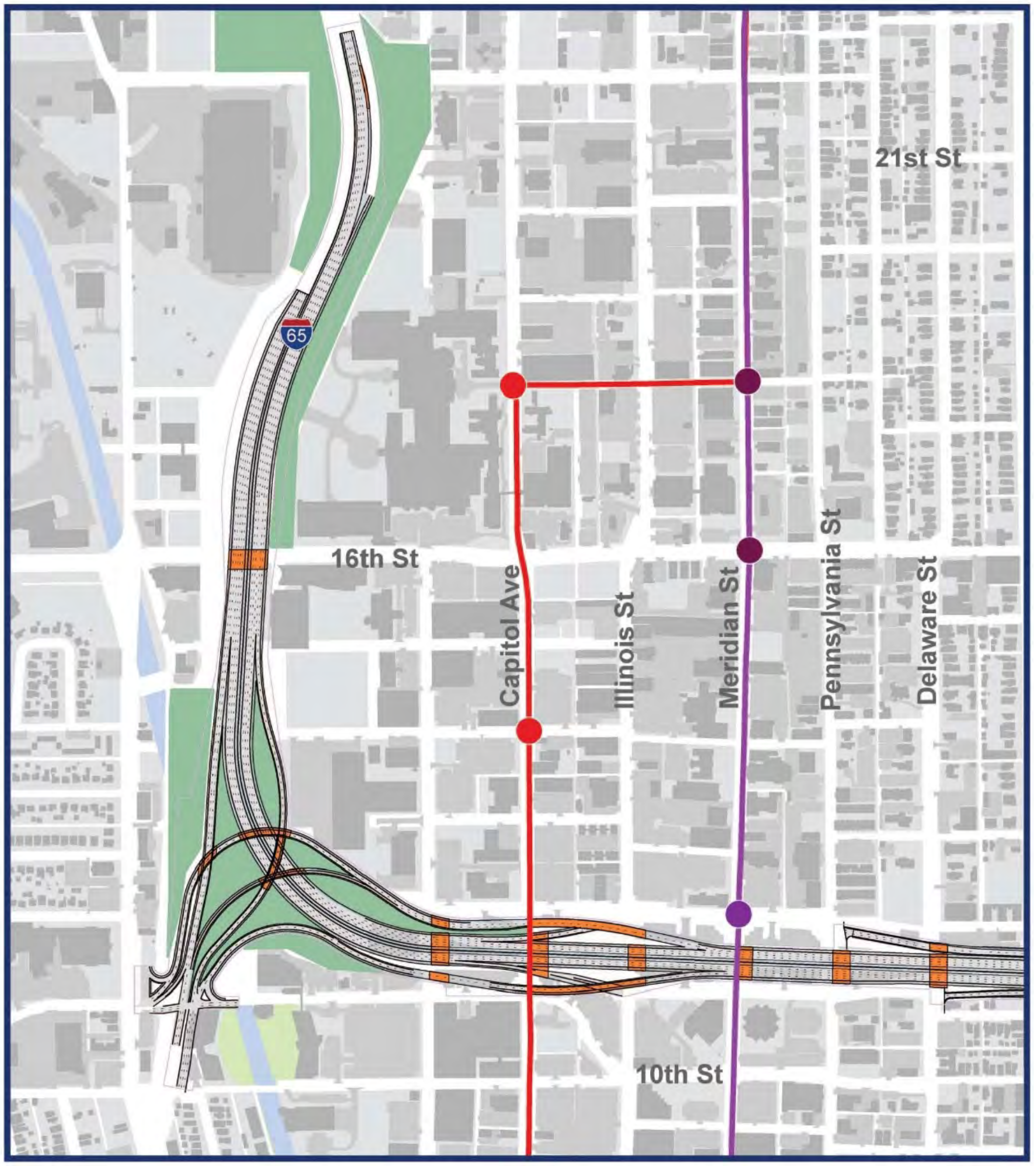
LEGEND

- Sheet
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Sheet Numbering

0 0.25 0.5 1 Miles

CONCEPT 3: UPGRADE EXISTING

NORTH SPLIT UPGRADES DRIVING PROGRESS



LEGEND

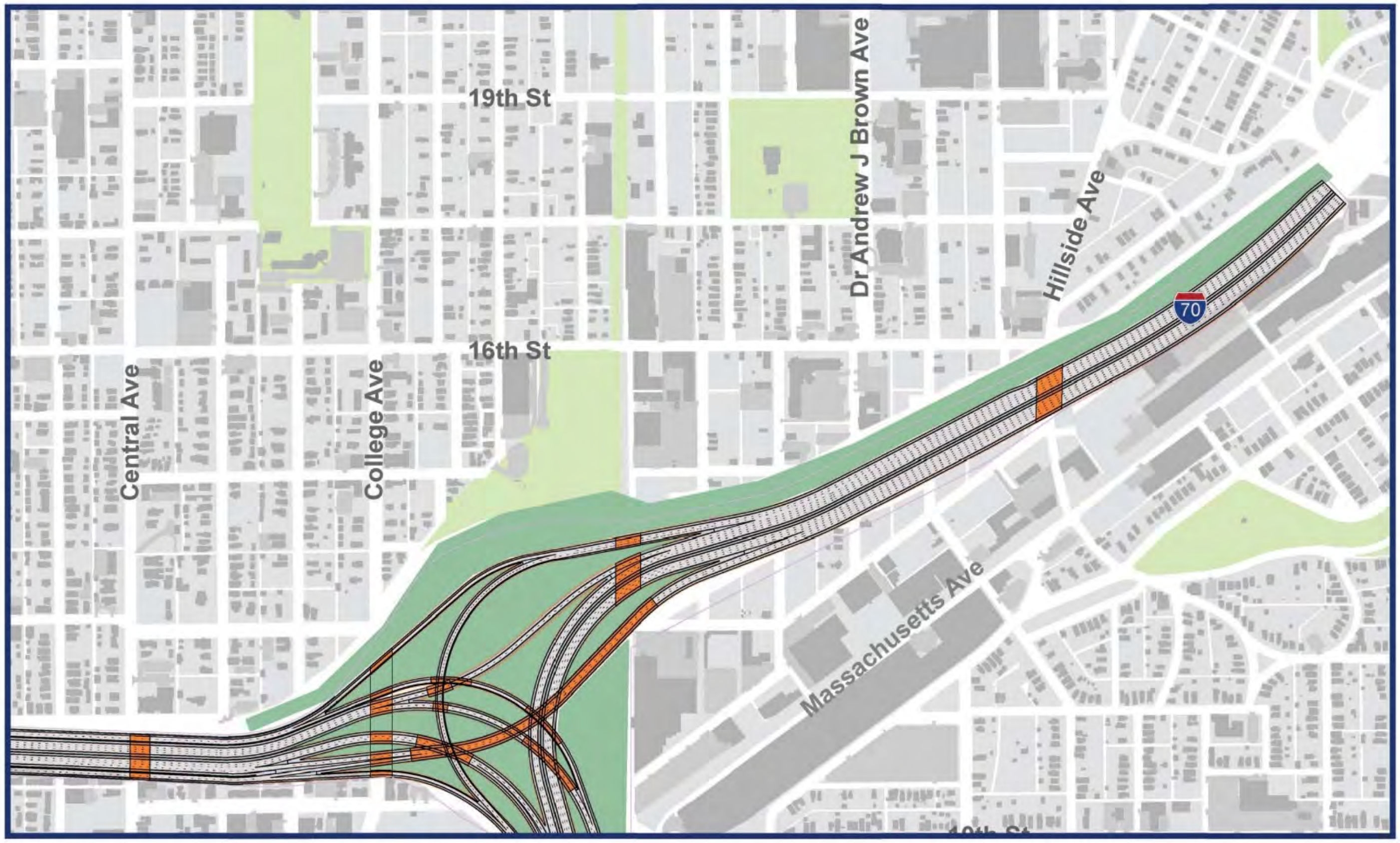
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way

0 0.1 0.2 Miles

Sheet 1

CONCEPT 3: UPGRADE EXISTING

NORTH SPLIT UPGRADES DRIVING PROGRESS



LEGEND

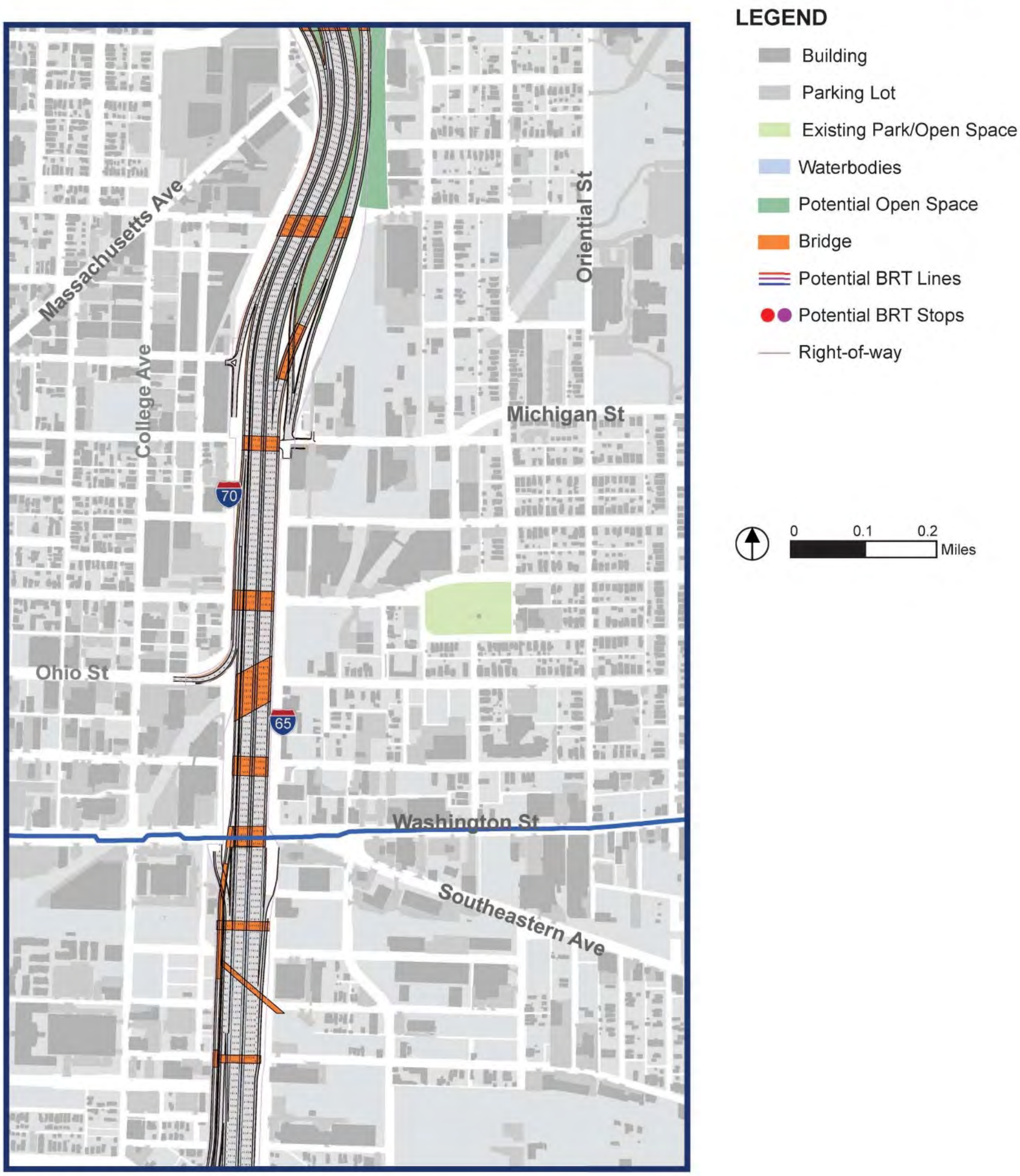
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way

0 0.1 0.2 Miles

Sheet 2

CONCEPT 3: UPGRADE EXISTING

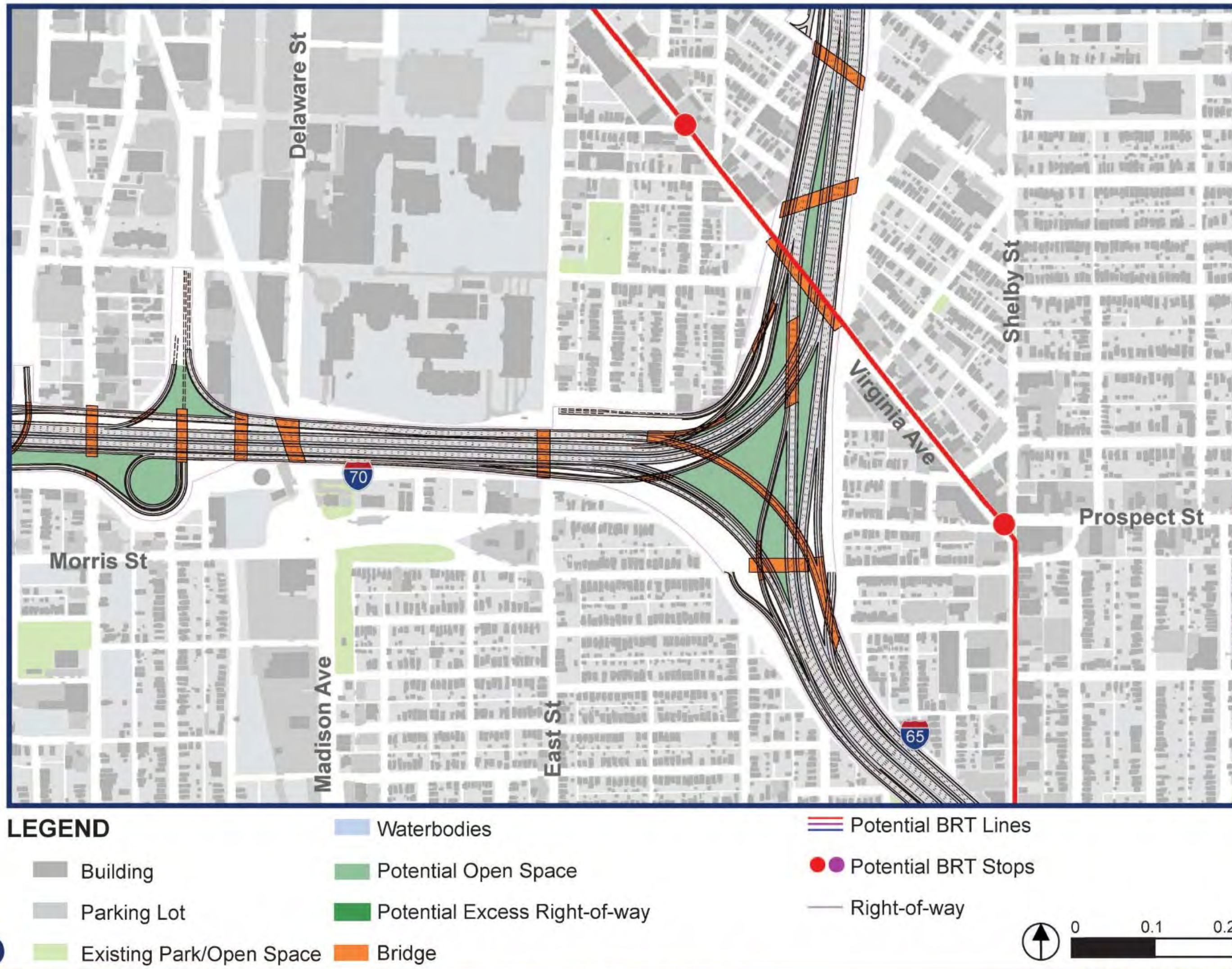
NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 3

CONCEPT 3: UPGRADE EXISTING

NORTH SPLIT UPGRADES DRIVING PROGRESS

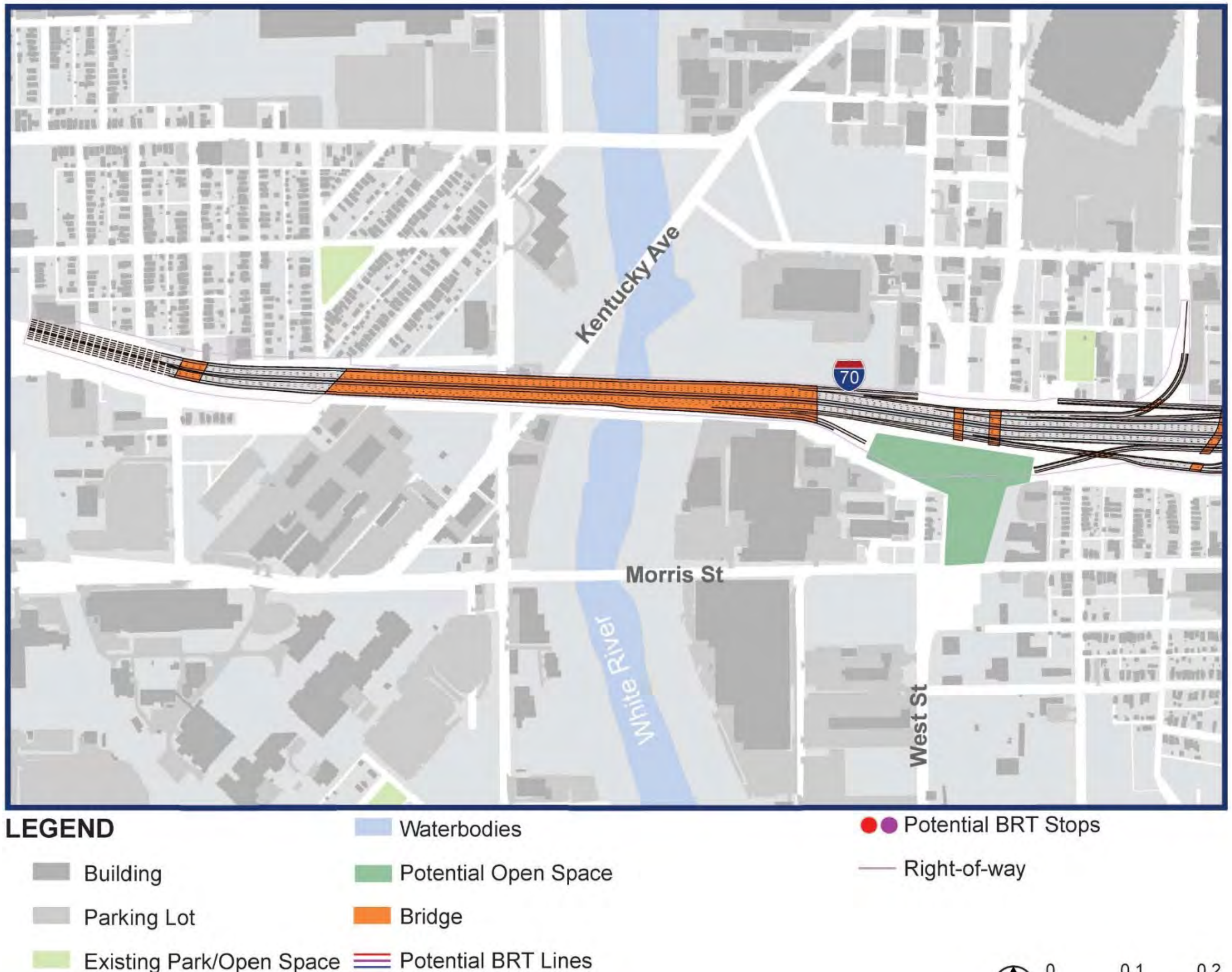


Sheet 4

CONCEPT 3: UPGRADE EXISTING

Sheet 5

CONCEPT 3: UPGRADE EXISTING



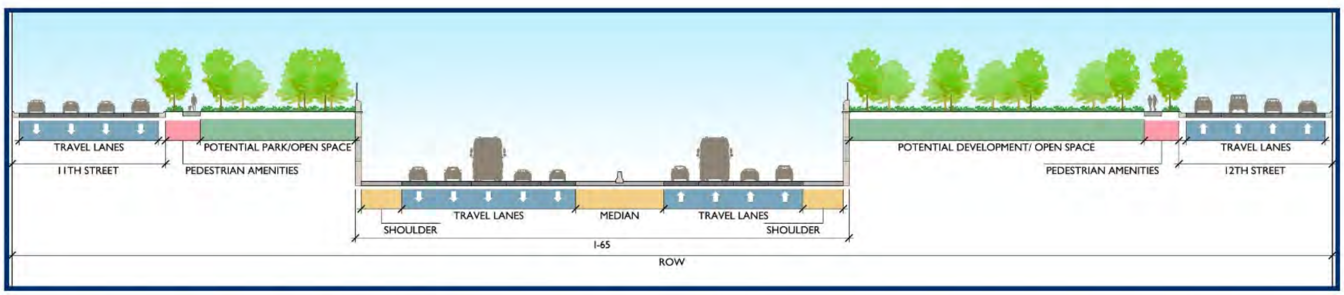
NORTH SPLIT UPGRADES DRIVING PROGRESS

7 CONCEPT 4: UPGRADED AND DEPRESSED INTERSTATES

This concept would lower the downtown interstate system below existing street levels where feasible. In terms of function, the roadway locations, C-D systems, and connections to local streets would be the same as Concept 3, but the interstate system would be below grade and all local street crossings and service intersections would be constructed over the interstate. System interchanges (Martin Luther King Boulevard/West Street, North Split, and South Split) would be depressed where feasible. Some ramp connections crossing the interstate within these system interchanges would be constructed over I-65 and I-70.

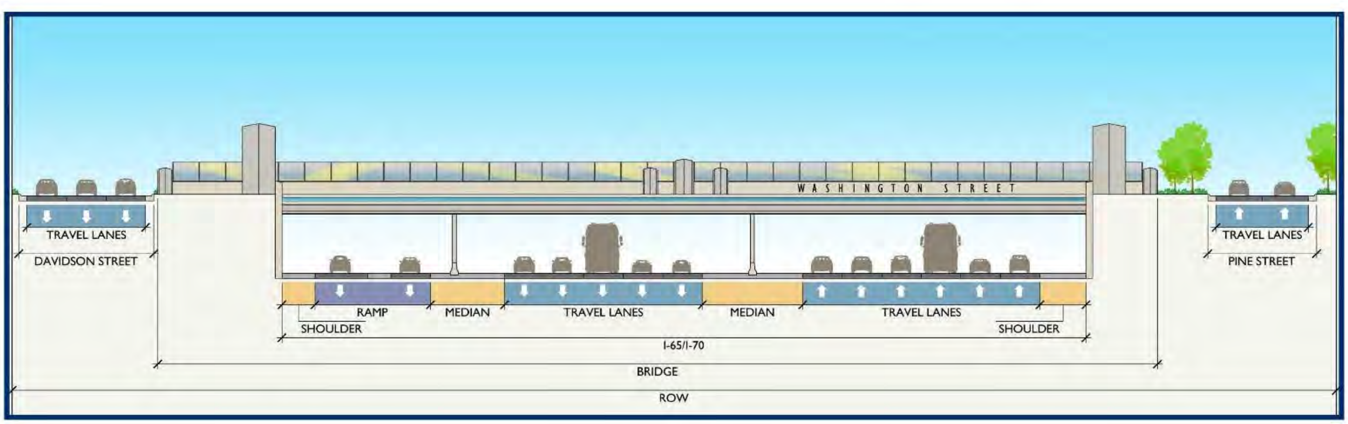
A typical section showing the depressed interstate highway is shown **Figure 7-1**. A typical local roadway bridge crossing is shown in **Figure 7-2**. Renderings of how Concept 4 might appear at Meridian Street and Illinois Street are provided in **Figure 7-3** and **Figure 7-4**.

Figure 7-1: Concept 4 Upgraded and Depressed Interstate



DEPRESSED DOWNTOWN INTERSTATES
I-65 near Meridian Street

Figure 7-2: Concept 4 Local Road Crossing



DEPRESSED DOWNTOWN INTERSTATES
I-65/I-70 at Washington Street Bridge

Figure 7-3: Rendering of Concept 4 Depressed Interstates at Meridian Street

View of I-65 at Meridian Street and Pennsylvania Street Looking South

7.1 Concept 4 Configuration

A description of the assumed representative layout for Concept 4 used in this analysis is presented below. The description includes references to five map sheets provided at the end of this chapter. The map sheet section begins with a key map to show the location of each map sheet.

North Leg

As shown in Sheets 1 and 2 of the map set at the end of this chapter, cross streets would pass over the depressed interstate at street level between the Martin Luther King Boulevard/West Street interchange and the North Split interchange. The layout of the north leg of the depressed downtown interstate system would be the same as Concept 3, described in **Section 6.1**. The depressed interstate would begin and end as described below:

Figure 7-4: Rendering of Concept 4 Depressed Interstates at Illinois Street

View of I-65 at Illinois Street Looking East

- I-65 from the north would start lowering after 16th Street. I-65 would remain depressed on the north leg and connections to local streets would be constructed at street level.
- C-D roads would be located parallel to mainline interstate lanes and would be used for ramp connections.
- I-70, coming from the east, would start lowering west of the Rural/Keystone interchange. The North Split interchange would remain depressed except for some ramp connections that would go over mainline interstate lanes.

East Leg

The east leg of the downtown interstate system with Concept 4 is shown in Sheets 3 and 4 at the end of this chapter. The basic layout of the east leg of the depressed downtown interstate system would be the same as Concept 3, as described in **Section 6.1**. The depressed interstate would begin and end as described below:

- The southern portion of I-65/I-70 between the North Split and South Split interchanges is already depressed. The northern section of this corridor, starting approximately north of Washington Street would be lowered and remain under the local streets to the north. The C-D systems would be lowered and connections to local streets would be constructed at street level.
- I-65, coming from the south, would start lowering just past Pleasant Run Creek to the South Split. The South Split interchange would remain depressed except for some ramp connections that would go over the mainline interstate lanes.

<u>*South Leg*</u>

The south leg of the downtown interstate system with Concept 4 is shown in Sheets 4 and 5 at the end of this chapter. The basic layout of Concept 4 would be the same as Concept 3, as described in **Section 6.1**. The depressed interstate would begin and end as described below:

- I-70, coming from the west, would start lowering just after the bridge over the White River and would remain depressed to the South Split. The C-D systems would be lowered and connections to local streets would be constructed at street level.

7.2 Concept 4 Performance

As described above, Concept 4 has the same geometric layout as Concept 3, with the same number of lanes, same interchanges and ramps, and same connections with the same local roadway network. Concept 4 differs from Concept 3 in the assumed elevation of the mainline of I-65 and I-70, but this would not materially affect operations. As a result, no separate modeling or traffic evaluations were conducted for Concept 4. All values and conclusions would be the same as Concept 3, as provided in **Section 6.2**.

7.3 Concept 4 Estimated Cost

The basis for cost estimating for system-level concepts is provided in **Section 3.2**. Estimated construction cost is provided in a range because of the level of uncertainty at this conceptual stage. For the purposes of cost estimating, Concept 4 is generally described as follows:

Concept 4 entails approximately seven miles of interstate reconstruction. Roadway removal, grading, and paving quantities would be similar to Concept 3, but structural construction would be less. Lowering the elevation of the interstates to cross under the existing surface streets in Concept 4 would result in large volumes of excavation, but the costs associated with overpass structures would be less.

Following are primary factors that could cause the cost of Concept 4 to be higher or lower within a range:

- Management of ground water during construction would be a cost driver. The volume of water to manage would dictate the cost associated with this during construction.
- Support of excavation, dependent upon analysis of soil conditions along with structural engineering and design, as well as the temporary systems used to prevent collapse of the excavation during construction would significantly impact the cost.
- Construction phasing would affect cost. The amount of space that can be provided to the contractor during a phase would drive the cost up or down. Allowing the contractor access to lanes in both directions is one way to reduce cost.

Based on the above assumptions and primary factors, a range of estimated cost and an estimate of yearly O&M cost is presented for Concept 4, as follows:

Estimated Project Cost = $1.5 billion to $2.4 billion

Estimated Annual O&M Cost = $6 million

The actual cost of Concept 4 could exceed the maximum value in the above range based on conditions encountered in future engineering for underground systems. A more reliable estimate of feasibility and cost would require detailed site-specific evaluation of groundwater levels, geotechnical conditions, and type and location of major utilities. These factors could vary by location throughout the inner loop, causing depressed roadways to be more expensive at some locations than others.

7.4 Concept 4 Estimated Impacts

Impacts are estimated below for traffic on neighborhood and downtown streets, construction impacts, neighborhood connectivity, right-of-way and relocations, historic resources, parks and recreation areas, and natural resources.

7.4.1 Local Street and Neighborhood Traffic Impacts

As noted in **Section 7.1**, Concept 4 has the same geometric layout as Concept 3, and no separate modeling or traffic evaluation was conducted for Concept 4. All values and conclusions would be the same as Concept 3, as provided in **Section 6.4.1**.

7.4.2 Construction and Maintenance of Traffic Impacts

The estimated construction duration for Concept 4 is six years. Phasing would need to occur half at a time on mainline I-70 and I-65 since existing and proposed lanes are within the same footprint, but at much different elevations, requiring significant excavation with more waste material and significant relocation of utilities and drainage crossings. This construction would impact local access and entrance at ramps for the specific direction under construction, requiring longer detour routes and more impacts to local street traffic.

This construction would also require incremental closures and construction of the local cross streets to contain impacts. Local streets would stay at or near existing grade as they cross the depressed interstate on new bridges. A high water table and existing soils comprised of sand and gravel deposits would require pumping and dewatering during construction, tall temporary retaining walls to construct half at a time, installation of proposed retaining walls with deep foundations, and permanent stormwater control systems to prevent flooding and to keep the interstate dry, especially during peak storm events.

Maintenance of traffic for the three major interchanges would be similar to Concept 3, but with the addition of several cut and cover structures.

7.4.3 Neighborhood Connectivity and Visual Continuity

The newly constructed bridges that cross the interstate corridor at street level would be key in providing opportunities for physical connections and visual continuity in this concept. They would be the dominant physical feature to provide connectivity and visual linkages. To best promote continuity, bridges designated for key streets should be designed to accommodate sufficient travel lanes with bike facilities, surface transit lines, and appropriate-width pedestrian connections so pedestrians feel safe using the bridge deck. These connections also allow for neighborhood-specific design enhancements to help reinforce the visual continuity across the interstate. Of all the concepts in this analysis, the depressed interstate would best accommodate unobstructed views across the corridor.

In this concept, special attention would need to be focused on creating safe intersections where ramps exit or enter the interstate. The intersections would need to use best design practices for pedestrian intersection treatments and the inclusion of multi-modal street-level facilities.

This concept could also introduce additional green space which could provide opportunities to minimize the impact of the interstate, reduce its width, and provide for better connectivity of the two sides of the interstate.

7.4.4 Right-of-Way and Relocations

Concept 4 is estimated to impact five to 10 acres of new right-of-way, which is primarily commercial, industrial, railroad, utility, and vacant land uses. It is estimated to require 10 to 15 relocations which are primarily commercial and residential properties. Right-of-way impacts and relocations may be avoided or minimized during the NEPA process and the design phase.

7.4.5 Historic Resources

Concept 4 would require the acquisition of right-of-way from the Old Northside Historic District north of I-65, and the St. Joseph Neighborhood Historic District south of I-65. A small portion of right-of-way may be required from the southeast corner of the Benjamin Harrison Home/Presidential Site National Historic Landmark property and individually listed Wyndham property. Concept 4 may require the acquisition of strip right-of-way from the Lockerbie Square Historic District west of I-65 and I-70. It may require right-of-way from the Holy Rosary-Danish Church Historic District and right-of-way from the Horace Mann Public School No. 13 northwest of the South Split interchange. Concept 4 would cross the Indianapolis Park and Boulevard System Historic District on the I-70 Bridge over the White River. It may be possible to avoid direct impacts to historic properties during the NEPA process and the design phase. Visual and noise effects are possible to adjacent historic properties and would be determined as part of the Section 106 consultation for this concept.

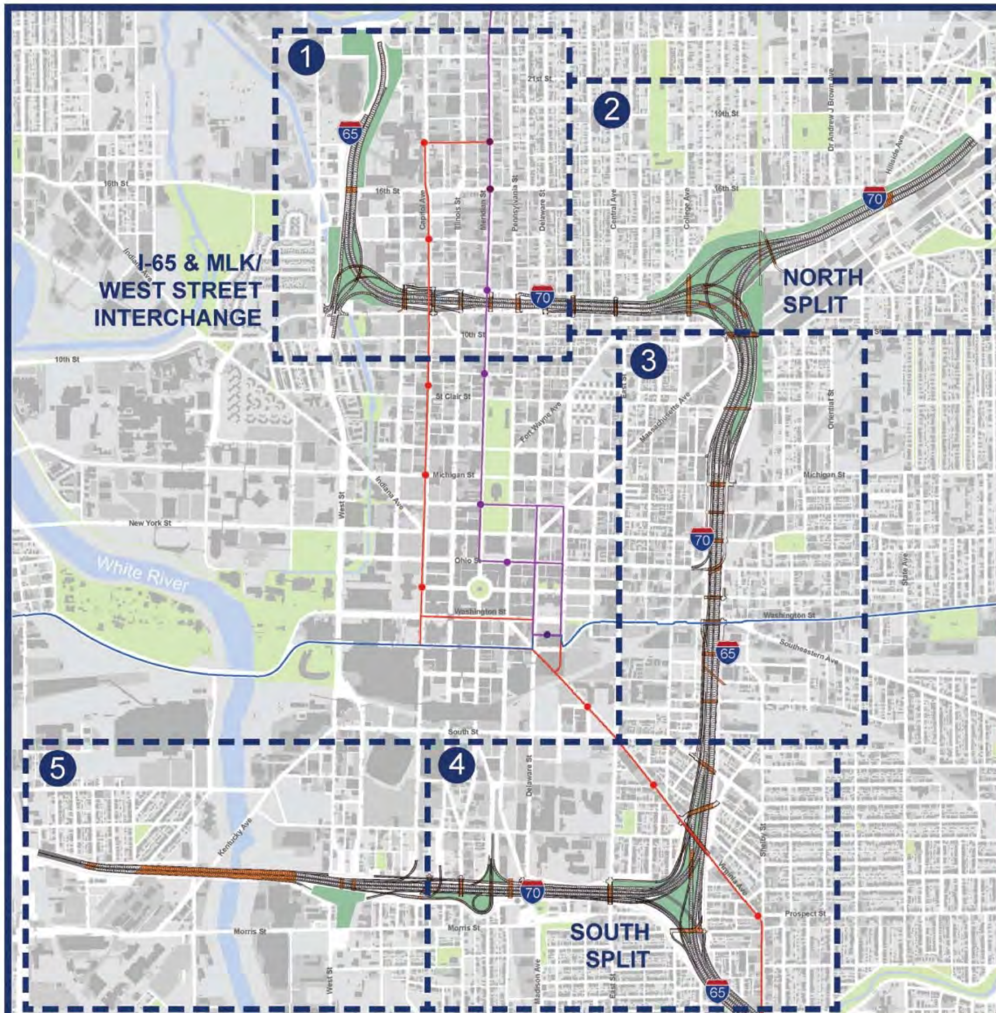
7.4.6 Parks, Recreational Areas, and Trails

Impacts to the Monon Trail, Cultural Trail at 10th Street and Virginia Avenue, Pogues Run Trail, and White River Wapahani Trail would occur during construction near the trails. The North Split interchange would be lowered and the Monon Trail would be constructed partially on a bridge to cross over portions of the interstate. There could be minor impacts to the Frank and Judy O'Bannon Soccer Park and Old Northside Trail (in the soccer park) to construct the Monon Trail bridge. The Cultural Trail and 10th Street at this location would cross over the interstates on a bridge. Permanent impacts to the connectivity of the trails are not anticipated.

7.4.7 Natural Resources

Concept 4 would impact trees within the existing right-of-way planted by local community groups and neighborhoods as well as volunteer trees that have grown naturally. Widening or reconstructing the I-70 White River bridge would potentially result in impacts to the White River due to causeways. Impacts to the White River floodway could also occur. Pogues Run flows through an underground structure, under I-65 and I-70 and much of Indianapolis, starting just north of New York Street and east of the interstates. Because Concept 4 includes depressing the interstates, the structure carrying Pogues Run under the interstates may require reconstruction or replacement.

Concept 4 Map Sheets
Upgraded and Depressed Interstates



CONCEPT 4: OVERVIEW

- Lower the interstate system below street level
- Replace or rehabilitate roadway and bridges
- Realign ramps to reduce conflicts
- Add one lane each way on north and east leg
- Add collector-distributor roads on south leg

LEGEND

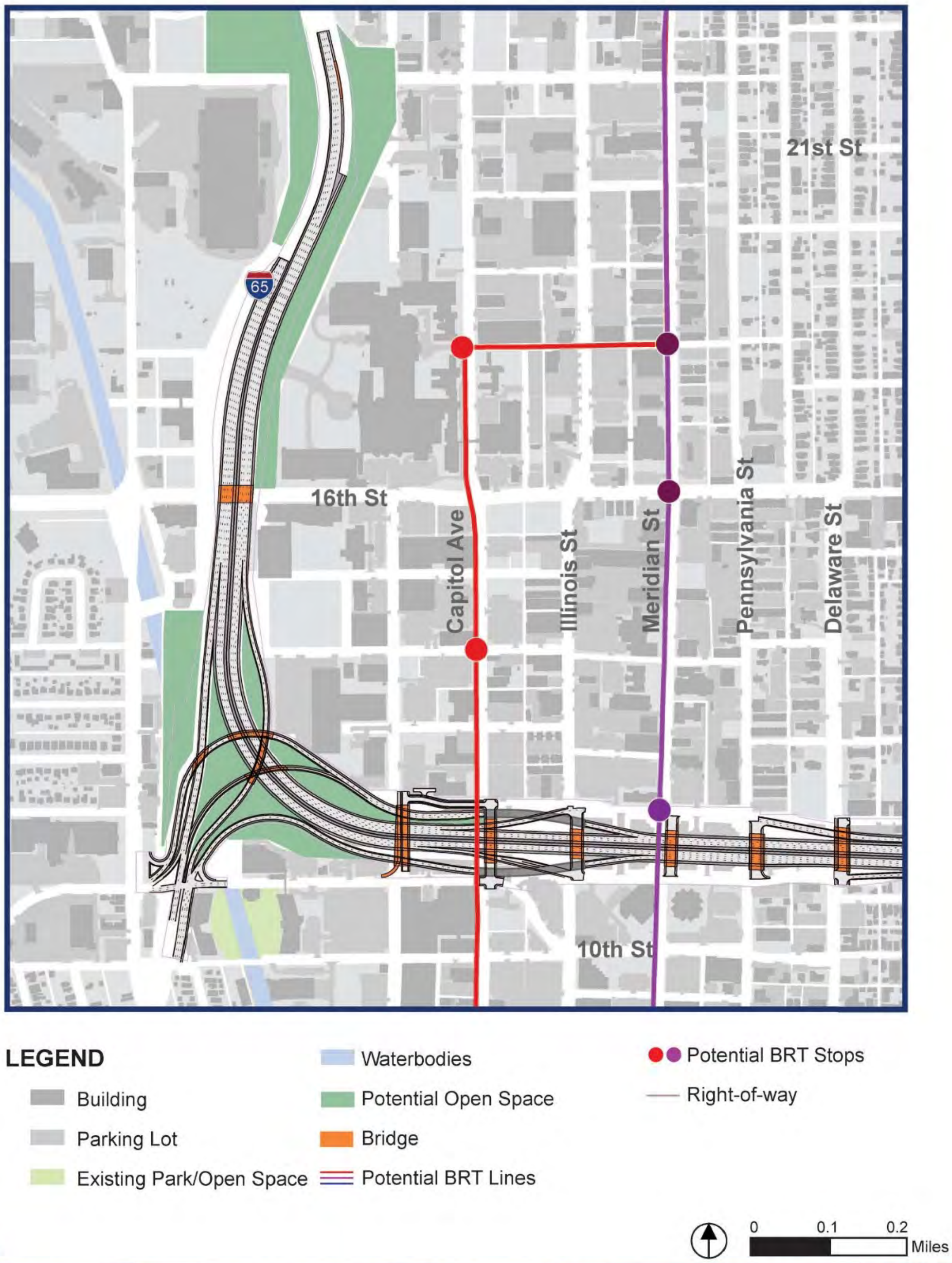
- Sheet
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Sheet Numbering

0 0.25 0.5 1 Miles

Key Map

CONCEPT 4: DEPRESSED INTERSTATE

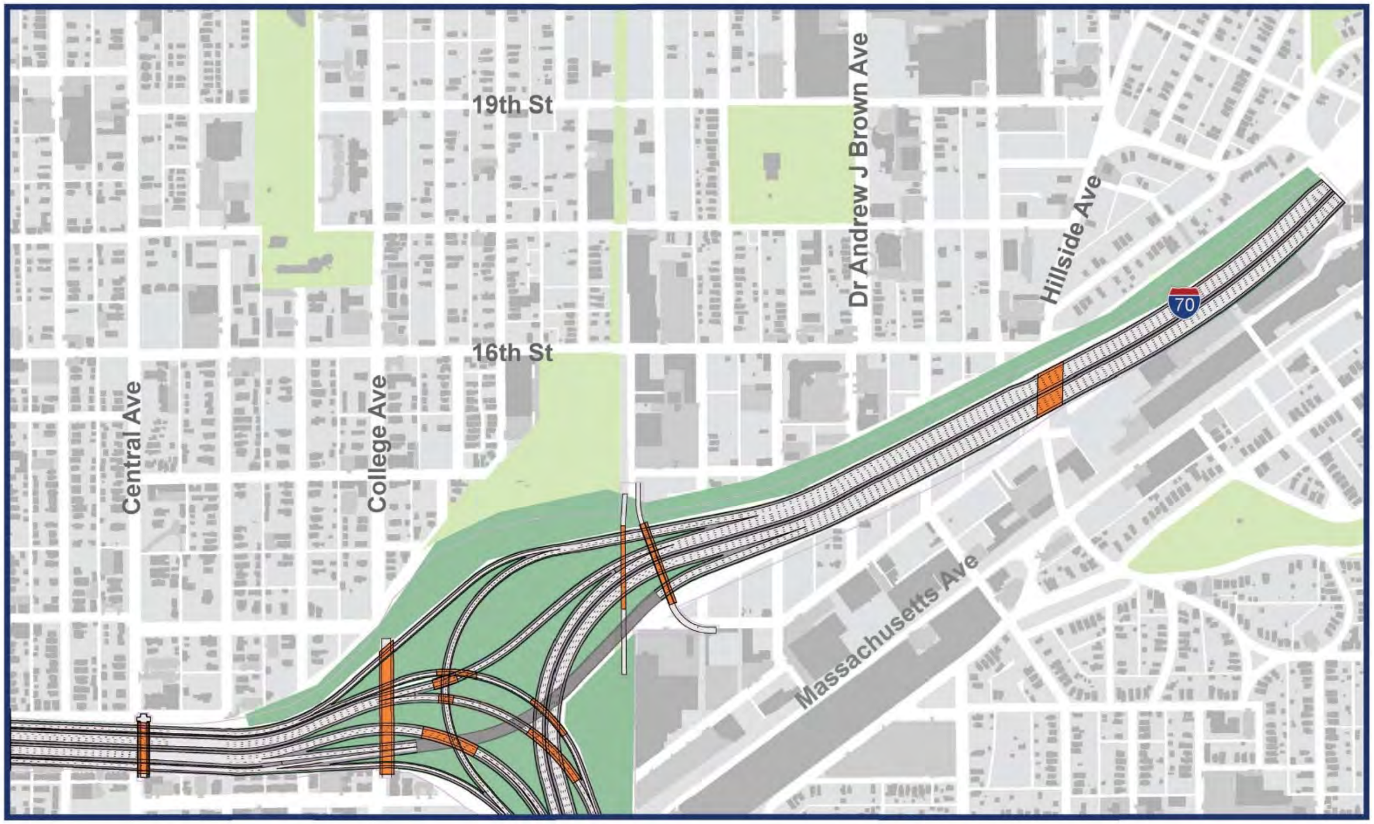
NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 1

CONCEPT 4: DEPRESSED INTERSTATE

NORTH SPLIT UPGRADES DRIVING PROGRESS



LEGEND

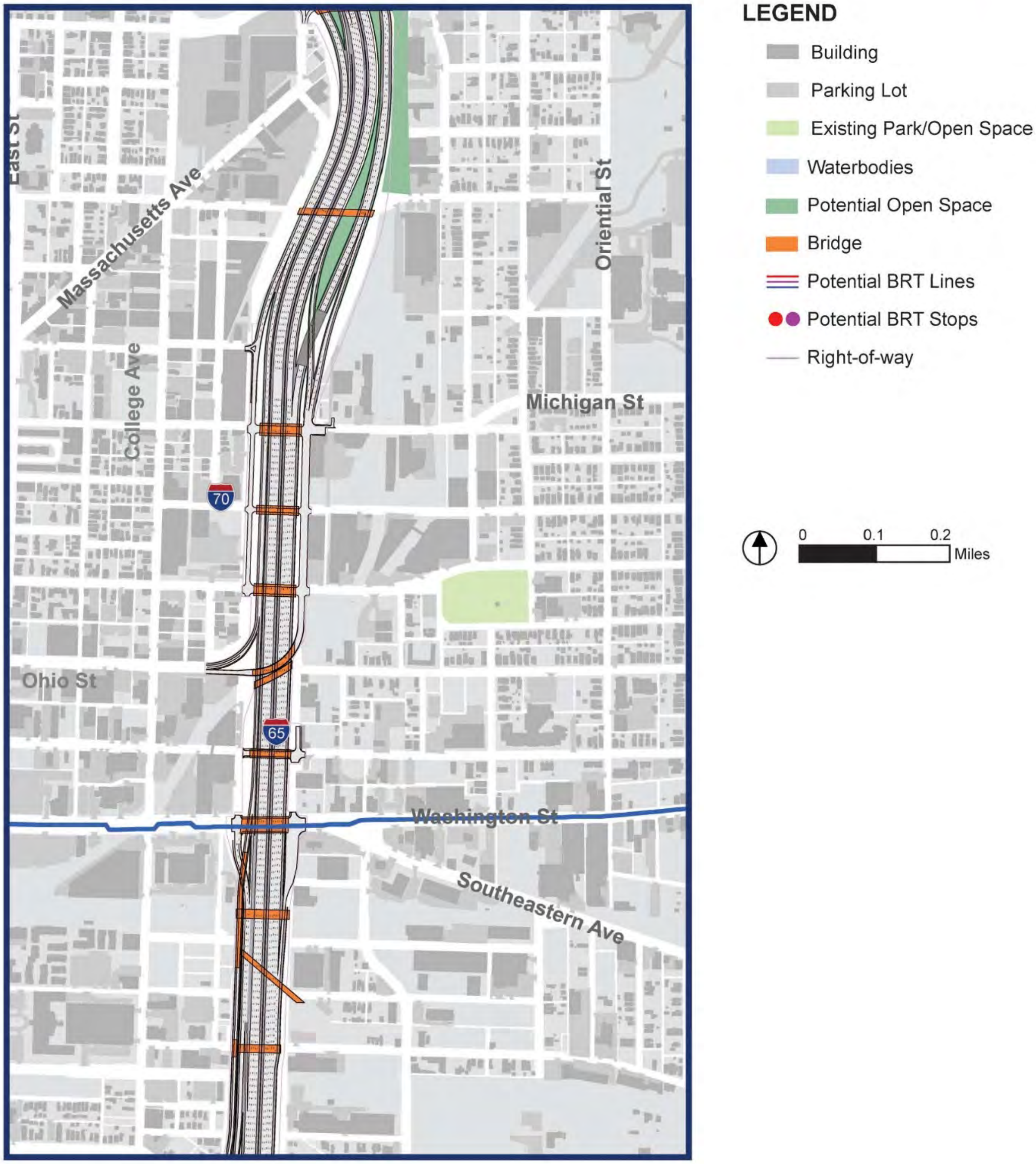
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way

0 0.1 0.2 Miles

Sheet 2

CONCEPT 4: DEPRESSED INTERSTATE

NORTH SPLIT UPGRADES DRIVING PROGRESS



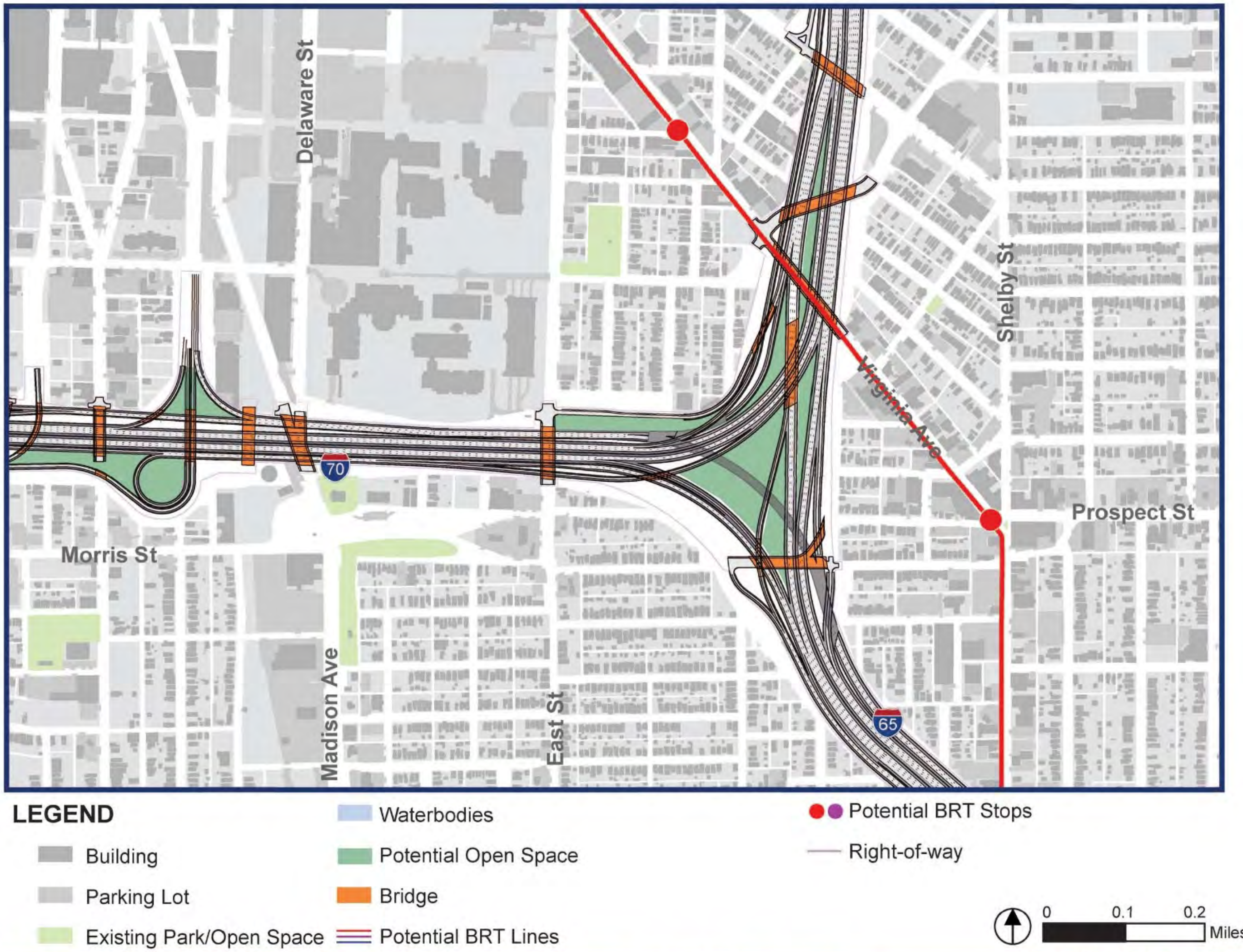
Sheet 3

CONCEPT 4: DEPRESSED INTERSTATE

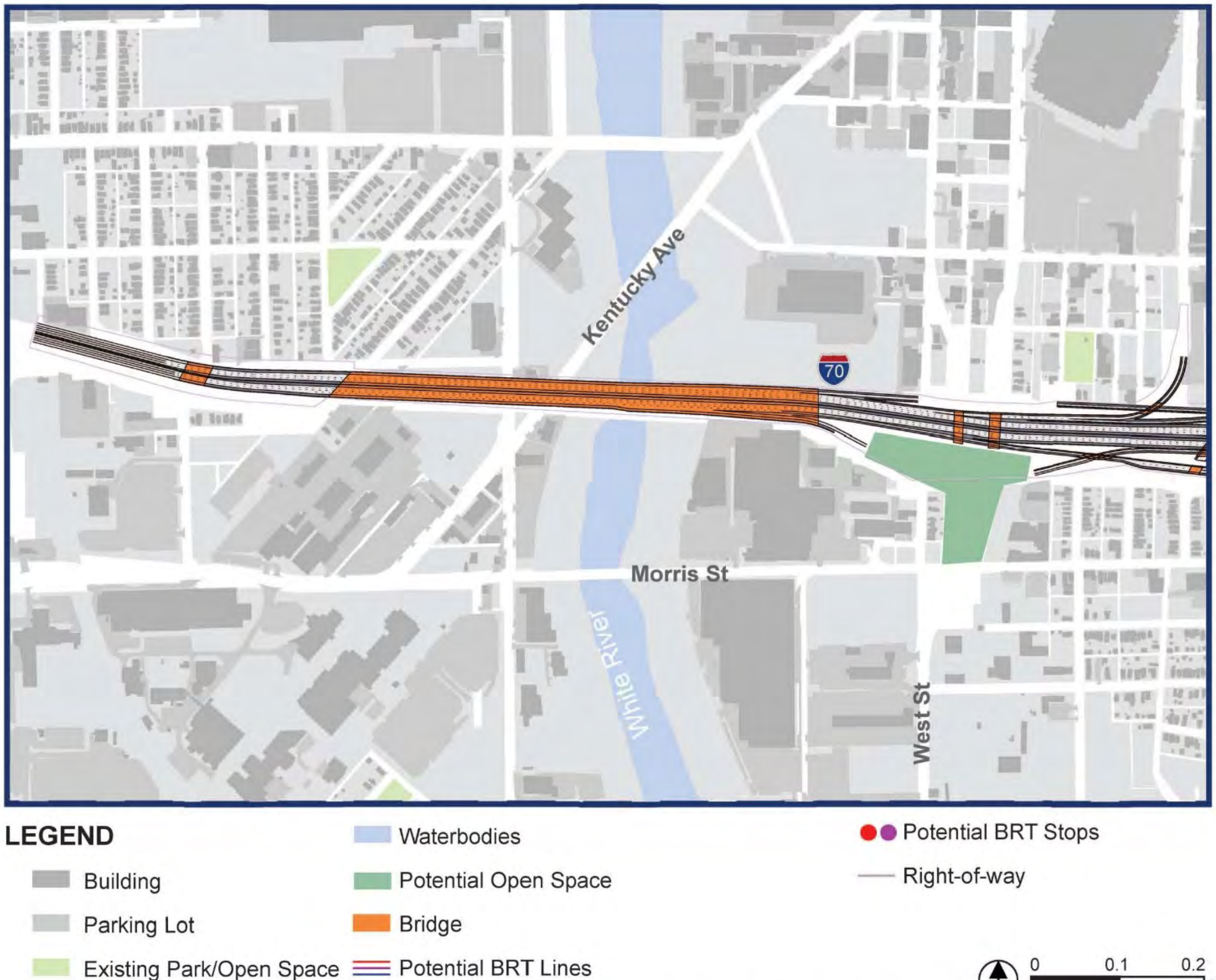
NORTH SPLIT UPGRADES DRIVING PROGRESS

Sheet 4

CONCEPT 4: DEPRESSED INTERSTATE



NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 5

CONCEPT 4: DEPRESSED INTERSTATE

NORTH SPLIT UPGRADES DRIVING PROGRESS

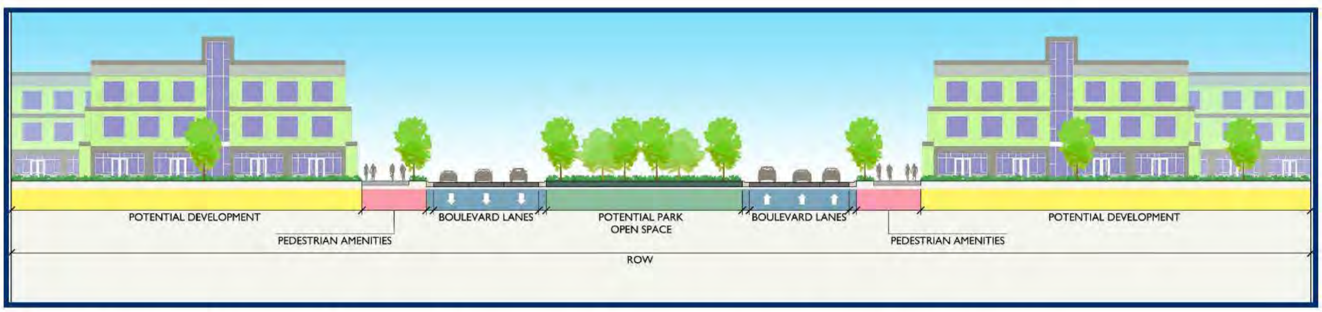
8 CONCEPT 5: AT-GRADE BOULEVARDS TO REPLACE EXISTING INTERSTATES

With this concept, all three legs of the existing downtown interstate system would be removed and replaced with at-grade boulevards. The boulevards would be low-speed, divided roadways with signalized intersections, a landscaped median in the center, and landscaped buffers on both sides. Unlike the existing interstates, where pedestrian and bicycle traffic is prohibited, use of these modes along and across the boulevards would be encouraged, with facilities incorporated into the design.

This concept would require decommissioning downtown interstates as described in **Chapter 2**. Presumably, I-65 and I-70 would be signed to follow I-465 around Indianapolis in a similar manner to I-74 and I-69 (when completed to the south). The existing portions of I-65 and I-70 outside I-465 are assumed to be physically unchanged in this analysis, although speeds are lowered in the travel demand model on the sections approaching downtown to transition operations from freeway to boulevard.

As with all concepts being reviewed in this analysis, the boulevard layouts are assumed to be representative configurations rather than final designs. Refinements would be made in a more extended study based on the results of initial testing, public input, and many other factors related to localized constraints and opportunities. A traditional boulevard section could be provided with two one-way road sections separated by a median, as shown in **Figure 8-1**.

Figure 8-1: Concept 5 At-grade Boulevard (Tight Cross Section)



REPLACE INTERSTATE WITH AT-GRADE BOULEVARDS (Split Boulevard with Development Outside)
Boulevard between Meridian Street and Pennsylvania Street

As an option, the two one-way roadways of the boulevard could be widely separated with opportunities for park land or development in between. A cross section for this option is shown in **Figure 8-2**. Either option would perform in a similar way in terms of traffic operations and these options are represented the same way in the travel demand model. The final configurations could look something like the preliminary renderings in **Figure 8-3** and **Figure 8-4**.

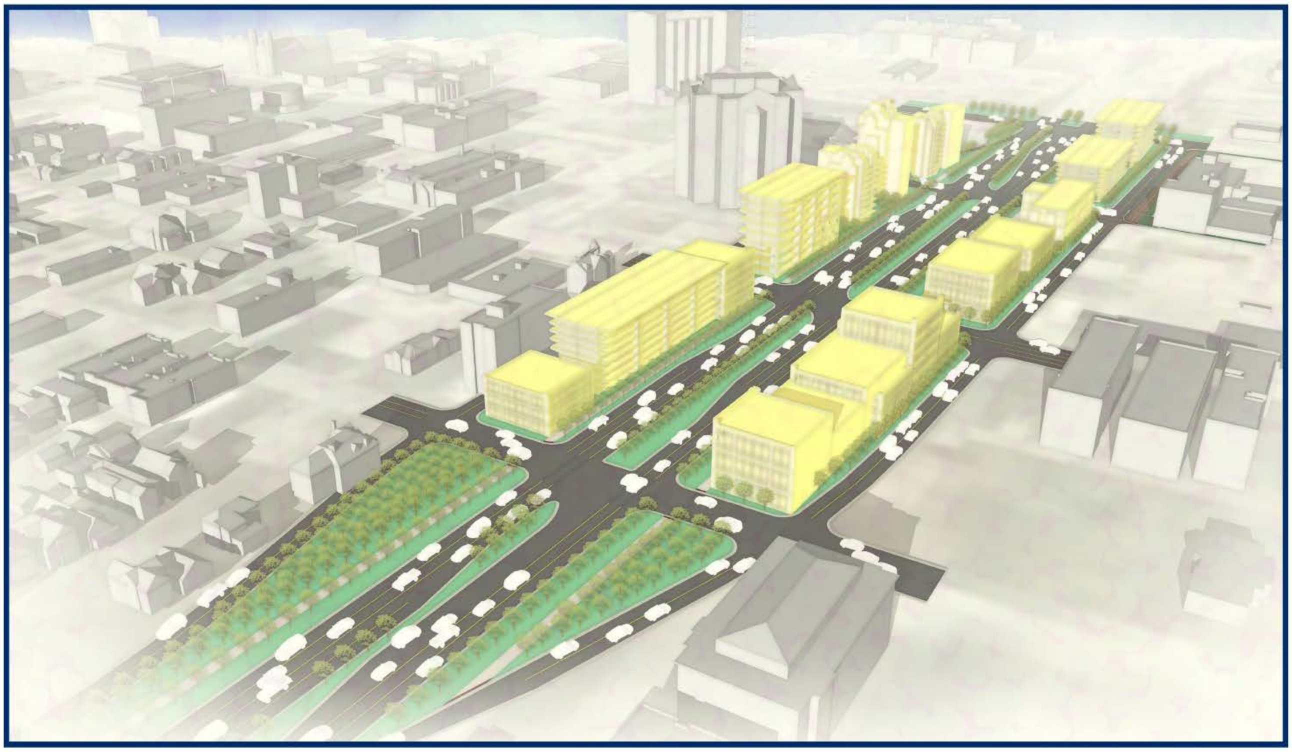
Figure 8-2: Concept 5 At-grade Boulevard (Spread Cross Section)

REPLACE INTERSTATE WITH AT-GRADE BOULEVARDS (Split Boulevard with Development in Center)
Boulevard between Meridian Street and Pennsylvania Street

Figure 8-3: Rendering of Concept 5 Boulevard at Meridian and Pennsylvania Streets

View of new Boulevard at Meridian Street and Pennsylvania Street Looking South

Figure 8-4: Rendering of Concept 5 Boulevard at Pennsylvania Street



View of new Boulevard at Pennsylvania Street Looking West

8.1 Concept 5 Configuration

Assumptions related to the boulevards in Concept 5 vary by location, since opportunities and constraints differ on the existing interstate highway alignments throughout the downtown area. The assumed layout of the downtown boulevards used for travel demand modeling, cost estimating, and impact review is shown in a series of maps provided at the end of this chapter.

Two key assumptions are included in Concept 5 to balance the objectives of providing a neighborhood scale facility while serving regional travel demand. The boulevard is assumed to have three lanes in each direction, consistent with the objective to provide a neighborhood type of street. Second, free-flowing interchanges are assumed at each quadrant of the inner loop so that the effectiveness of the boulevards can be analyzed directly. The use of roundabouts in lieu of interchanges with Concept 5 is analyzed in **Section 8.2.1**

Common assumptions for all boulevards in Concept 5 are as follows:

- All boulevards would be three lanes in each direction westbound on the north leg between the North Split and Pennsylvania Street, where four lanes would be provided for efficient connections. Boulevards with four lanes each way were not considered due to the pedestrian barrier they would create.
- Interchange configurations similar to existing conditions are assumed at Martin Luther King Boulevard/West Street, the North Split, and the South Split so that modeling results relate to the boulevard, rather than lower capacity intersections, traffic signals, or roundabouts.

- Boulevard intersections would be controlled by traffic signals. Traffic signal timing would be optimized on the boulevard. Optimizing cross street traffic at the same time to provide signal coordination among intersections outside the corridor (such as through downtown) would require extensive analysis and probable hardware changes to the signals that are not considered in this analysis.
- Dual left turn lanes would be provided from the boulevard at locations where there are two or more receiving lanes on the crossing street. Single left turn lanes would be provided if there is only one receiving lane on the minor street.
- Two-way minor street intersections with the boulevards would not have left turn lanes. Left turns would be allowed from minor streets that “T” into the Boulevard. The intent is to avoid limitations to boulevard capacity where the purpose of the minor streets would be to deliver traffic to and from downtown.
- Existing parallel streets to the boulevard would be reduced to no more than two through lanes to minimize the impact to adjacent properties (i.e. 11th and 12th Streets on the north leg; Pine Street and Davidson Street on the east leg).

Following is a description of the assumed representative layout for Concept 5 used in this analysis. The description includes references to four map sheets provided at the end of this chapter. The map sheet section begins with a key map to show the location of each map sheet.

North Leg

The north leg of Concept 5 from the Martin Luther King Boulevard/West Street interchange to the North Split interchange is shown in Sheets 1 and 2 at the end of the chapter. It would include the following major changes:

- Portions of the interchange would be removed and replaced with semi-directional ramps to provide improved traffic delivery to the boulevard sections. The speed limit at these ramps would be lowered since they feed traffic directly to the local road network with signalized intersections.
- I-65 from the north would transition to a boulevard section at the Martin Luther King Boulevard/West Street interchange.
- I-70 from the east would transition to a boulevard section after passing through the North Split interchange.
- Frontage one-lane roads are not provided for purposes of modeling as they provide no traffic movement purpose and could potentially create operational challenges due to the proximity to the minor street/boulevard intersections. These parallel frontage roads could be installed for property access and parking.

East Leg

The east leg of Concept 5, from the North Split interchange to the South Split interchange, is shown in Sheets 2, 3, and 4 at the end of the chapter. Assumptions related to this section of six-lane boulevard include the following:

- The crossing at Ohio Street would be grade separated with an overpass due to the proximity of the railroad crossing.
- Since Calvary Street and Virginia Street are close to each other, Calvary Street would bridge over the boulevard for improved operations.
- I-65 from the south would transition to a boulevard section just north of the South Split interchange.

South Leg

The south leg of Concept 5, from the South Split interchange to West Street, is shown in Sheet 4 at the end of this chapter. Assumptions related to this section of six-lane boulevard include the following:

- Access to the boulevard would be provided at all locations that have I-70 interchange access today.
- I-70 from the west would transition to a boulevard section just east of the bridge over the White River, with boulevard intersections to serve the West Street/Missouri Street one-way pair.

8.2 Concept 5 Performance

As described in **Section 3.1**, a microsimulation model derived from the IMPO regional travel demand model is used to measure the performance of the system-level concepts within a traffic study area in the vicinity of the downtown.

Table 8-1 shows the expected changes in total VMT and VHT in the morning peak with Concept 5. Total VMT in the subarea traffic network would be about 4% less with the boulevards than with interstates, indicating that on the average, travel paths would be more direct. Total VHT, however, would be much higher, with a 50% increase in total time spent traveling in the traffic study area. Total delay would increase by about 40% in the area.

The total time for travel by all users in the traffic study area would be 50% longer in the morning peak hour due to the increase in congestion as traffic diverts from high-capacity interstates to lower-capacity arterials. The capacity of an interstate lane is two and a half to three times the capacity of an arterial lane. In addition, traffic on all streets approaching downtown would need to cross congested signalized intersections on the boulevards. The high increase in delay indicates back-ups and poor service levels at intersections throughout the downtown.

Figure 8-5 illustrates the general pattern of traffic changes in the morning peak with Concept 5. Roads with traffic increases are shown in red and those with decreases are shown in blue. Traffic on the boulevards would be much lower than existing interstates on all three legs of the inner loop since the capacity of the boulevards would be much lower. Traffic levels would increase on most all other routes in and near the downtown. The few exceptions are routes that currently link with interstate ramps to distribute traffic downtown. Traffic increases on routes inside and outside downtown would be substantial. These traffic increases, coupled with the need to cross highly congested intersections on the boulevards, would result in the high level of system delay shown in **Table 8-1**.

Table 8-1: Concept 5 System-Level Performance Measures, AM Peak

AM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 5 (Boulevards)	Percent Change
Vehicle Miles of Travel (VMT)	311,565	299,723	-4%
Vehicle Hours of Travel (VHT)	43,880	65,749	50%
Total Delay (hours)	21,346	29,907	40%

Table 8-2 shows the system-level performance of Concept 5 during the afternoon peak hour. The VMT would be about the same, indicating that the length of trips would be similar to existing. Travel times and delay, however, would be much higher as the boulevards reach capacity and traffic leaving downtown backs up at signalized boulevard intersections. Total VHT with the boulevards would be 105% higher to move the same distance in the subarea, and delay would increase by an estimated 145% in the afternoon peak.

Figure 8-5: Concept 5 - AM Traffic Flow Compared to No-Build

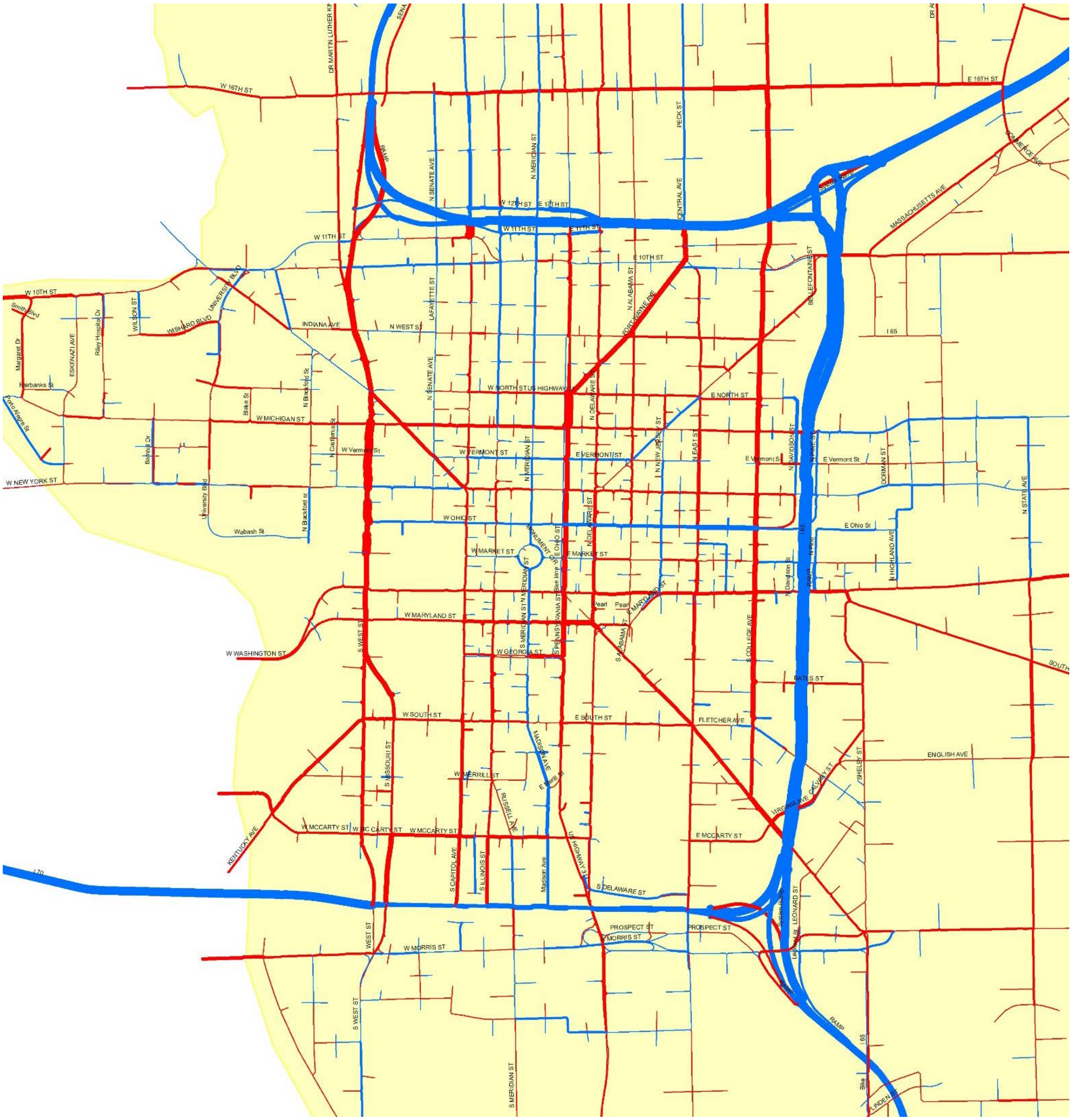


Table 8-2: Concept 5 System-Level Performance Measures, PM Peak

PM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 5 (Boulevards)	Percent Change
Vehicle Miles of Travel (VMT)	351,685	350,005	0%
Vehicle Hours of Travel (VHT)	48,711	99,953	105%
Total Delay (hours)	23,471	57,553	145%

The total travel time for motorists that enter or cross a boulevard to leave the downtown area during the afternoon peak hour would roughly double. The large increase in delay would be due to added congestion as traffic is diverted from higher capacity interstates, and the need for all traffic on local streets to pass through the signalized intersections on the congested boulevards to leave downtown. Intersection back-ups and poor service levels would occur at intersections throughout the downtown during the afternoon peak hour.

The general pattern of traffic in the downtown area during afternoon peak is shown in **Figure 8-6**. As in the morning peak, there would be a reduction in traffic volumes on the three legs of the inner loop due to the significant reduction in capacity of the boulevards compared to the existing interstates. Traffic levels would increase on many downtown streets, but especially on West Street, Virginia Avenue, and College Avenue. Since grade separations are assumed for these routes through the remaining interchange areas, boulevard intersections would be avoided. Traffic volumes on some local streets would be lower than current levels due to challenges for local traffic to cross the congested boulevards.

Overall, the system-level performance measures indicate that trip lengths would not change, but the time spent to make those trips would be significantly greater during both peak hours, but especially during the afternoon peak hour. The higher VHT and VMT values in the afternoon reflect the fact that more people are traveling at that time of day for a wide range of reasons, compared with the morning, when most trips are home-to-work.

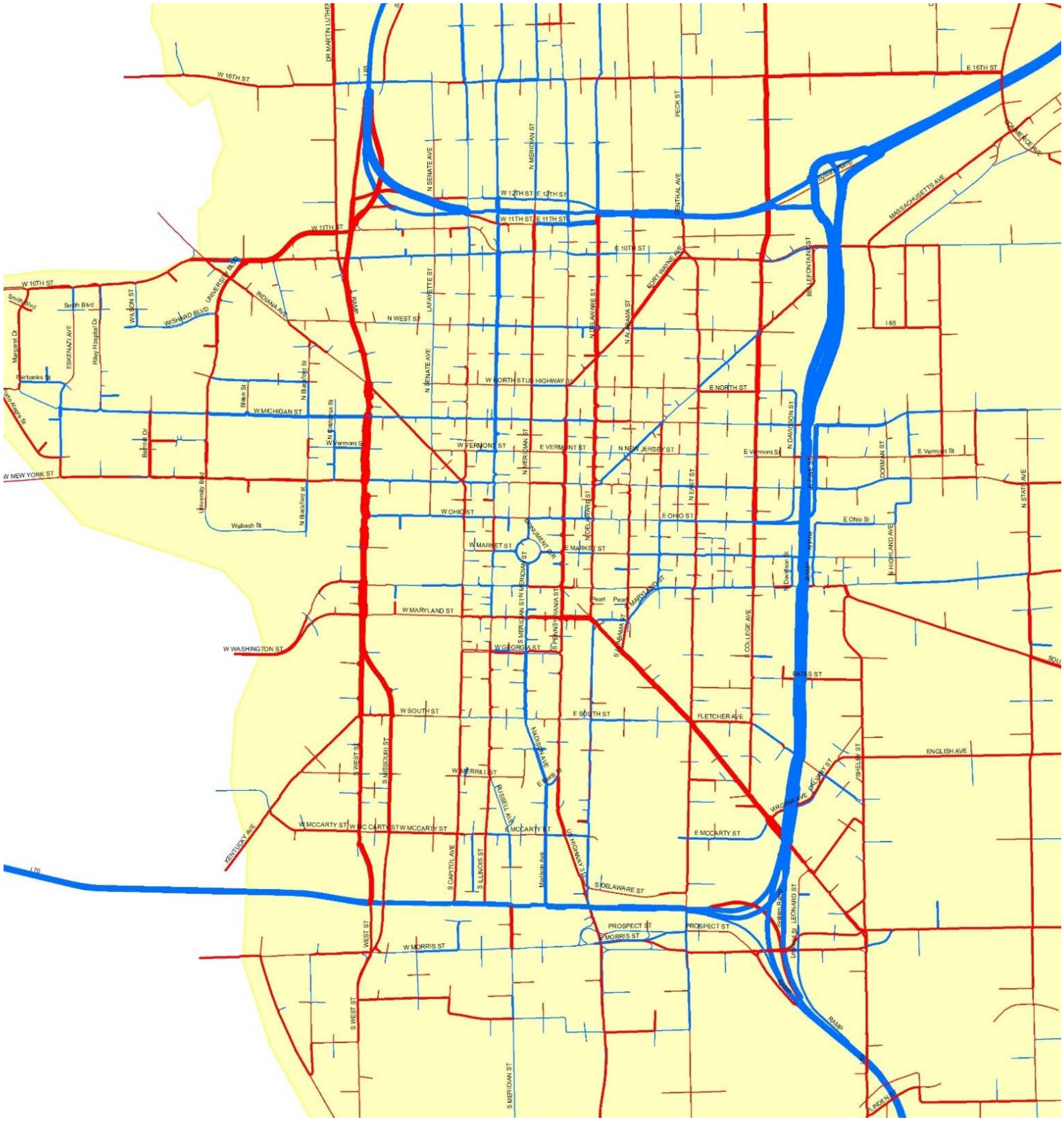
The large increases in VHT and total delay in **Table 8-1** and **Table 8-2** indicate that operations would be very different from today with Concept 5. Most of the street system downtown would be in a gridlock condition, particularly during the afternoon peak hour, as motorists back up at boulevard intersections to leave downtown. These high levels of congestion would negatively affect mobility, air quality, traffic safety, and quality of life for a large segment of those that live, work, and visit downtown Indianapolis.

It should be noted that the system-level delays described here are totaled for all roadways, not just on the boulevards that replace the interstates. A large part of the delay would be felt on local streets as motorists try to enter or leave the boulevards, cross the boulevards, or use alternate routes that must serve higher traffic volumes. Currently, local streets pass under high volumes of traffic traveling on the interstate(s) instead of intersecting with that traffic at grade. Traffic impacts on local roads are described in the neighborhood impact discussion in **Section 8.4.1**.

The microsimulation model was used to estimate traffic back-ups (queues) on I-65 and I-70 approaching downtown with Concept 5. Following are approximate back-of-queue limits for the worst-case morning or afternoon peak hour:

- North: 4-7 miles (Kessler Boulevard to Lafayette Road)
- East: 5-7 miles (Arlington Avenue to I-465)
- South: 4-7 miles (I-465 to Southport Road)
- West: 1-3 miles (Harding Street to Holt Road)

Figure 8-6: Concept 5 - PM Traffic Flow Compared to No-Build



8.2.1 Concept 5 Roundabout Analysis

It has been suggested that the Martin Luther King Boulevard/West Street interchange, the North Split interchange, and South Split interchange be replaced by traffic circles or roundabouts in conjunction with the installation of boulevards on the legs of the inner loop. As noted in **Section 8.1**, interchanges are assumed in the modeling of traffic performance for Concept 5. Roundabouts were also tested to see how they would perform.

For purposes of analysis, the potential roundabouts were configured to maximize their capacity by using multilane entries and bypass lanes wherever feasible. Although a smaller scale roundabout might be more aesthetically appealing, the intent with this analysis was to determine whether a roundabout of any design would serve the traffic demand at these locations.

Figure 8-7 shows the assumed layout of the North Split roundabout. Similar layouts were developed for the Martin Luther King Boulevard/West Street interchange and South Split interchange locations.

The roundabouts were analyzed for the morning and afternoon peaks using "Sidra Intersection," which is the most widely-used software tool for roundabout analysis by state transport agencies in the U.S. The results are shown in **Table 8-3**.

Figure 8-7: Example Roundabout Layout - North Split

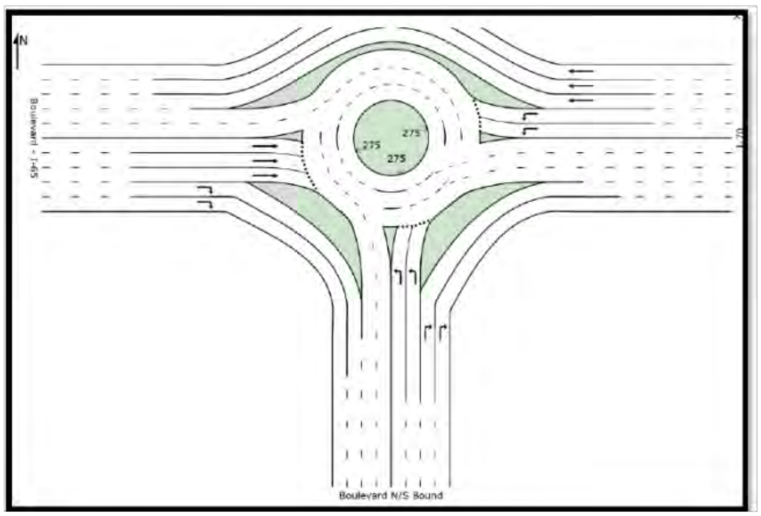


Table 8-3: Concept 5 Roundabout Performance

Parameter	MLK/West St.	North Split	South Split
Morning Peak			
Average Delay (minutes)	5.3	3.1	12.1
Queue Length (vehicles)	220	269	443
Queue Length (miles)	1.1	1.4	2.2
Level of Service	F	F	F
Morning Peak			
Average Delay (minutes)	8.1	11.4	4.8
Queue Length (vehicles)	381	393	169
Queue Length (miles)	1.9	1.9	0.8
Level of Service	F	F	F

As shown in **Table 8-3**, the average delay, queue length, and level of service (LOS) would be poor for roundabouts at each of the three locations. LOS is a term used by traffic engineers to describe the quality of traffic operations, ranging from A for unimpeded free flow to F for stop and go operation with excessive delay. A roundabout would operate very poorly at any of the three locations in Concept 5.

Variations could be a traffic circle similar to Monument Circle, with right angle approaches potentially controlled with stop signs or traffic signals, or a traffic circle or roundabout with underpasses or overpasses. A traffic circle would have less capacity than the modeled roundabout, and operations would be worse. A traffic circle or roundabout with underpasses or overpasses would operate as an interchange and would be less efficient than the existing interchanges with directional ramps that serve movements directly.

Due to the poor operations of roundabouts at these traffic levels, they are not considered further for any of the concepts in this analysis.

8.3 Concept 5 Estimated Cost

The basis for cost estimating for system-level concepts is provided in **Section 3.2**. Estimated construction cost is provided in a range because of the level of uncertainty at this conceptual stage. For the purposes of cost estimating, Concept 5 is generally described as follows:

Concept 5 encompasses removal of seven miles of I-65 and I-70 in the area of the inner loop. In place of the interstates and interchanges, surface boulevard streets would be constructed.

Following are primary factors that could cause the cost of Concept 5 to be higher or lower within a range:

- Phasing to allow the contractor efficiency in demolition at intersections and of elevated interstate would reduce cost.
- Controlling right-of-way acquisition beyond the existing I-65 and I-70 alignments would help control cost.
- Balancing of cuts to fill for earthwork to reduce the amount of spoils to haul offsite would have an impact on the cost.

Based on the above assumptions and primary factors, a range of estimated cost and an estimate of yearly O&M cost is presented for Concept 5, as follows:

Estimated Project Cost = $500 million to $900 million

Estimated Annual O&M Cost = $2 million

8.4 Concept 5 Estimated Impacts

Impacts are estimated below for traffic on neighborhood and downtown streets, construction impacts, neighborhood connectivity, right-of-way and relocations, historic resources, parks and recreation areas, and natural resources.

8.4.1 Local Street and Neighborhood Traffic Impacts

Traffic changes in and near downtown with the implementation of Concept 5 are shown in **Figure 8-8** for the morning peak and **Figure 8-9** for the afternoon peak. Traffic increases are shown in red and decreases are shown in blue. Changes on the interstates and West Street are solid arrows. The open arrows represent total traffic on local streets that cross each leg of the inner loop or West Street to enter or leave downtown.

Figure 8-8: Concept 5 Traffic Volume Changes (AM peak)

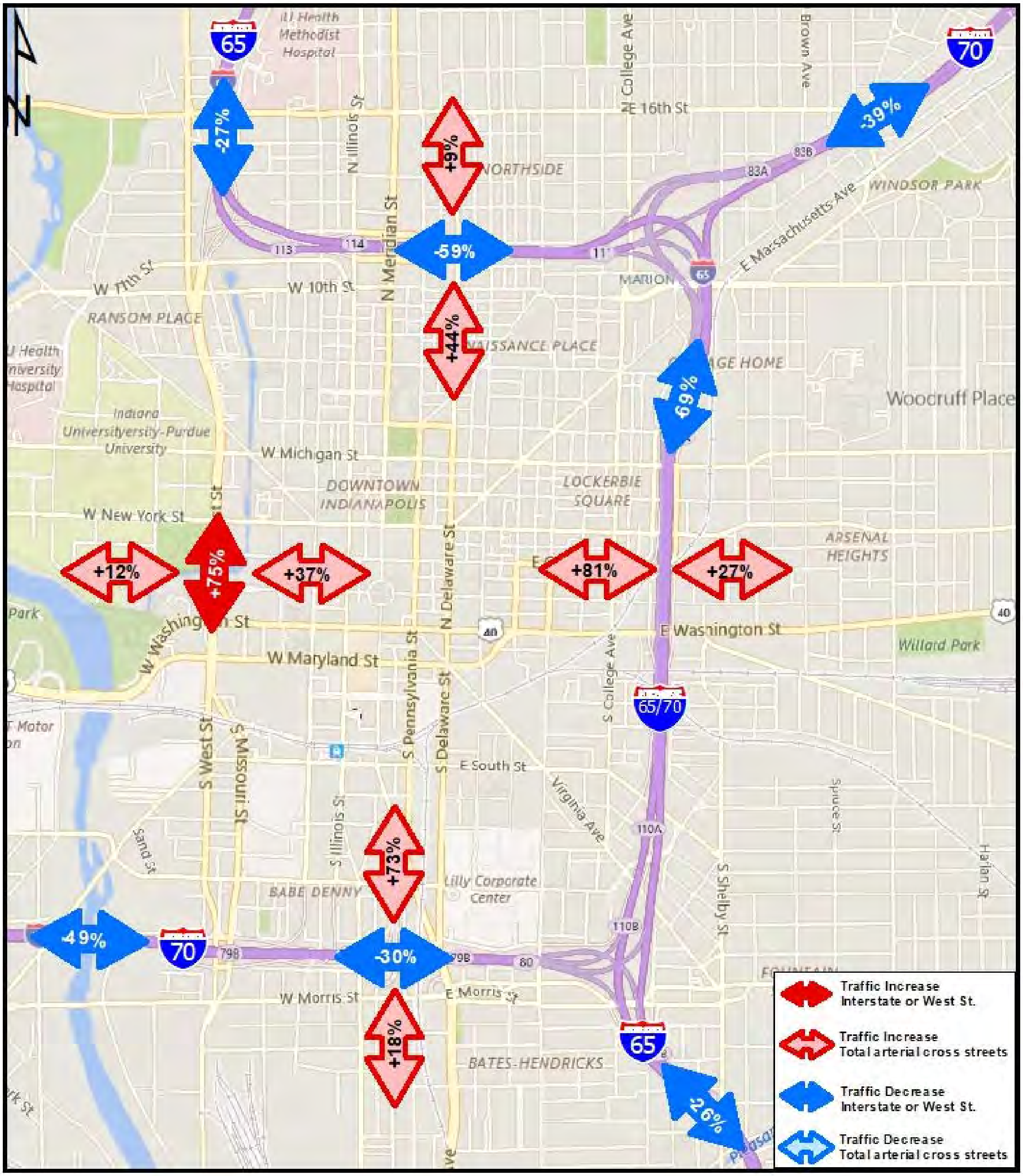
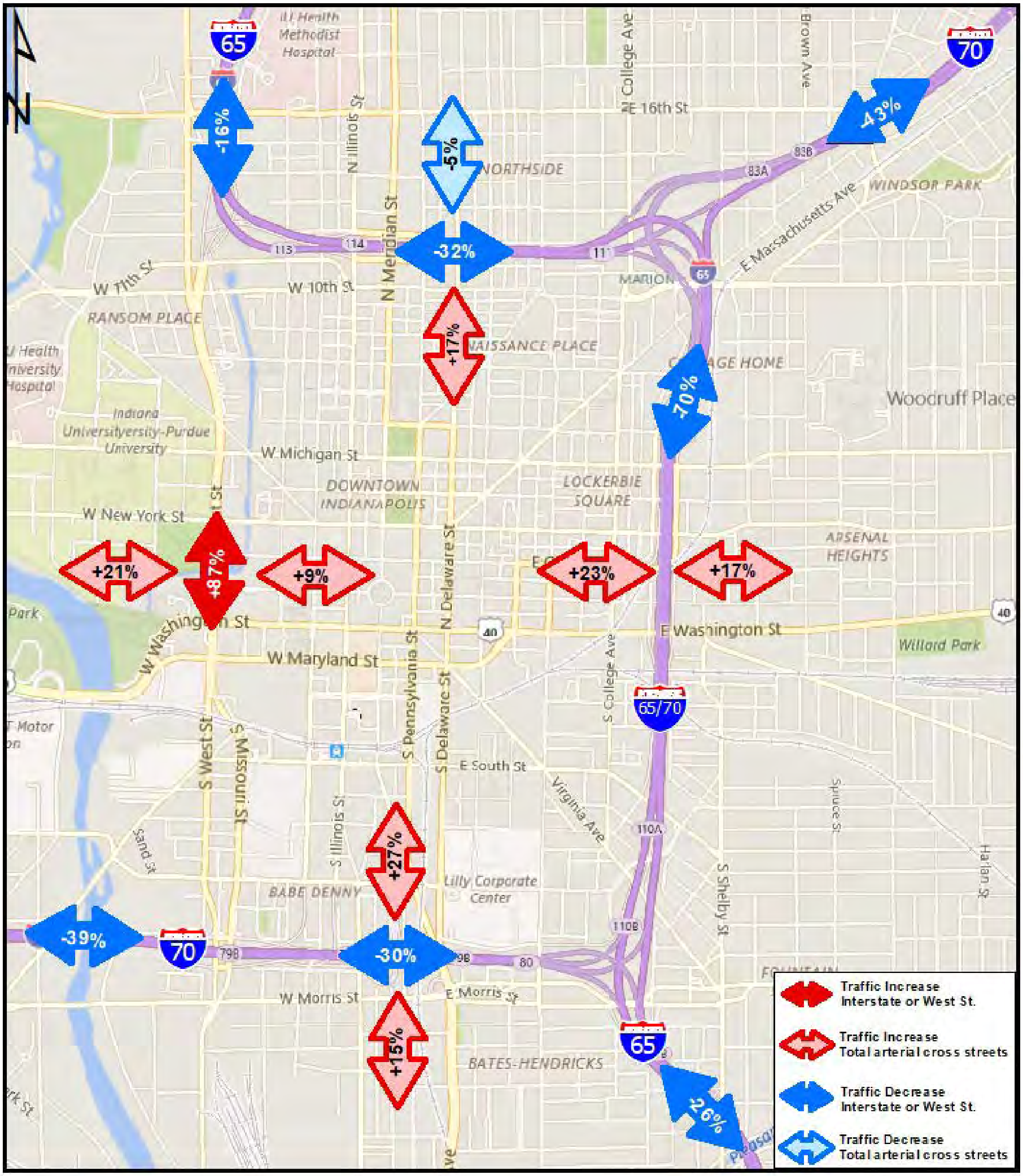


Figure 8-9: Concept 5 Traffic Volume Changes (PM peak)



Traffic on the inner loop would be much lower than existing at all locations during both peak hours. As shown in **Figure 4-2**, current interstate traffic volumes vary between 109,000 vehicles per day on the south leg to 161,000 vehicles per day on the east leg. The boulevards would be at capacity for a six-lane divided roadway controlled by traffic signals, which would be near 50,000 vehicles per day, with high levels of congestion through most of the day. As a point of reference, West Street currently carries about 38,000 vehicles per day at its busiest locations. The model shows traffic levels on West Street increasing by an average of 75% in the morning peak and 84% in the afternoon peak with Concept 5.

With one exception, total traffic on streets that cross the legs of the inner loop and West Street would increase in all directions with Concept 5. The exception is a 5% decrease on local streets in the Meridian corridor north of the inner loop. This decrease is an apparent result of downtown traffic seeking alternate routes that do not require passing through the congested intersections of the north boulevard. Local traffic movements from outside the downtown area would increase in the range of 12% to 27% in the morning peak and 16% to 21% in the afternoon peak. Traffic would also increase on many routes that do not enter or leave the downtown area, including 30th Street, Keystone Avenue, and Raymond Street.

Traffic on local streets that cross the legs of the inner loop or West Street inside the inner loop would increase in all directions during both peak hours. This traffic would increase by 37% to 81% in the morning peak and by 9% to 27% in the afternoon peak. The large traffic changes in the network of Concept 5 result from the diversion of 50,000 to 80,000 vehicles per day from interstates to local roadways and from the congested intersections on all boulevard sections. Under current conditions, traffic entering, leaving, and circulating through the downtown area is able to pass under the large volumes of traffic on the interstates.

In terms of changes on individual routes, the most significant increases would be on downtown streets. The microsimulation model shows the largest changes on individual streets with Concept 5 to be those listed below:

- Fort Wayne Avenue at Delaware Street: 300% increase (pm peak)
- College Avenue at Michigan St: 180% increase (am peak)
- Virginia Ave at Delaware Street: 450% increase (am and pm peak)
- Capitol Avenue at McCarty Street: 100% increase (am peak)
- 16th Street at Capitol Avenue: 180% increase (am peak)
- Kentucky Avenue at South Street: 80% increase (am peak)

The traffic growth rates shown above are derived based on traffic demand. As described in **Section 3.1**, a travel demand model first estimates the number of trips, then it assigns all trips to the available network. The traffic volumes predicted would exceed the current capacity of these roadways. Without significant changes to increase their capacity (e.g., added lanes, curb parking removal, one-ways), the excess number of vehicles would back up in parking lots and garages or on side streets downtown, and on local roadways beyond the traffic study area.

8.4.2 Construction and Maintenance of Traffic Impacts

The estimated construction duration for Concept 5 is four years. For the north leg, the initial phase would be to move the traffic destined to and from downtown to the existing 11th and 12th streets. The next phase would be to remove the existing mainline lanes and bridges between the exits. Most of this activity would take place while maintaining local street connectivity on the existing north-south streets. Once the existing interstate is removed, then segmental construction of the at-grade boulevards and its intersections with the local street system could start.

For the east leg and the south leg, the initial phase would divert traffic onto either the existing C-D lanes or the outside lanes. Removal of the existing interstate lanes and bridges could then start, followed by the segmental construction of at-grade boulevards. Once this is completed, the next phase would be to move traffic onto the completed section of the boulevard and start the construction of the outside lanes.

The interchange reconstructions at Martin Luther King Boulevard/West Street, North Split, and South Split would be completed under traffic to maintain connectivity to and from the local street network. Some phased detours and ramp closures might be required.

8.4.3 Neighborhood Connectivity and Visual Continuity

The at-grade boulevards would blend into the existing grid layout of downtown, reducing the perception that the interstate corridor serves as a barrier between existing neighborhoods and downtown. From the perspective of connectivity and visual continuity, this concept would allow the existing street network to tie into the boulevards for greater vehicular street connections. Appropriately designed pedestrian connections such as sidewalks would help improve overall neighborhood connection to and through the corridor. With the high volumes, numerous intersections, and turning movements, careful attention would need to be paid in creating safe and accessible pedestrian and bicycle facilities within the corridor. This concept would provide good unobstructed visibility through the corridor.

This concept would increase the opportunity for physical connections on the east and south legs of the downtown interstate network, eliminating the existing interstate barrier and providing at-grade connections across the interstate corridor. Connectivity challenges on the south leg include the existing land uses and the lack of existing multi-modal facilities.

This concept would also introduce additional areas for potential use as either green space or for new neighborhood-scaled development---both of which would provide opportunities to minimize the impact of the boulevard, reduce its width, and provide for better connectivity of the two sides of the interstate corridor.

The number of travel lanes and the number of vehicles that would use the boulevard would be significant in determining the degree that traffic would create a physical obstruction to connectivity across the corridor.

8.4.4 Right-of-Way and Relocations

Concept 5 is estimated to impact one to five acres of new right-of-way, which is primarily commercial, industrial, and vacant land uses. It is also estimated to require one to five relocations which are primarily commercial, industrial, and residential properties. Right-of-way impacts and relocations may be avoided or minimized during the NEPA process and the design phase. Approximately 80 acres of existing right-of-way could potentially be available for development or as open space.

8.4.5 Historic Resources

Concept 5 may require the acquisition of strip right-of-way from the Old Northside Historic District north of I-65. It may be possible to avoid direct impacts to historic properties during the NEPA process and the design phase. Visual and noise effects are possible to adjacent historic properties and would be determined as part of the Section 106 consultation for this concept.

8.4.6 Parks, Recreational Areas, and Trails

Temporary impacts to the Monon Trail, Cultural Trail at 10th Street and Virginia Avenue, and Pogues Run Trail would occur during construction over or near the trails. Permanent impacts to the trails are not anticipated. There would also be a potential opportunity for trails along the north, east, and south leg boulevards.

8.4.7 Natural Resources

Concept 5 would impact trees within the existing right-of-way planted by local community groups and neighborhoods as well as volunteer trees that have grown naturally. Concept 5 does not include work to the I-70 bridge over the White River and would have no impacts to this waterway or floodway.

Concept 5 Map Sheets

At-Grade Boulevards to Replace Existing Interstates

CONCEPT 5: OVERVIEW

- Replace all three legs of downtown interstates
- Construct six-lane divided boulevards on all three legs
- Install traffic signals at all boulevard intersections
- Retain system interchanges for boulevard access

LEGEND

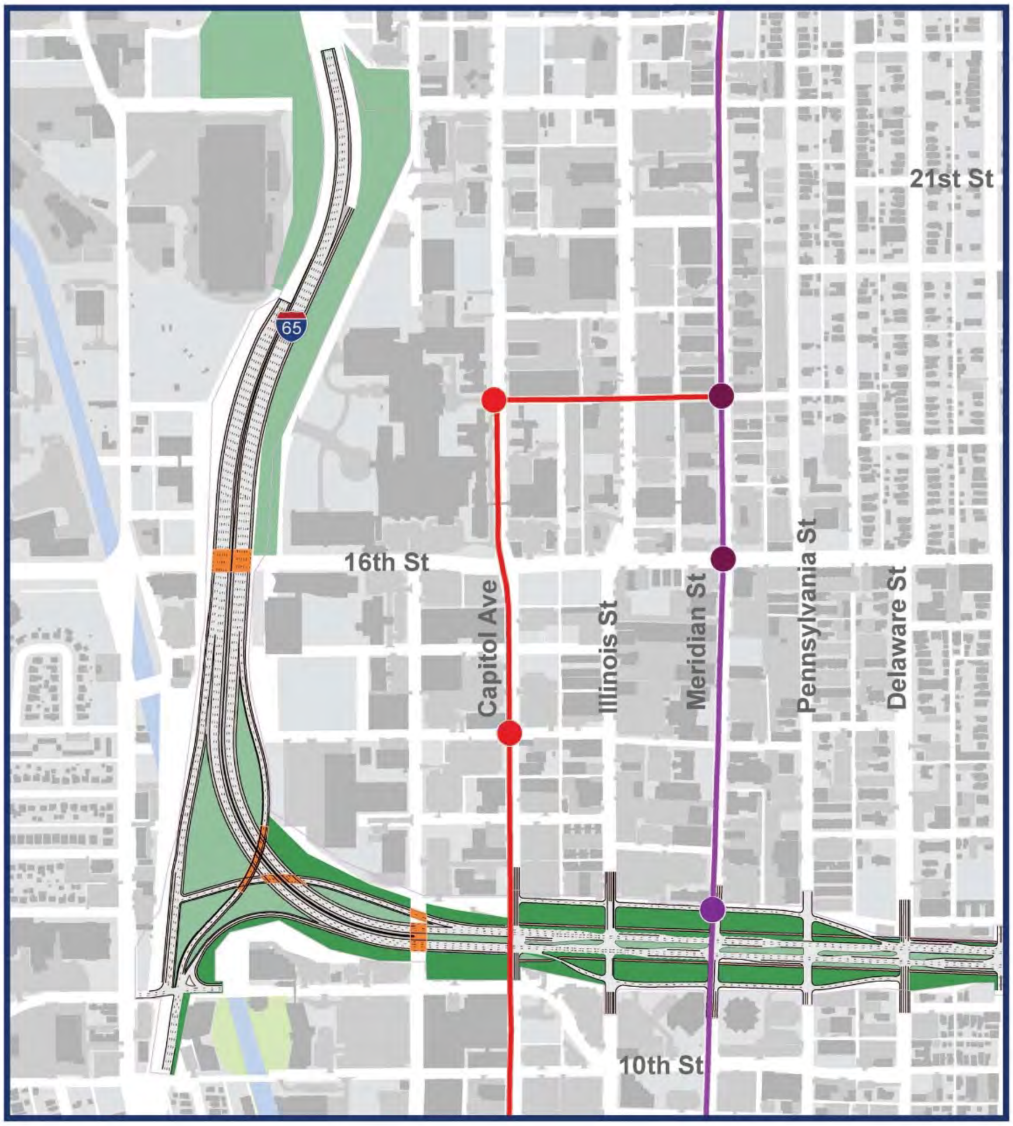
- Sheet
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Potential Excess Right-of-way
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Sheet Numbering
- Potential Trail or Greenway

0 0.25 0.5 1 Miles

Key Map

CONCEPT 5: BOULEVARD

NORTH SPLIT UPGRADES DRIVING PROGRESS



LEGEND

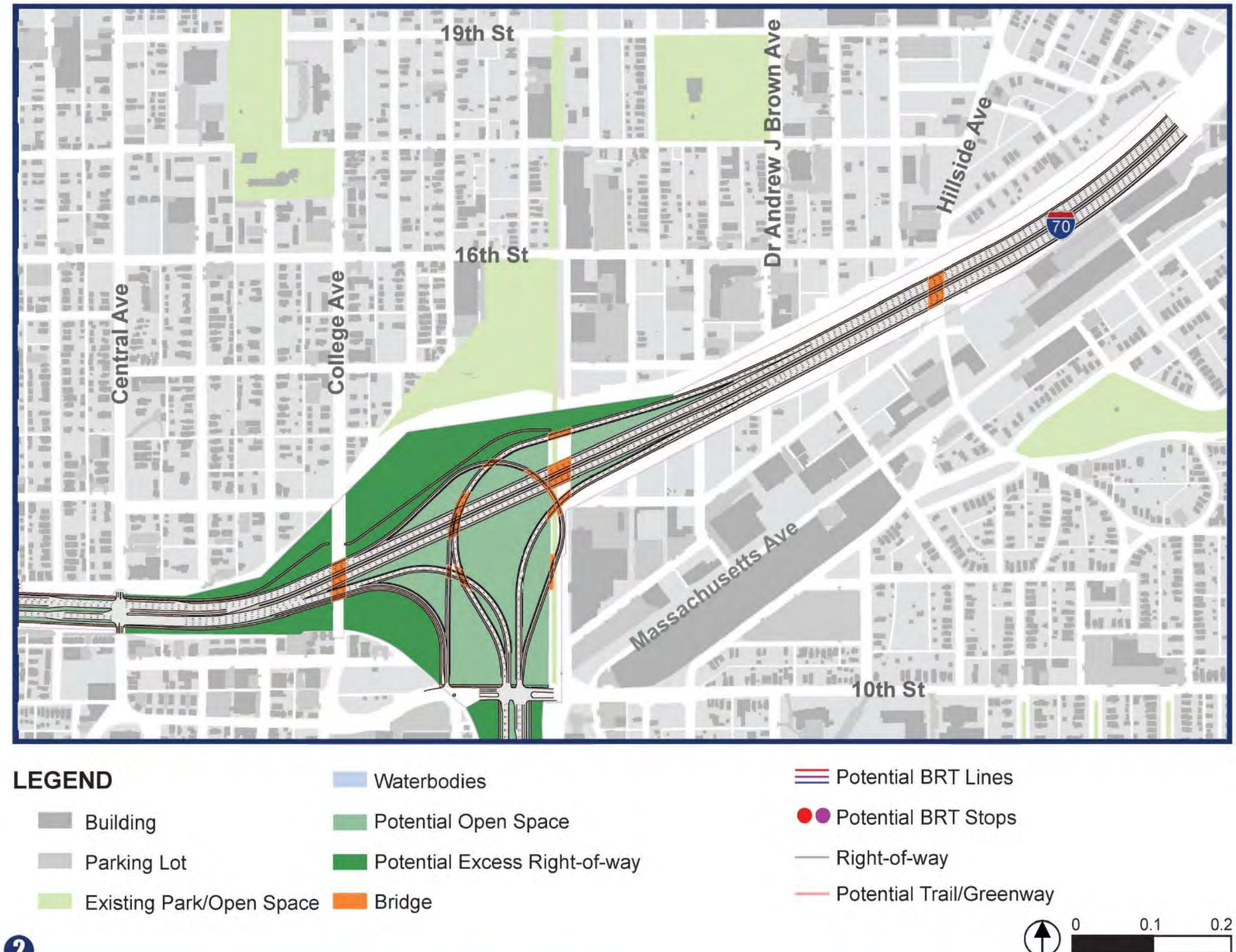
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Potential Excess Right-of-way
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Potential Trail/Greenway

0 0.1 0.2 Miles

Sheet 1

CONCEPT 5: BOULEVARD

NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 2

CONCEPT 5: BOULEVARD

NORTH SPLIT UPGRADES DRIVING PROGRESS

Sheet 3

CONCEPT 5: BOULEVARD

NORTH SPLIT UPGRADES DRIVING PROGRESS

Sheet 4

CONCEPT 5: BOULEVARD

LEGEND

- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Potential Excess Right-of-way
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Potential Trail/Greenway

0 0.1 0.2 Miles

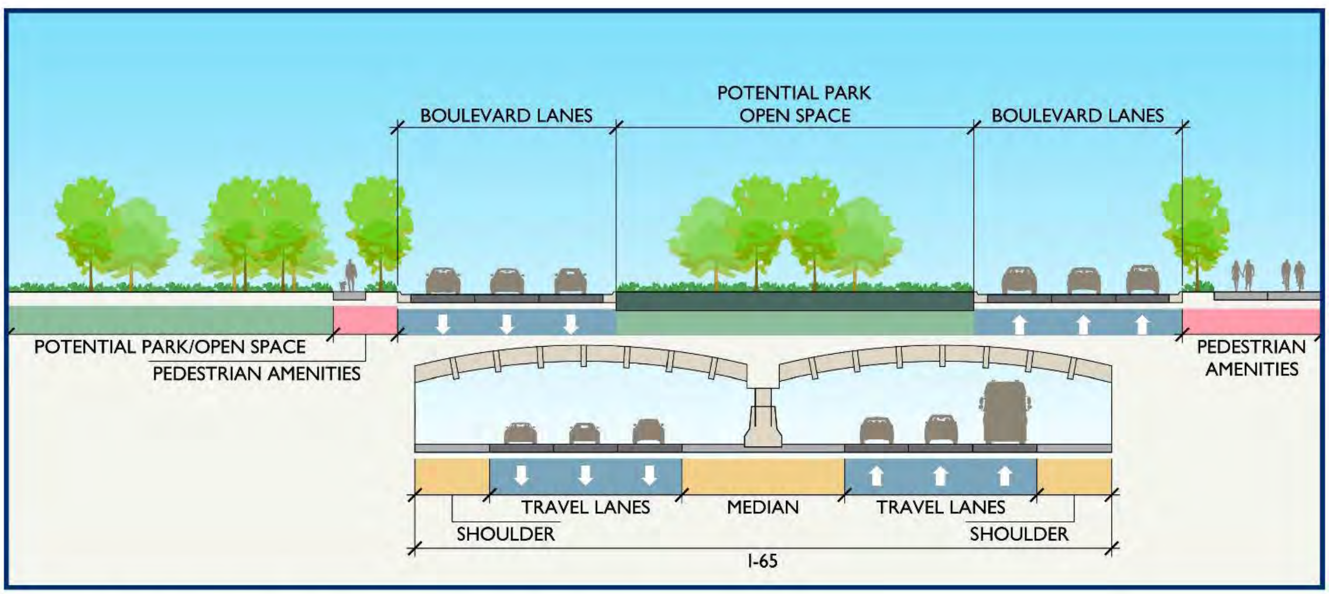
NORTH SPLIT UPGRADES DRIVING PROGRESS

9 CONCEPT 6: AT-GRADE BOULEVARDS WITH INTERSTATE TUNNELS

With this concept, components of Concepts 4 and 5 are combined to replace the three legs of the existing downtown interstate system. The interstate system would be lowered as described in Concept 4 and at-grade boulevards would be constructed on top of the interstate lanes, similar to Concept 5. The interstates would provide uninterrupted service for traffic moving through the downtown area and the boulevards would collect and distribute traffic from the downtown arterial street grid.

The at-grade boulevards would be low-speed, divided roadways with signalized intersections, a landscaped median in the center, and landscaped buffers on both sides. Unlike the existing interstates, where pedestrian and bicycle traffic is prohibited, use of these modes along and across the boulevards would be encouraged, with facilities incorporated into the design. A typical section showing the components of Concept 6 is presented in **Figure 9-1**.

Figure 9-1: Concept 6 Boulevards and Interstate Tunnels



AT-GRADE BOULEVARDS WITH INTERSTATES IN TUNNELS
I-65 between Meridian Street and Pennsylvania Street

This concept would not require decommissioning downtown interstates as described in **Chapter 3** since I-65 and I-70 would continue to pass through the downtown. By placing a portion of the traffic underground, the benefits of lower speed, well landscaped multi-modal boulevards could potentially be achieved at the surface. The existing portions of I-65 and I-70 outside the downtown are assumed to be physically unchanged in Concept 6.

As with all concepts being reviewed in this analysis, the at-grade boulevard with interstate tunnels option is intended to be a representative configuration rather than a final design. A traditional boulevard section could be provided with two one-way road sections separated by a median, as shown in **Figure 8-1**, or the boulevard may look something like **Figure 8-2**, with the two one-way roadways widely separated, with opportunities for park land or development in between.

A rendering showing the components of the interstate tunnel and boulevard is provided in **Figure 9-2**. With the tunnel underground, **Figure 9-3** shows how Concept 6 might look where the boulevard crosses Meridian and Pennsylvania Streets.

Figure 9-2: Rendering Concept 6 Boulevard and Interstate Tunnel

View of Boulevard and I-65 Tunnel at Illinois Street Looking East

9.1 Concept 6 Configuration

Assumptions related to the boulevards and tunnels in Concept 6 vary by location, since opportunities and constraints differ on the existing interstate highway alignments throughout the downtown area. The assumed layout of the downtown boulevards and tunnels used for travel demand modeling, cost estimating, and impact review is shown in a series of maps provided at the end of this chapter.

Figure 9-3: Rendering Concept 6 Boulevard at Meridian and Pennsylvania Streets

View of Boulevard and I-65 Tunnel at Meridian Street and Pennsylvania Street Looking Southeast

As with Concept 5, two assumptions are made to balance the objectives of providing a neighborhood scale facility while serving regional travel demand. The boulevard is assumed to have three lanes in each direction, consistent with the objective to provide a neighborhood type of street. Second, free-flowing interchanges are assumed in all four quadrants of the inner loop. (See **Section 8.2.1** regarding potential for roundabouts.) Common assumptions for all boulevards in Concept 6 are the same as those listed in **Section 8.1** for Concept 5. The tunnels are assumed to be continuous except at entry and exit portals as shown on the maps at the end of this chapter.

Following is a description of the assumed representative layout for Concept 6 used in this analysis. The description includes references to five map sheets provided at the end of this chapter. The map sheet section begins with a key map to show the location of each map sheet.

North Leg

The north leg of Concept 6 from the Martin Luther King Boulevard/West Street interchange to the North Split is shown in Sheets 1 and 2 at the end of this chapter. Concept 6 would include the following major changes:

- I-65 from the north would be lowered after passing through the Martin Luther King Boulevard/West Street interchange and would remain below street level through the north leg.
- I-70 from the east would remain at grade through the North Split interchange.

- As with Concept 5, frontage one-lane roads are not provided for purposes of modeling as they provide no traffic movement purpose and could potentially create operational challenges due to the proximity to the minor street/boulevard intersections. These parallel frontage roads could be installed for property access and parking.

East Leg

The east leg of Concept 6, from the North Split to the South Split, is shown in Sheets 3 and 4 at the end of the chapter. Assumptions related to this section of six-lane boulevard include the following:

- The crossing at Ohio Street would be grade separated due to the proximity of the railroad crossing.
- Since Calvary Street and Virginia Street are close to each other, Calvary Street would bridge over the boulevard for improved operations.
- I-65 from the south would be split into ramps to I-70 west tunnel, I-70 west boulevard, I-65 north tunnel, and I-65 north boulevard south of Morris Street.

South Leg

The south leg of Concept 6, from the South Split to West Street, is shown in Sheets 4 and 5 at the end of this chapter. Assumptions related to this section of six-lane boulevard include the following:

- Access to the boulevard would be provided at all locations that have I-70 interchange access today.
- I-70 from the west would be lowered east of the bridge over the White River. Access to the boulevard would be through a new interchange at West Street.

9.2 Concept 6 Performance

As described in **Section 3.1**, a subarea microsimulation model derived from the IMPO regional travel demand model is used to measure the performance of the system-level concepts within a designated traffic study area in the vicinity of the downtown. The microsimulation model considers localized traffic operations in addition to the route capacity factors considered in the IMPO model.

Table 9-1 shows the expected changes in total VMT and VHT in the traffic study area during the morning peak hour if Concept 6 was implemented. The total VMT in the subarea would be about the same as the No-Build, indicating motorists would drive about the same distance. Total travel time would be about the same overall with Concept 6. There would be a reduction in total delay in the vicinity of downtown, meaning that service would be improved on the most congested facilities.

Table 9-1: Concept 6 System-Level Performance Measures, AM Peak

AM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 6 (Boulevards/ Tunnels)	Percent Change
Vehicle Miles of Travel (VMT)	311,565	310,996	0%
Vehicle Hours of Travel (VHT)	43,880	44,323	1%
Total Delay (hours)	21,346	19,506	-9%

Figure 9-4 illustrates the general pattern of traffic changes in the morning peak with Concept 6. Roads with traffic increases are shown in red and those with decreases are shown in blue. The heavy red lines of the three legs of the inner loop represent the tunnels, which show a large increase in traffic since they currently do not exist. The heavy blue lines represent traffic diverted from the surface interstates to the tunnels. There are modest increases on most downtown streets as traffic balances in response to the intersections of the boulevards from streets that are currently served by interstate ramps.

Table 9-2 shows expected changes in total VMT and total VHT in the traffic study area during the afternoon peak hour. Total VMT would be slightly lower, meaning that motorists are taking more direct routes to their destinations. Total VHT and total delay would be 6% higher than the No-Build. The increase in VHT and delay indicates that the benefits of the tunnels are offset by delays at signalized boulevard intersections in the afternoon peak hour.

Table 9-2: Concept 6 System-Level Performance Measures, PM Peak

PM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 6 (Boulevards/ Tunnels)	Percent Change
Vehicle Miles of Travel (VMT)	351,685	349,804	-1%
Vehicle Hours of Travel (VHT)	48,711	51,516	6%
Total Delay (hours)	23,471	24,197	3%

Figure 9-5 illustrates the general pattern of traffic changes in the afternoon peak with Concept 6. Roads with traffic increases are shown in red and those with decreases are shown in blue. As in the morning peak the heavy red lines of the three legs of the inner loop represent the tunnels, which show a large increase in traffic since they currently do not exist, and the heavy blue lines represent traffic diverted from the surface interstates to the tunnels. There are modest increases on many downtown streets as traffic balances in response to the intersections of the boulevards, with decreases on streets that are currently served by interstate ramps.

In summary, the network as a whole would operate in a manner similar to the existing network if the downtown interstates were replaced with a boulevard and tunnel system. Total distance traveled and time spent for trips would be about the same in the morning. Travel would take longer in the afternoon. The total delay entering and leaving downtown would be about 3% greater in the afternoon peak hour. The microsimulation model also indicates that there would be no significant queuing on interstates with Concept 6.

9.3 Concept 6 Estimated Cost

The basis for cost estimating for system-level concepts is provided in **Section 3.2**. Estimated construction cost is provided as a range given the level of uncertainty at this conceptual stage. For the purposes of cost estimating, Concept 6 is generally described as follows:

Concept 6 consists of full removal of existing interchanges and interstate for seven miles of I-65 and I-70. I-65 and I-70 would be reconstructed as a tunnel following the current alignment. The method for constructing this tunnel would be open cut excavation, construction of a four-sided concrete tunnel, and backfill material placed on top of the tunnel to match existing surface elevation. New boulevard surface streets, including green space, would be constructed over the cap of the tunnels. New access to interstate tunnels would be constructed and the existing city street grid would be reestablished via the new boulevard streets.

Figure 9-4: Concept 6 - AM Traffic Flow Compared to No-Build

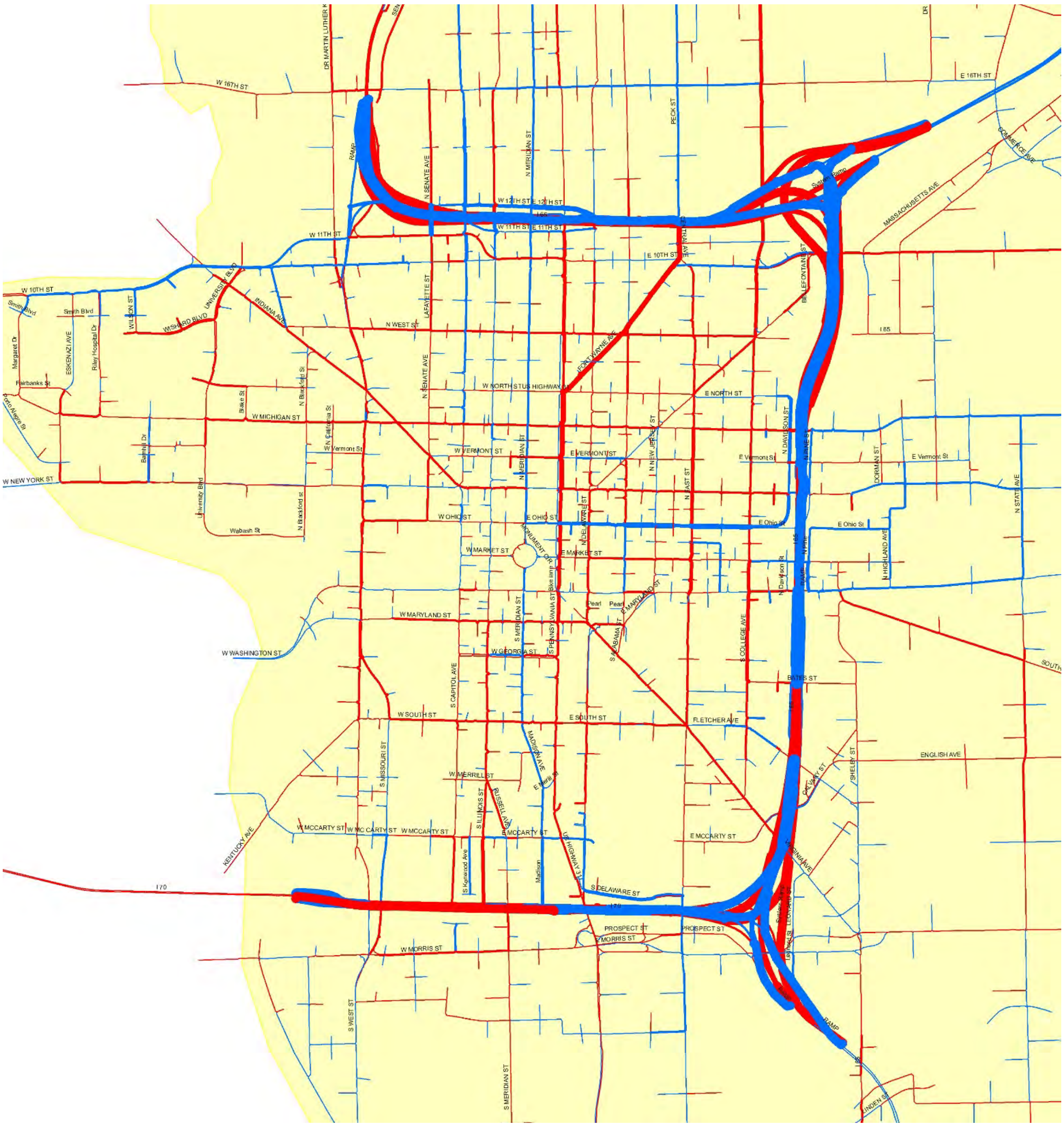
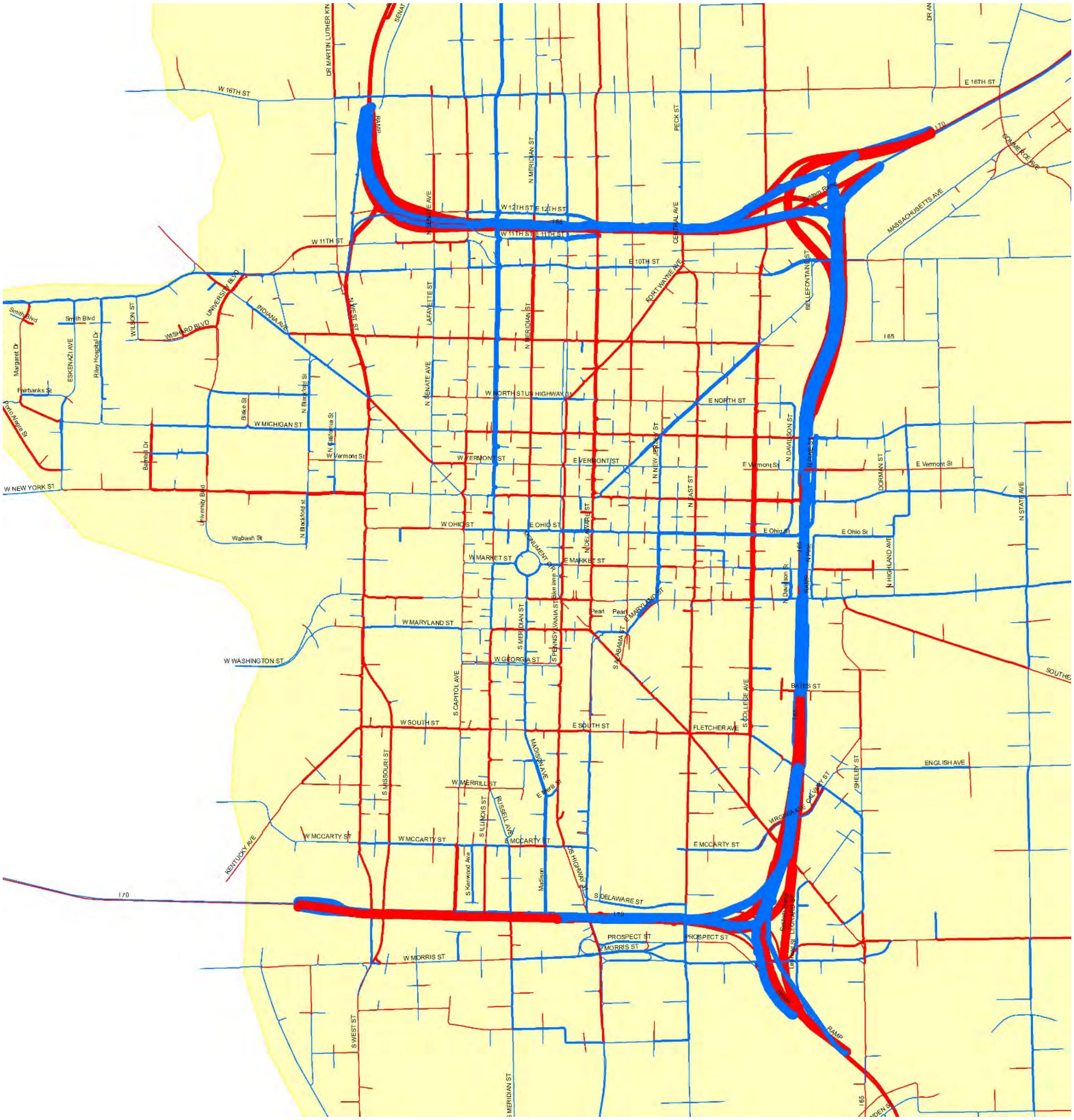


Figure 9-5: Concept 6 - PM Traffic Flow Compared to No-Build



Following are primary factors that could cause the cost of Concept 6 to be higher or lower within a range:

- Final designed cross section of the tunnel. The required depth and width of the tunnel would control cost in multiple facets; material cost, excavation cost, and support of excavation cost.
- Construction Project Phasing. Allowing the tunnel to be constructed full width vs. in half sections would prevent the contractor from having to duplicate work by switching sides and rebuilding the temporary supports required for the excavation, which could ultimately reduce construction time, and as a result, cost. It would also limit the number of temporary detours.
- Geotechnical Report. A geotechnical analysis would identify temporary structures needed to support the excavation. The number and complexity of the temporary structures would greatly impact cost. Also, the deep foundation design would be greatly impacted by the results of the geotechnical report. Pile type, size, and quantity are also analyzed in a geotechnical report and would have an impact on project cost.
- Water Table. In parts of the downtown area, the water table would be within the level of the tunnel system. Dewatering systems (pumps, piping, etc.) could have a significant effect on project costs.

Based on the above assumptions and primary factors, a range of estimated cost and an estimate of yearly O&M cost is presented for Concept 6, as follows:

Estimated Project Cost = $3.3 billion to $5.5 billion

Estimated Annual O&M Cost
Road = $2.7 million
Tunnel = $4.1 million

The actual cost of Concept 6 could exceed the maximum value in the above range based on conditions encountered in future engineering for underground systems. A more reliable estimate of feasibility and cost would require detailed site-specific evaluation of groundwater levels, geotechnical conditions, and type and location of major utilities.

9.4 Concept 6 Estimated Impacts

Impacts are estimated below for traffic on neighborhood and downtown streets, construction impacts, neighborhood connectivity, right-of-way and relocations, neighborhood connectivity, historic resources, parks and recreation areas, and natural resources.

9.4.1 Local Street and Neighborhood Traffic Impacts

Traffic changes in and near downtown with the implementation of Concept 6 are shown in **Figure 9-6** for the morning peak and **Figure 9-7** for the afternoon peak. Traffic increases are shown in red and decreases are shown in blue. Changes on the interstates and West Street are solid arrows. The open arrows show total traffic on local streets that cross each leg of the inner loop or West Street to enter or leave downtown.

During the morning peak hour, total traffic in the interstate corridors would be within 4% of existing traffic patterns except immediately west and south of the North Split, where volumes would be about 20% lower. The afternoon peak pattern would be similar, except the reduction would be much smaller near the North Split (8% to 11%). I-65 traffic north of the inner loop would increase by 13%. West Street traffic would increase by 14% in the morning peak and 12% in the afternoon peak. These changes, particularly the large increase on West Street, appear to due to delays at the signalized intersections on the north boulevard.

Figure 9-6: Concept 6 Traffic Volume Changes (AM peak)

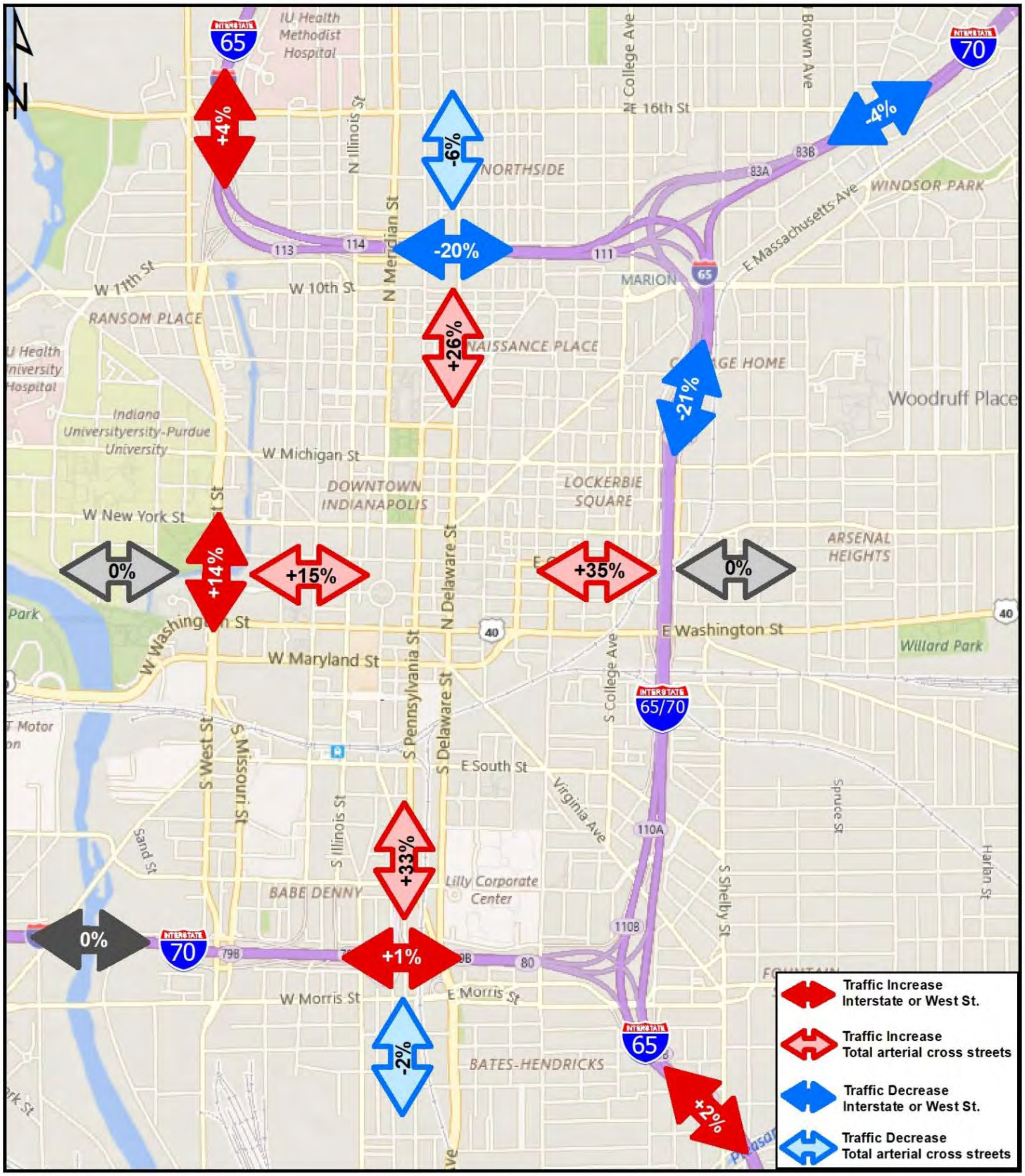
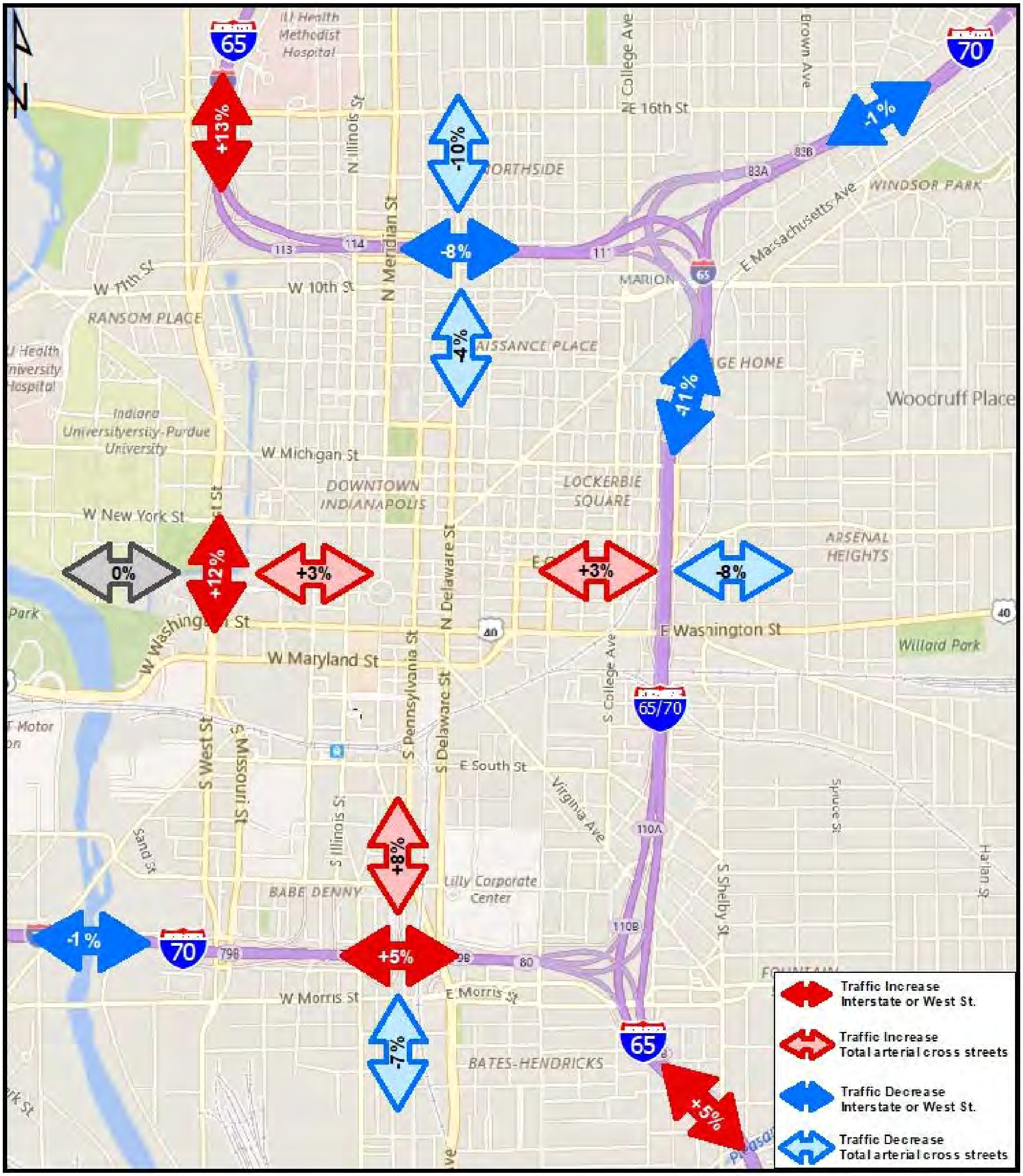


Figure 9-7: Concept 6 Traffic Volume Changes (PM peak)



Local traffic on streets that cross the inner loop or West Street outside the inner loop would be 2% to 6% lower in the morning peak and 7% to 10% lower in the afternoon peak. Traffic on streets that cross the inner loop or West Street inside the inner loop would increase in all directions in the morning peak, with traffic levels 15% to 35% higher than existing. Traffic would also be higher in the afternoon peak, by 3% to 8%, except to the north, which would decrease by 4%. Clearly, more traffic is drawn to West Street and its link to I-65 north with this scenario.

In terms of the largest changes on individual routes, most changes would be modest. The largest changes on individual streets with Concept 6 would be on streets that link with grade separations over the inner loop, as drivers avoid the signalized intersections of the boulevards. The streets listed below link with the College Avenue overpass, which remains as part of the North Split interchange in this concept:

- Fort Wayne Avenue at Delaware Street: 300% increase (pm peak)
- College Avenue at Michigan Street: 130% increase (pm peak)

9.4.2 Construction/Maintenance of Traffic Impacts

The estimated construction duration for Concept 6 is 10 years. This concept would essentially be a combination of Concepts 4 and 5. However, the depressed interstate would now be a cut and cover tunnel topped by the boulevards. A high water table and existing soils comprised of sand and gravel deposits would require pumping and dewatering during construction of the tunnels. Tall temporary retaining walls would be constructed half at a time, and the permanent retaining walls would have deep foundations. Extensive permanent stormwater control systems would be required to prevent flooding and to keep the depressed section dry, especially during peak storm events.

9.4.3 Neighborhood Connectivity and Visual Continuity

The surface boulevards would blend into the existing grid layout of downtown, reducing the perception of the existing interstate as a barrier between neighborhoods and downtown. The interstate tunnels could increase the safety of connections across the corridor by reducing traffic levels on the boulevards. Appropriately designed intersections and pedestrian connections would help improve overall neighborhood connection to and through the corridor. This concept would provide good, unobstructed visibility across and through the corridor.

This concept would also increase the opportunity for physical connections on the east and south legs of the downtown interstate network, eliminating the existing interstate barrier and providing at-grade connections across the interstate corridor. Existing land uses and the lack of existing facilities along the south leg make this section particularly challenging for improving pedestrian connections.

Like the boulevard concept, this concept also introduces an opportunity for additional green space or for new neighborhood-scaled development---both of which provide opportunities to minimize the impact of the boulevard, reduce its width, and provide for better connectivity of the two sides of the interstate corridor. As with Concept 5, the number of travel lanes and the number of vehicles that would use the boulevards would be significant in determining the degree that traffic would create a physical obstruction to connectivity across the corridors.

9.4.4 Right-of-Way and Relocations

Concept 6 is estimated to impact five to 10 acres of new right-of-way, which is primarily commercial, industrial, residential, railroad, utility, and vacant land uses. It is also estimated to require five to 10 relocations which are primarily commercial, industrial, and residential properties. Right-of-way impacts and relocations may be avoided or minimized during the NEPA process and the design phase. Approximately 50 acres of existing right-of-way could potentially be available for development or as open space.

9.4.5 Historic Resources

Concept 6 may require the acquisition of strip right-of-way from the Old Northside Historic District north of I-65, and the St. Joseph Neighborhood Historic District south of I-65. Concept 6 would cross the Indianapolis Park and Boulevard System Historic District on the I-70 bridge over the White River. It may be possible to avoid direct impacts to historic properties during the NEPA process and the design phase. Visual and noise effects are possible to adjacent historic properties and would be determined as part of the Section 106 consultation for this concept.

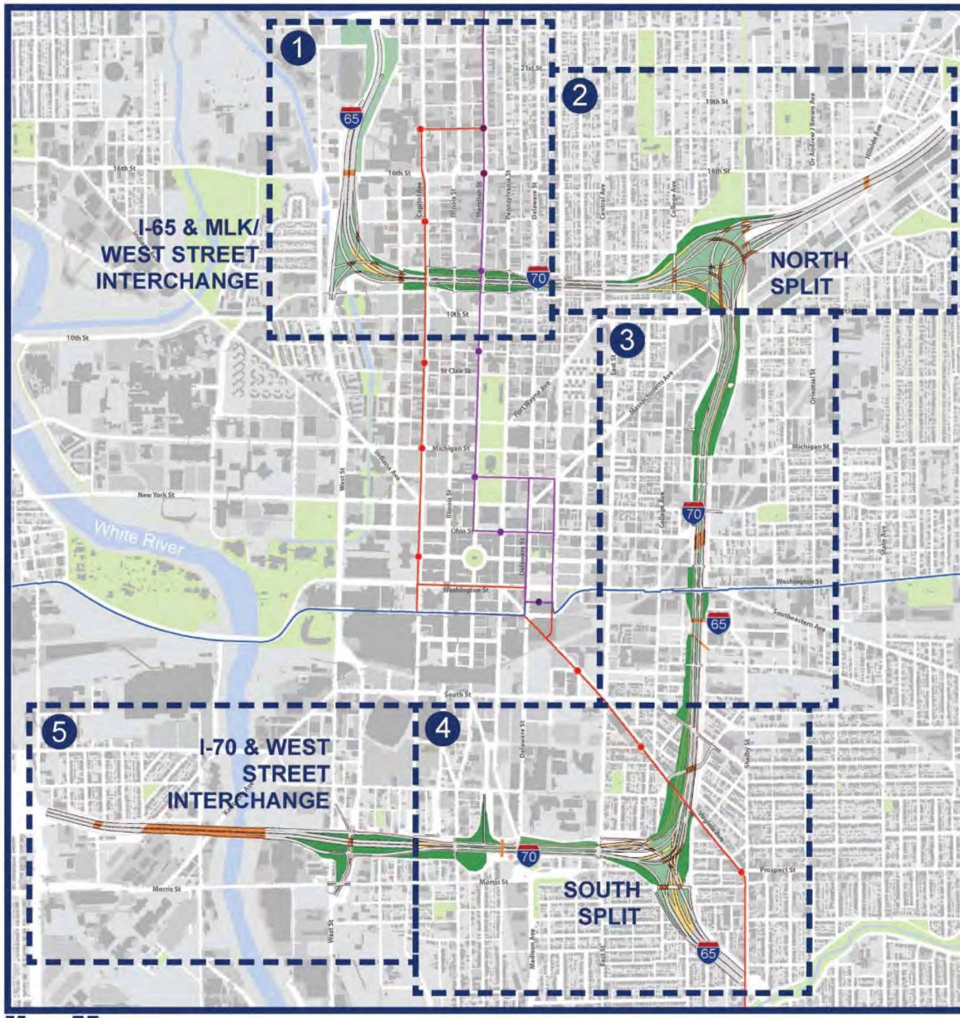
9.4.6 Parks, Recreational Areas, and Trails

Temporary impacts to the Monon Trail, Cultural Trail at 10th Street and Virginia Avenue, Pogues Run Trail, and White River Wapahani Trail would occur during construction over or near the trails. The Monon Trail may require a slight realignment at the North Split interchange. Permanent impacts to the connectivity of the trails are not anticipated. There are is a potential opportunity for trails along the north, east, and south leg boulevards.

9.4.7 Natural Resources

Concept 6 would impact trees within the existing right-of-way planted by local community groups and neighborhoods as well as volunteer trees that have grown naturally. Widening or reconstructing the I-70 White River bridge would potentially result in impacts to the river due to causeways. Impacts to the White River floodway could also occur. Pogues Run flows through an underground structure under I-65 and I-70 and much of Indianapolis, starting just north of New York Street and east of the interstates. Because Concept 6 includes tunneling, the structure carrying Pogues Run under the interstates may require reconstruction or replacement.

Concept 6 Map Sheets
At-Grade Boulevards with Interstate Tunnels



CONCEPT 6: OVERVIEW

- Provide tunnels under all three legs for through interstate traffic
- Construct six-lane divided boulevards on all three legs
- Install traffic signals at all boulevard intersections
- Retain system interchanges for boulevard access

LEGEND

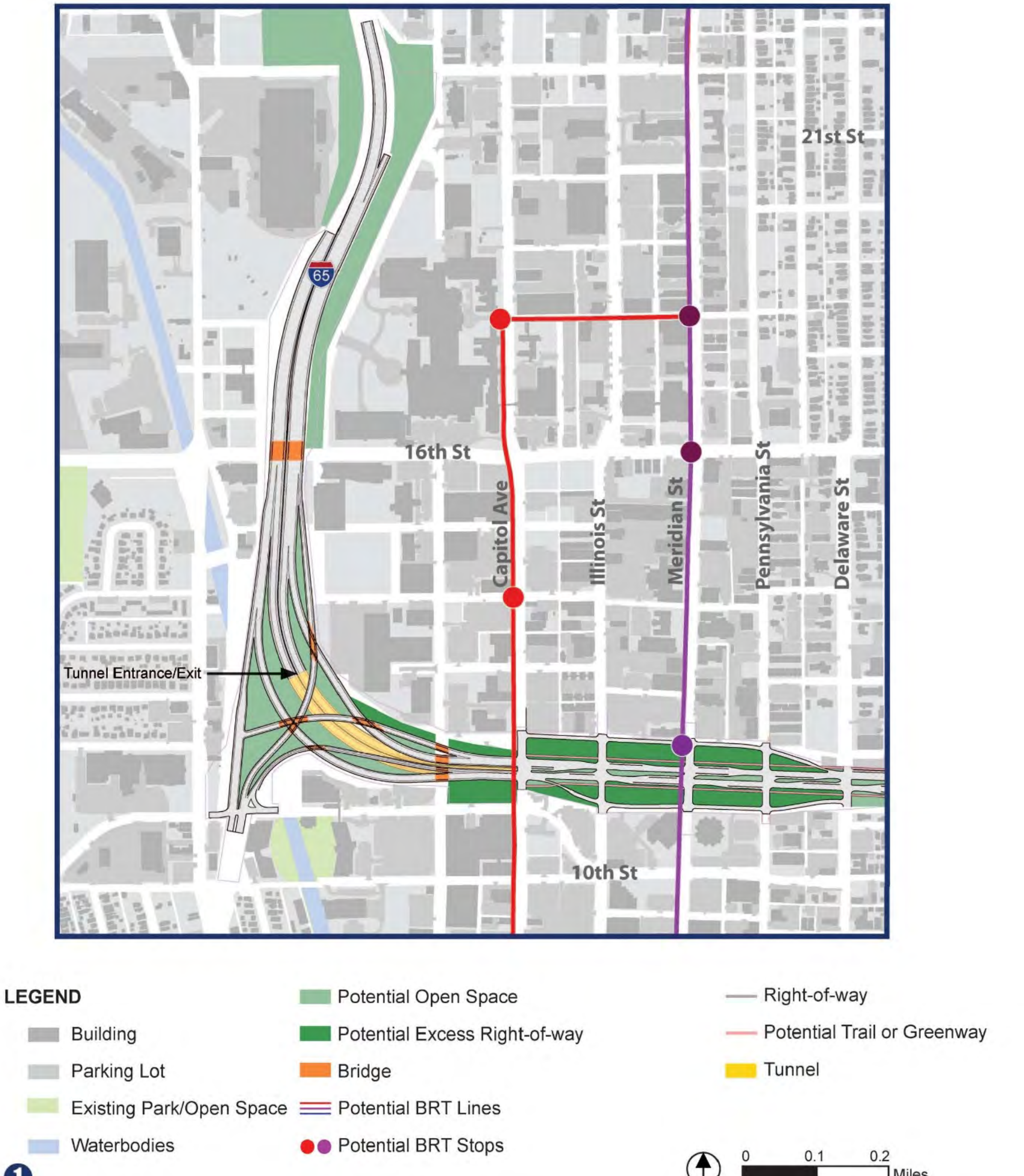
- Sheet
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Potential Excess Right-of-way
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Sheet Numbering
- Potential Trail or Greenway
- Tunnel

0 0.25 0.5 1 Miles

Key Map

CONCEPT 6: BOULEVARD + TUNNEL

NORTH SPLIT UPGRADES DRIVING PROGRESS

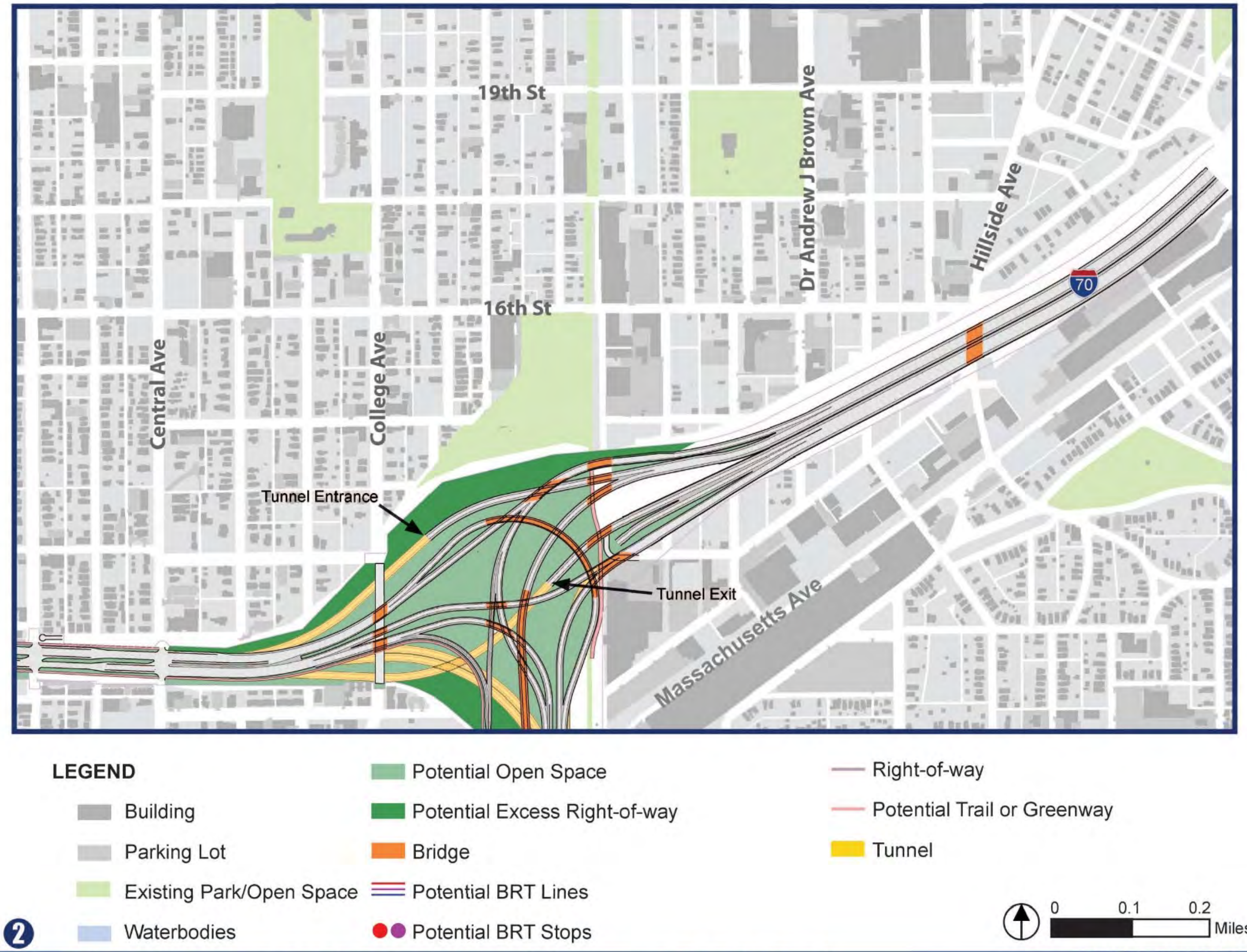


Sheet 1

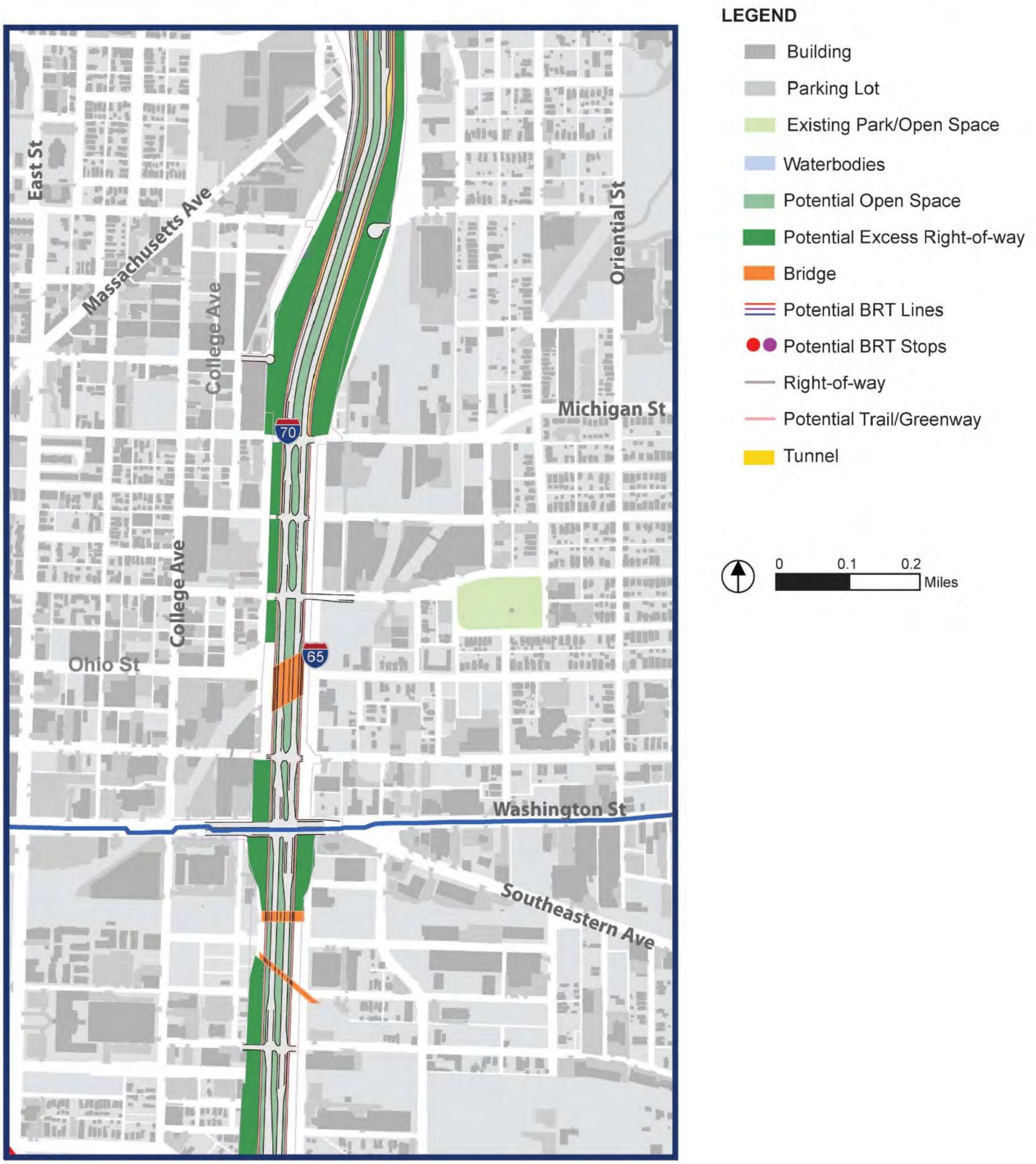
CONCEPT 6: BOULEVARD + TUNNEL

NORTH SPLIT UPGRADES DRIVING PROGRESS

CONCEPT 6: BOULEVARD + TUNNEL



NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 3

CONCEPT 6: BOULEVARD + TUNNEL

NORTH SPLIT UPGRADES DRIVING PROGRESS

LEGEND

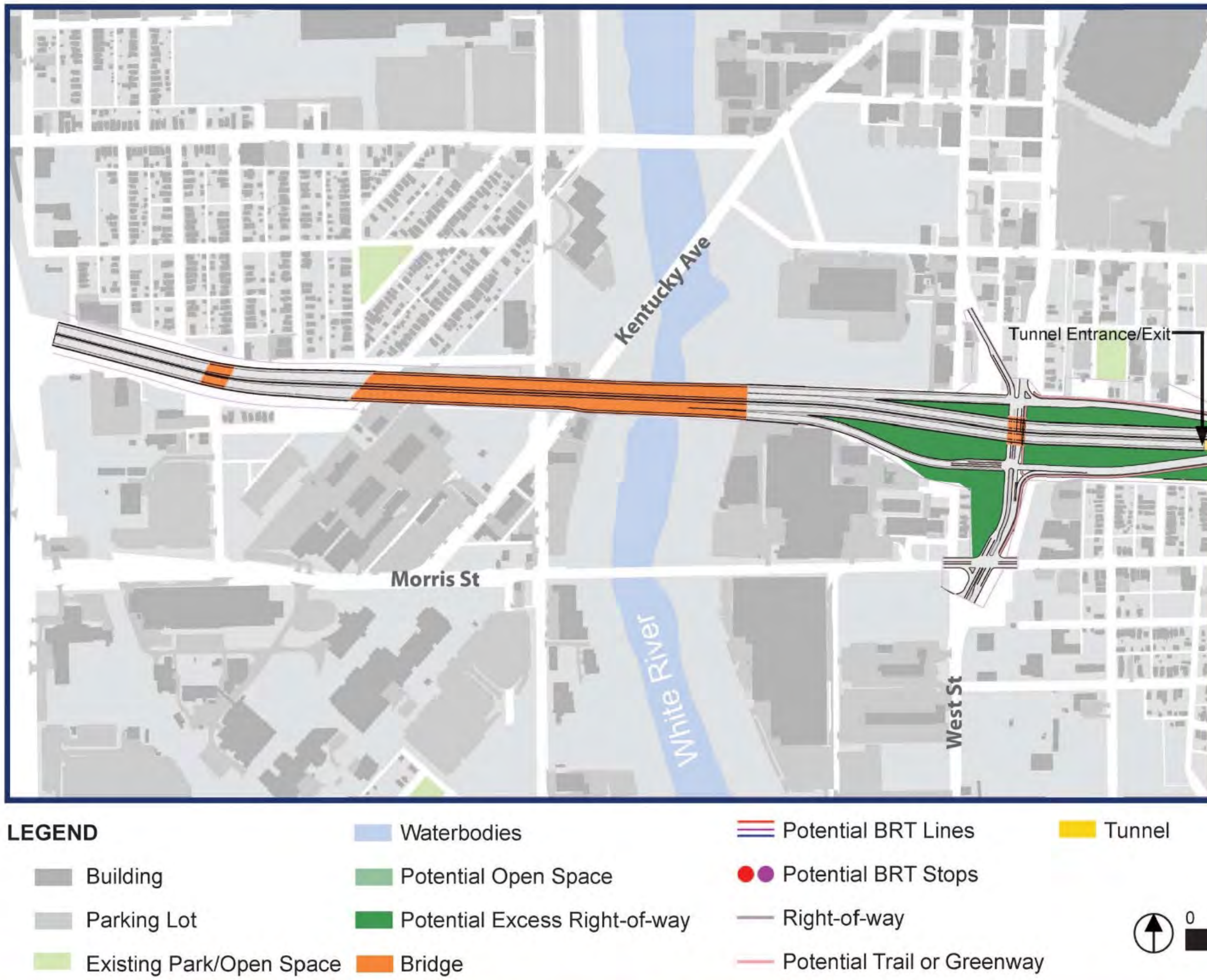
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Potential Excess Right-of-way
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Potential Trail or Greenway
- Tunnel

0 0.1 0.2 Miles

Sheet 4

CONCEPT 6: BOULEVARD + TUNNEL

NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 5

CONCEPT 6: BOULEVARD + TUNNEL

NORTH SPLIT UPGRADES DRIVING PROGRESS

10 CONCEPT 7: NEW INTERSTATE LINK UNDER WEST STREET BOULEVARD

With this concept, a new interstate link would be provided on the west side of the downtown area to link I-65 at the Martin Luther King Boulevard/West Street interchange to I-70 at the West Street interchange. I-65 would be routed through a tunnel on this alignment under West Street, then it would follow I-70 east on the south leg of the inner loop to rejoin existing I-65 at the South Split. The north leg of the inner loop would be reconstructed as a six-lane boulevard. West Street would also be reconstructed as a six-lane boulevard over the new I-65 tunnel.

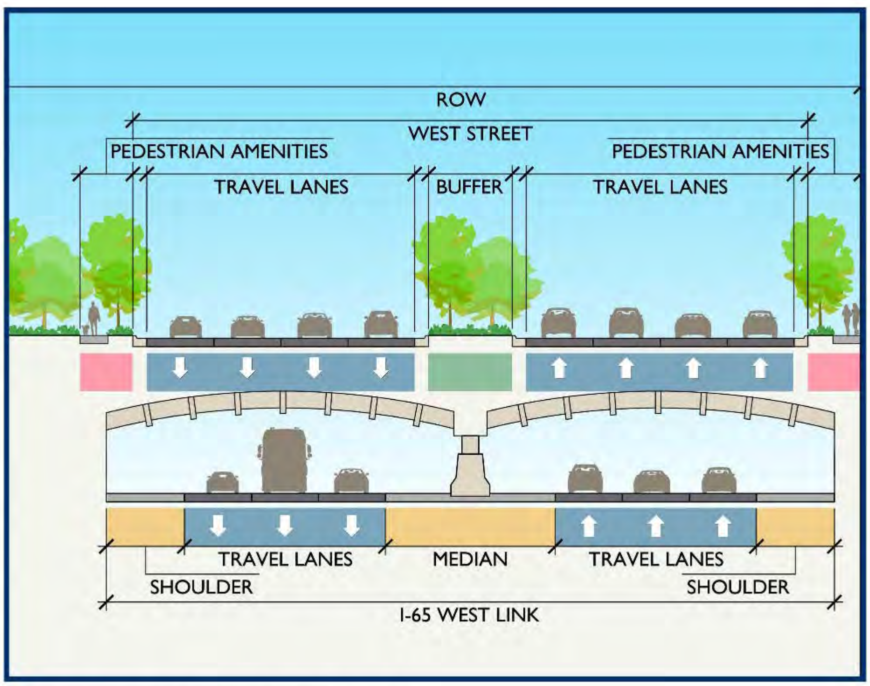
The I-65 tunnel under West Street would provide uninterrupted service for traffic moving through the downtown area and the West Street Boulevard would collect and distribute traffic from the downtown street grid. Both the West Street Boulevard and the north leg boulevard would be low-speed, divided roadways with signalized intersections, a landscaped median in the center, and landscaped edges. Unlike the existing interstates, where pedestrian and bicycle traffic is prohibited, use of these modes along and across the boulevards would be encouraged, with facilities incorporated into the design. A typical section showing the components of Concept 7 is presented in **Figure 10-1**.

This concept would require decommissioning of I-65 on the north leg of the downtown interstate loop as described in **Chapter 2** and I-65 would have to be rerouted to the new alignment. By placing the I-65 traffic underground, the benefits of lower speed, well landscaped multi-modal boulevards could be achieved at the surface. The existing portions of I-65 and I-70 outside the downtown are assumed to be physically unchanged.

As with all concepts being reviewed in this analysis, the West Street Boulevard and I-65 tunnel option is assumed to be a representative configuration rather than a final design.

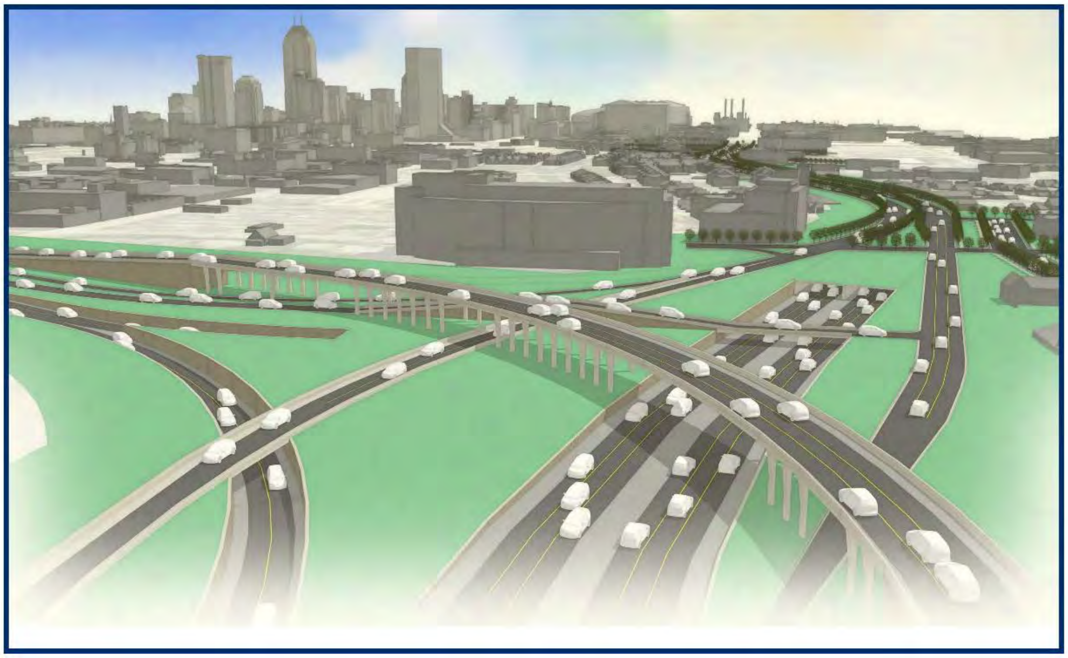
A rendering view of the West Street Boulevard and I-65 tunnel as it would appear at the Martin Luther King Boulevard/West Street interchange is shown in **Figure 10-2**. A cut-away of the boulevard/tunnel at New York Street is shown in **Figure 10-3**, and an image of how the boulevard might appear at Ohio Street is provided in **Figure 10-4**.

Figure 10-1: Concept 7 West Street Boulevard and Tunnel



NEW WEST STREET INTERSTATE LINK
West Street at Washington Street

Figure 10-2: Rendering Concept 7 I-65 Tunnel at West Street Interchange

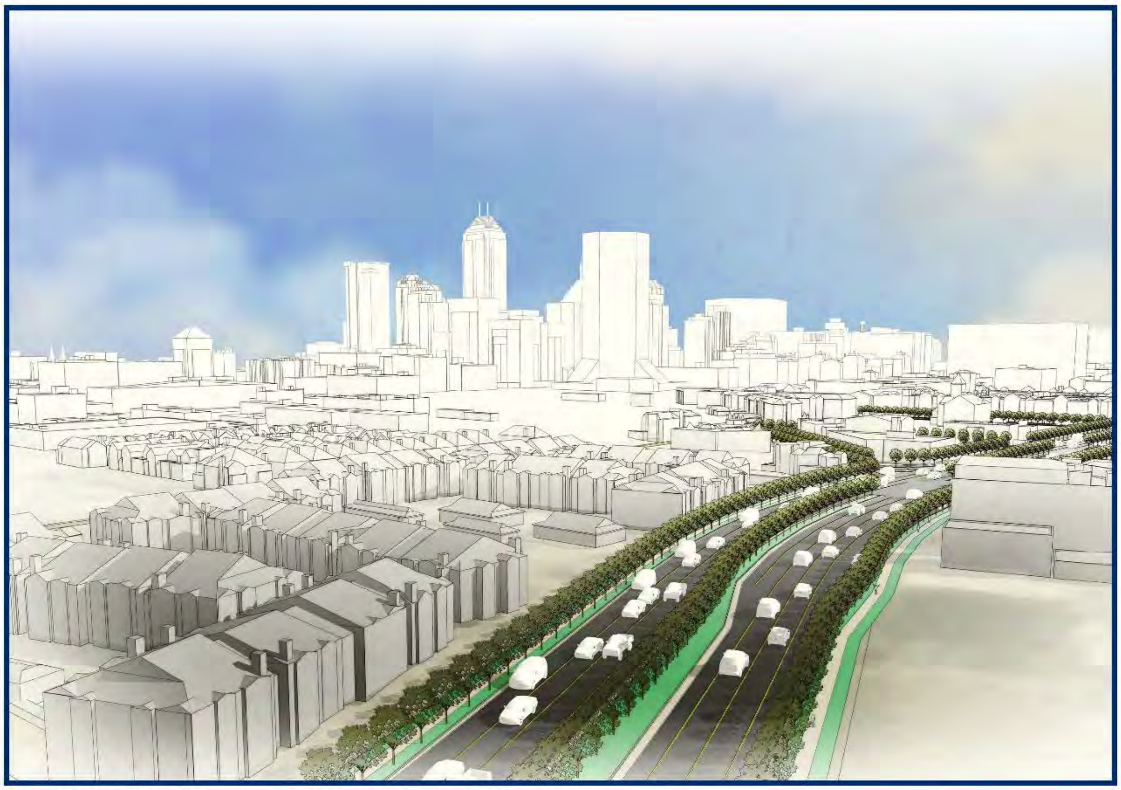


View of I-65 and West Street Interchange Looking South

Figure 10-3: Rendering Concept 7 I-65 Tunnel under West Street

View of West Street Over New Interstate Tunnel Looking North Towards New York Street

Figure 10-4: Rendering Concept 7 I-65 Tunnel/West Street Boulevard at Ohio Street



View of West Street Over New Interstate Tunnel Looking South

10.1 Concept 7 Configuration

The assumed layout of Concept 7 used for travel demand modeling, cost estimating, and impact review is shown in a series of six maps provided at the end of this chapter. As with Concept 5, two assumptions are made to balance the objectives of providing a neighborhood scale facility on West Street while serving regional travel demand with the I-65 tunnel. The boulevards are assumed to have three lanes in each direction, and free-flowing interchanges are assumed in all four quadrants of the inner loop.

Common assumptions for all boulevards in Concept 7 are the same as those listed in **Section 8.1** for Concept 5. The I-65 tunnel is assumed to be continuous except at entry and exit portals as shown on the maps at the end of this chapter.

Following is a description of the assumed representative layout for Concept 7 used in this analysis. The description includes references to six map sheets provided at the end of this chapter. The map sheet section begins with a key map to show the location of each map sheet.

North Leg

The north leg of Concept 7 from the Martin Luther King Boulevard/West Street interchange to the North Split interchange is shown in Sheets 1 and 2 at the end of this chapter. Concept 7 would include the following major changes:

- I-65 from the north would be lowered south of the 16th Street overpass and would be below street level as it crosses 11th Street. The Martin Luther King Boulevard/West Street interchange would be reconstructed to provide access to the boulevard along the north leg and the local streets (11th Street, West Street, Martin Luther King Boulevard).
- The existing I-65 section from West Street to the North Split would be reconstructed as a six-lane boulevard as described for Concept 5 in **Section 8.1**.

East Leg

The east leg of Concept 7, from the North Split interchange to the South Split interchange, is shown in Sheets 3 and 4 at the end of the chapter. Assumptions related to this section are as follows:

- This section of I-70 would be reconstructed in a way similar to existing, as with Concept 1 in **Section 4.1**.

South Leg

The south leg of Concept 7, from the South Split interchange to West Street, is shown in Sheets 4 and 5 at the end of this chapter. Assumptions related to this section include the following:

- This section of I-70 would be reconstructed in a way similar to existing, as with Concept 1 in **Section 4.1**, with the addition of one lane eastbound on I-70 from the West Street tunnel ramp to the South Split.
- The West Street/Missouri Street interchange would be reconstructed to serve the West Street Boulevard and I-65 tunnel from the north.

West Leg

The west leg of Concept 7, from the Martin Luther King Boulevard/West Street interchange to the West Street/Missouri Street interchange, is shown in Sheets 1, 5, and 6 at the end of the chapter. Assumptions related to this section are as follows:

- I-65 would be constructed as a six-lane freeway in a tunnel under West Street, with access to the local street system provided by a surface boulevard similar to the existing West Street layout.
- A new directional interchange would be constructed at I-70 and West Street, just east of the bridge over the White River.

10.2 Concept 7 Performance

As described in **Section 3.1**, a subarea microsimulation model derived from the IMPO regional travel demand model is used to measure the performance of the system-level concepts within a designated traffic study area in the vicinity of the downtown. The microsimulation model considers localized traffic operations in addition to the route capacity factors considered in the IMPO model.

Table 10-1 shows the expected changes in total VMT and VHT during the morning peak hour if Concept 7 was implemented. The values in **Table 10-1** indicate that motorists would be driving about 5% further in the traffic study area during the morning peak than they do today, indicating that they are avoiding congested routes. The total VHT in the subarea in and near downtown would increase by 21% in Concept 7, with 23% more delay. These measures indicate that motorists would drive further and take more time to get where they are going with Concept 7.

Table 10-1: Concept 7 System-Level Performance Measures, AM Peak

AM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 7 (West St Tunnel)	Percent Change
Vehicle Miles of Travel (VMT)	311,565	325,882	5%
Vehicle Hours of Travel (VHT)	43,880	52,948	21%
Total Delay (hours)	21,346	26,347	23%

Figure 10-5 illustrates the general pattern of traffic changes in the morning peak with Concept 7. Roads with traffic increases are shown in red and those with decreases are shown in blue. The heavy red line on West and Missouri Streets represents the tunnels, which show a large traffic increase since they currently do not exist. Traffic on the north leg boulevard and the east leg would be lower than existing interstates. Some north-south streets downtown would have lower volumes than existing as traffic balances in response to the additional West Street capacity. East-west traffic would increase due to the loss of capacity on the north leg.

Table 10-2 shows the expected changes in total VMT and VHT in the traffic study area during the afternoon peak if Concept 7 is implemented. The values are similar to the morning peak, except all levels are somewhat higher. Motorists would drive a bit further than they do today, and it would take an average of about 24% longer.

Table 10-2: Concept 7 System-Level Performance Measures, PM Peak

PM Peak Performance Measures Traffic Study Area – Downtown Vicinity	Concept 1 (No-Build)	Concept 7 (West St Tunnel)	Percent Change
Vehicle Miles of Travel (VMT)	351,685	375,371	7%
Vehicle Hours of Travel (VHT)	48,711	61,769	27%
Total Delay (hours)	23,471	29,176	24%

Figure 10-6 illustrates the general pattern of traffic changes in the afternoon peak with Concept 7. Roads with traffic increases are shown in red and those with decreases are shown in blue. The heavy red line on West and Missouri Streets represents the tunnels, which show a large traffic increase since they currently do not exist. As in the morning peak, traffic on the north leg boulevard and the east leg would be lower than existing interstates, and most north-south streets downtown would have lower volumes as traffic responds to the additional West Street capacity. East-west traffic would increase on some streets due to the loss of capacity on the north leg.

Overall, the high levels of total VHT and total delay indicate that the addition of a new interstate tunnel link under West Street would not divert sufficient traffic from the north leg boulevard to provide good service at a system level. The north boulevard would be highly congested with daily traffic volumes near 50,000 vehicles per day, and the signalized intersections would result in significantly higher delays than motorists are currently experiencing in the corridor.

Figure 10-5: Concept 7 - AM Traffic Flow Compared to No-Build

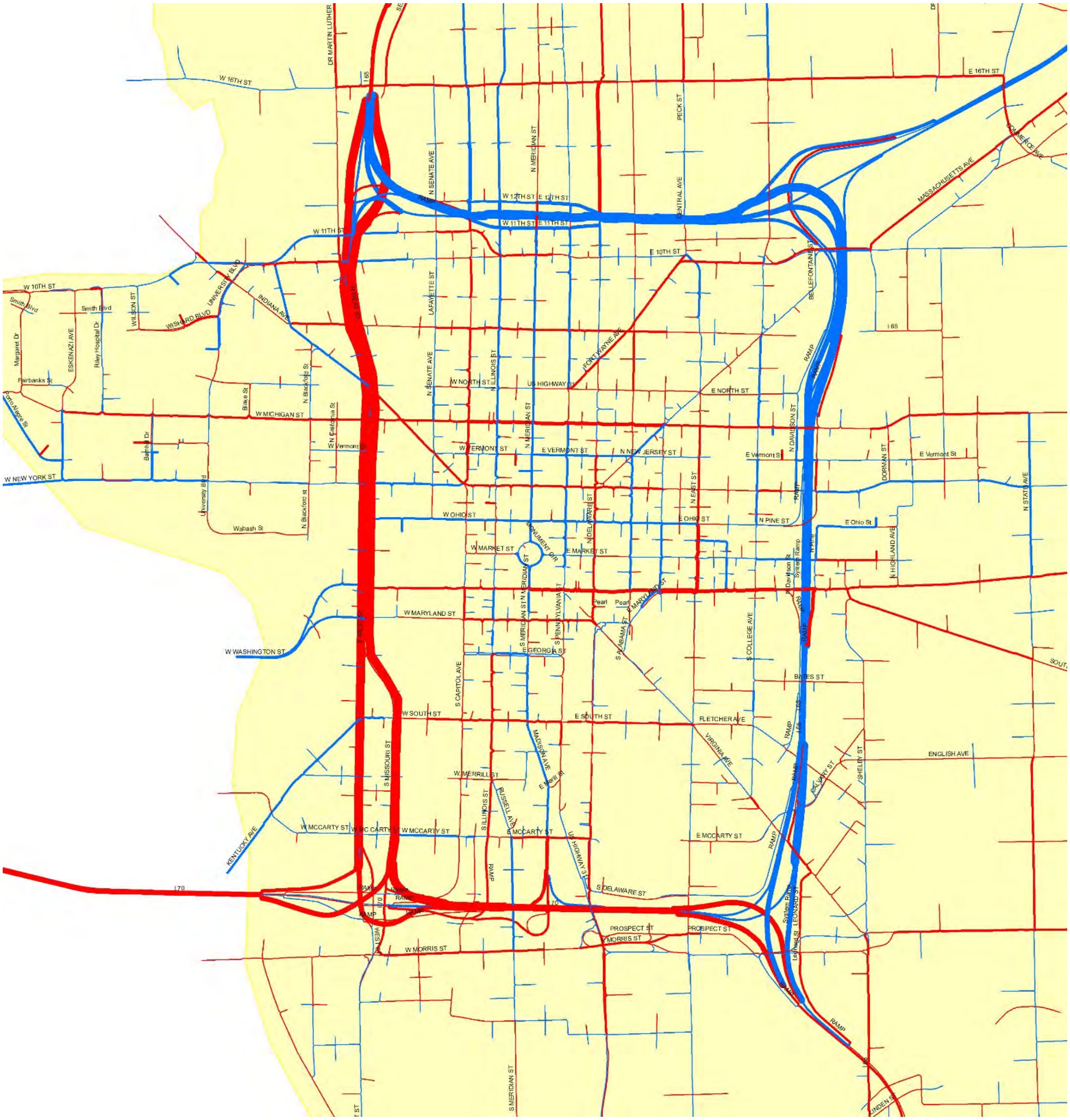
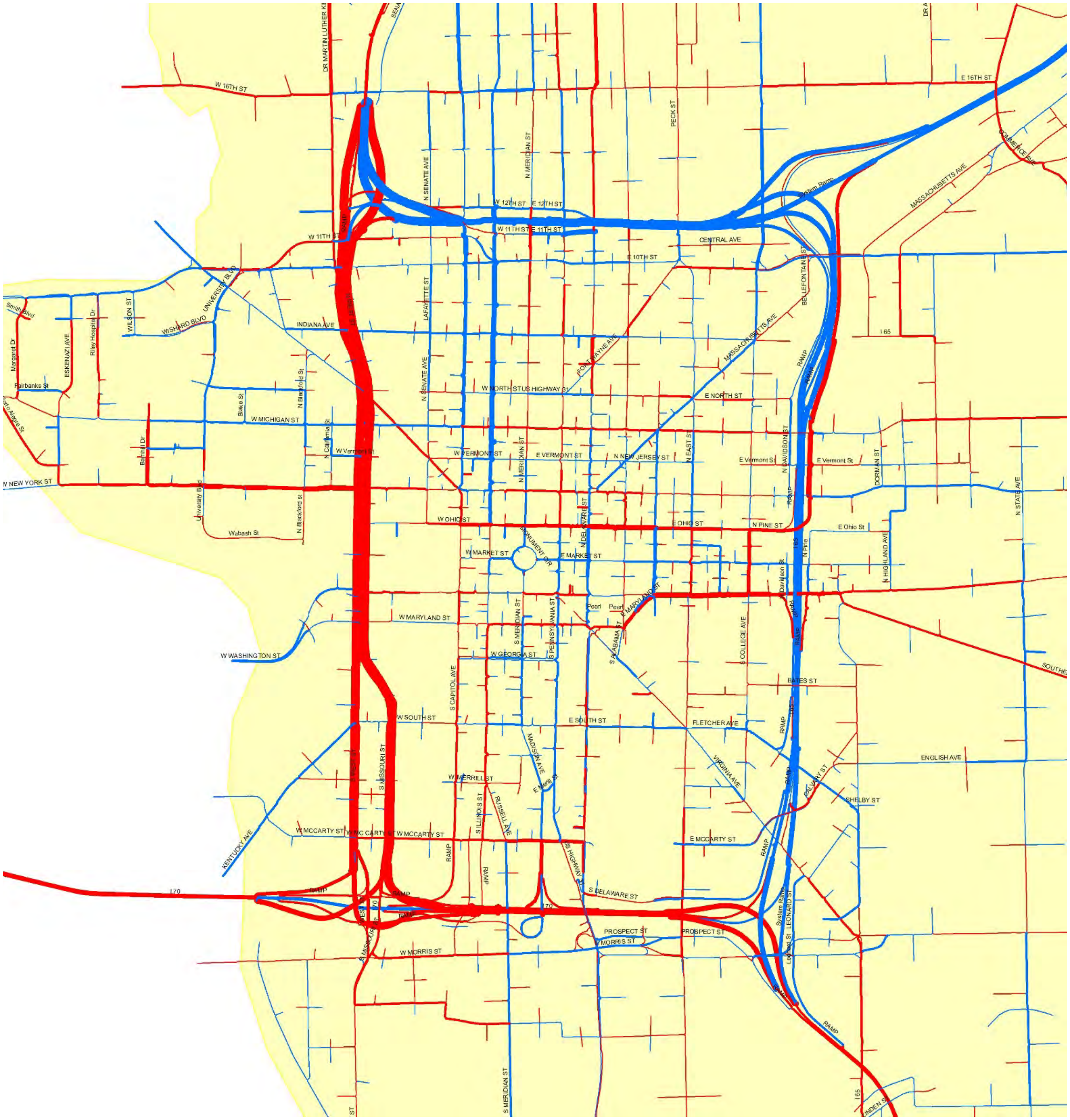


Figure 10-6: Concept 7 - PM Traffic Flow Compared to No-Build



Microsimulation modeling indicates that reduction in capacity on the north leg would create traffic back-ups (queuing) in all directions on the interstates approaching downtown in both the morning and afternoon peak hours. Following are approximate back-of-queue limits for the worst-case morning or afternoon peak hour with Concept 7:

- North: 4-7 miles (Kessler Boulevard to Lafayette Road)
- East: 5-7 miles (Arlington Avenue to I-465)
- South: 4-7 miles (I-465 to Southport Road)
- West: 1-3 miles (Harding Street to Holt Road)

10.3 Concept 7 Estimated Cost

The basis for cost estimating for system-level concepts is provided in **Section 3.2**. Estimated construction cost is provided in a range given the level of uncertainty at this conceptual stage. For the purposes of cost estimating, Concept 7 is generally described as follows:

Concept 7 consists of removing and reconstructing 7 miles of I-65 and I-70, and removing a 2-mile section of West Street to be replaced with a new tunnel to carry I-65 traffic. West Street would be reconstructed as a boulevard on top of the new tunnel. The interstate on the north leg of the inner loop would be removed and a boulevard would be constructed. I-70 would be reconstructed on the east and south legs.

Following are primary factors that could cause the cost of Concept 7 to be higher or lower within a range:

- Support of Excavation. Depending on analysis of soil conditions along with structural engineering and design, the temporary systems used to prevent collapse of the excavation during construction would significantly impact the cost.
- Construction Phasing. The amount of space provided to the contractor during a phase of construction would drive the cost up or down. Allowing the contractor access to lanes in both directions is one way to reduce cost.
- Interchange design. Utilization of earth fill in lieu of walls, designing an alignment allowing for basic column and cap structures, and keeping architectural features to a minimum would reduce cost.
- Water Table. In parts of the downtown area, the water table would be within the level of the tunnel system. Dewatering systems (pumps, piping, etc.) could have a significant effect on project costs.

Based on the above assumptions and primary factors, a range of estimated cost and an estimate of yearly O&M cost is presented for Concept 7, as follows:

Estimated Project Cost = $1.6 billion to $2.6 billion

Estimated Annual O&M Cost

Road = $2.9 million
Tunnel = $1.5 million

The actual cost of Concept 6 could exceed the maximum value in the above range based on conditions encountered in future engineering for underground systems. A more reliable estimate of feasibility and cost would require detailed site-specific evaluation of groundwater levels, geotechnical conditions, and type and location of major utilities.

10.4 Concept 7 Estimated Impacts

Impacts are estimated below for traffic on neighborhood and downtown streets, construction impacts, neighborhood connectivity, right-of-way and relocations, historic resources, parks and recreation areas, and natural resources.

10.4.1 Local Street and Neighborhood Traffic Impacts

Traffic changes in and near downtown with the implementation of Concept 7 are shown in **Figure 10-7** for the morning peak and **Figure 10-8** for the afternoon peak. Traffic increases are shown in red and decreases are shown in blue. Changes on the interstates and West Street are solid arrows. The open arrows represent total traffic on local streets that cross each leg of the inner loop or West Street to enter or leave downtown.

As would be expected with a new interstate link to form a west leg for the inner loop, traffic on the interstate links would be higher than existing on the west and south legs, and lower on the north and east legs during both peak hours. Traffic would be 5% to 11% higher on the I-65 connections north and south of the inner loop indicating an attractiveness of the new I-65 route for longer trips. This is even more pronounced on I-70 west of the downtown loop, which would increase by 28% in the morning peak and 20% in the afternoon peak.

Local traffic movements on streets that cross the inner loop or West Street from outside the inner loop would be lower on the north and west in both the morning and evening peak. Traffic east of the inner loop would increase by 14% in the morning. Traffic south of the inner loop would increase by 17% in the afternoon peak. Traffic on streets that cross the inner loop or West Street inside the inner loop would increase sharply to the south and east during both peak hours, in the range of 21% to 34%. Traffic on local streets that cross the north leg from outside the inner loop would be 25% lower than existing during the evening peak. These patterns suggest motorists are avoiding the congested signalized boulevard intersections on the north leg when they enter or leave downtown.

Most changes on individual routes would be modest. A large increase is shown on Fort Wayne Avenue because it links with College Avenue, which retains an overpass at the North Split interchange instead of a signalized intersection on the north leg. The largest changes on individual streets with Concept 7 are listed below:

- Fort Wayne Avenue at Delaware Street: 100% increase (pm peak)
- 16th Street at Capitol Avenue: 60% increase (am peak)
- Kentucky Avenue 45% decrease (am peak)
- Washington Street at West Street: 25% decrease (am peak)

10.4.2 Construction/Maintenance of Traffic Impacts

The estimated construction duration for Concept 7 is seven years. A high water table and existing soils comprised of sand and gravel deposits would require pumping and dewatering during construction of the tunnel. Tall temporary retaining walls would be constructed half at a time, and the permanent retaining walls would have deep foundations. Extensive permanent stormwater control systems would be required to prevent flooding and to keep the depressed section dry, especially during peak storm events.

At West Street, since the existing lanes are within the same footprint of the new interstate through most the corridor, the construction phasing would have to occur by halves. All northbound and southbound traffic would be placed on one side of West Street, with excavation of the other lanes on the other side. This would require incremental closures for construction of local crossing streets to minimize disruption to local street network. The interchange reconstruction of Martin Luther King Boulevard and the new interchange at I-70 and West Street would be constructed under phased traffic to minimize disruption of access into and out of downtown.

Figure 10-7: Concept 7 Traffic Volume Changes (AM peak)

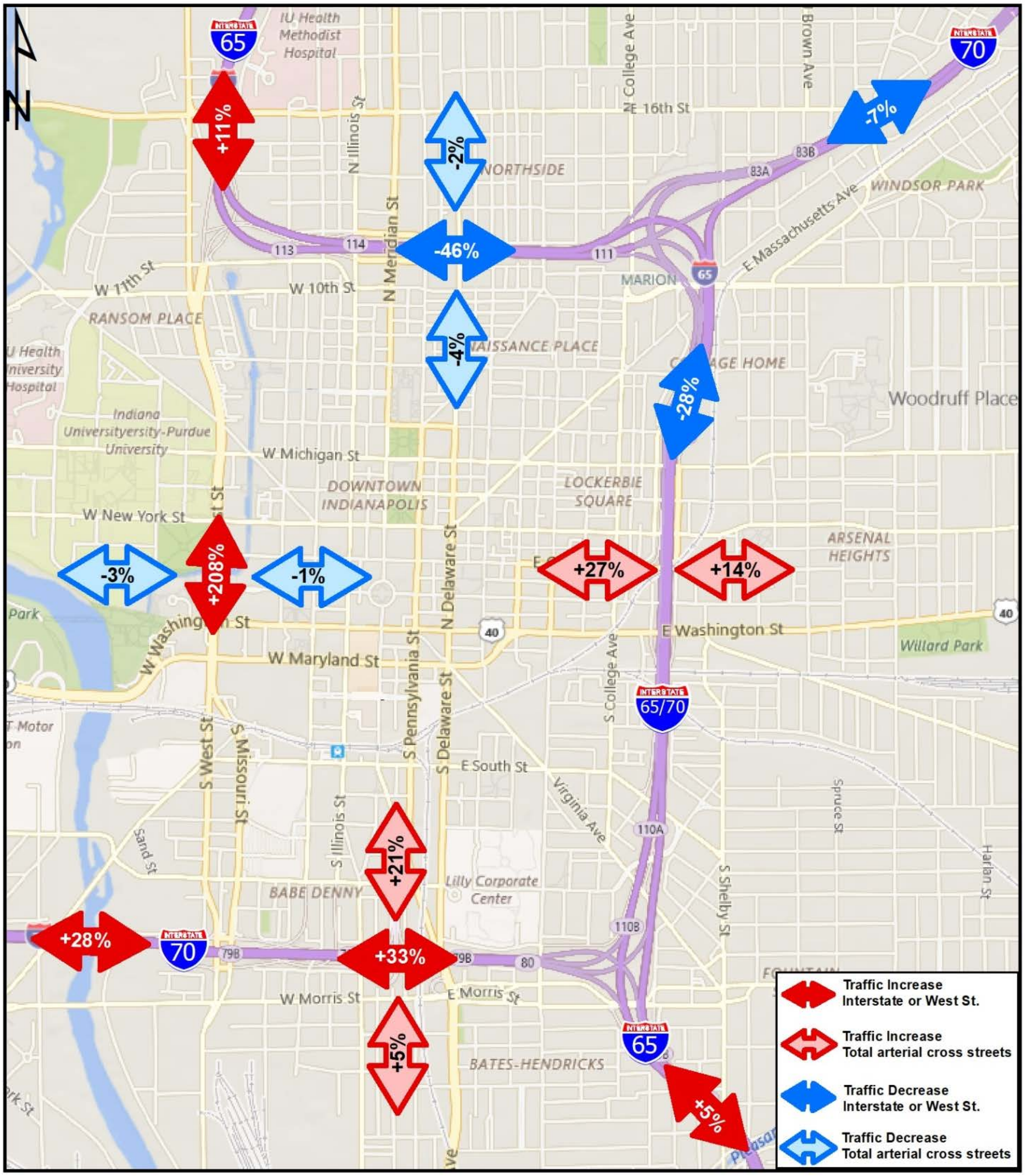
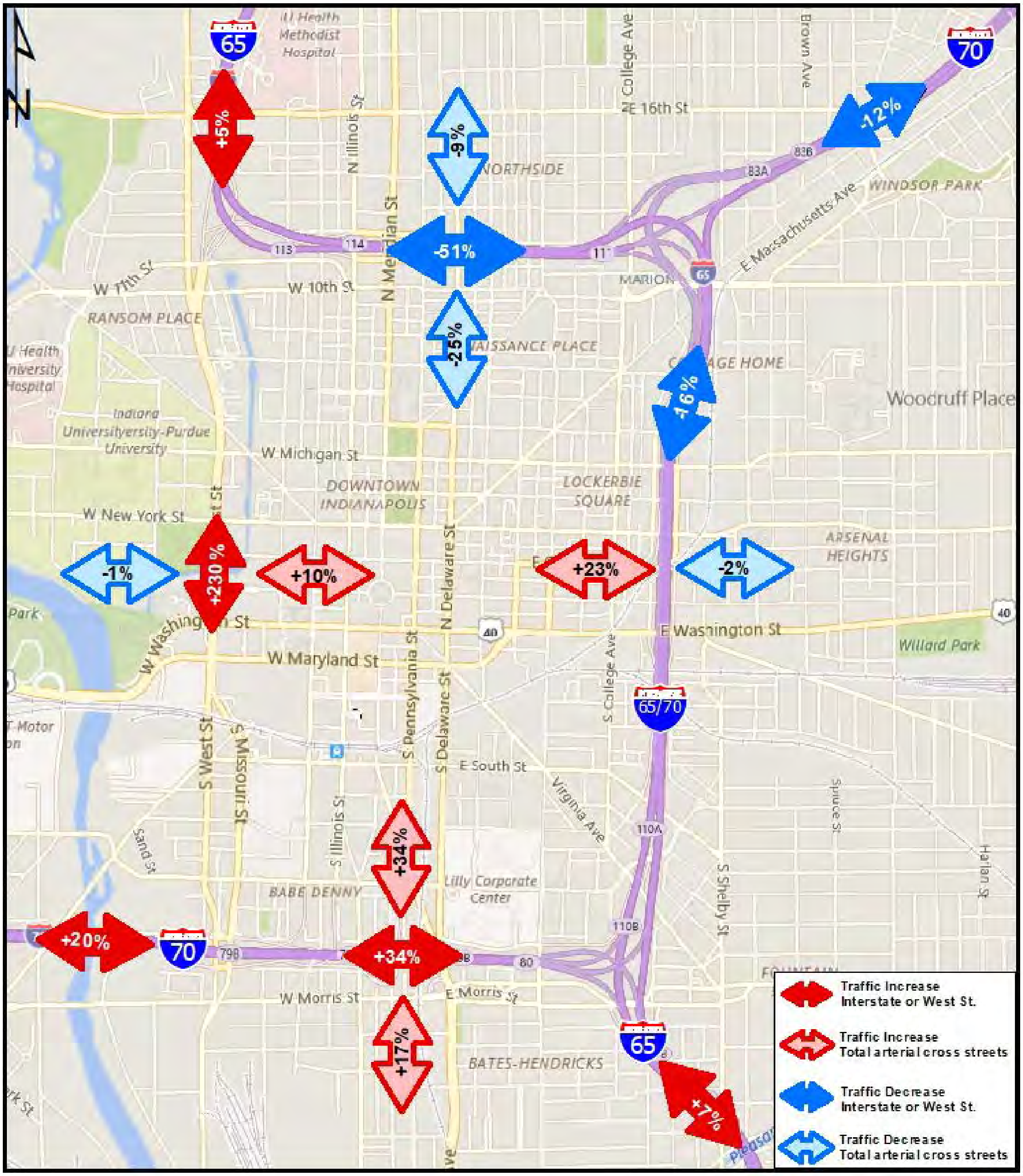


Figure 10-8: Concept 7 Traffic Volume Changes (PM peak)



For the I-65 north leg, as in Concept 5, the initial phase would be to move the traffic destined to and from downtown to the existing 11th and 12th Streets. The next phase would be removal of the existing mainline lanes and bridges between the exits. Once the existing interstate is removed, segmental construction of the at-grade boulevards and intersections with the local street system would occur.

The upgrade of the east leg and south leg would be similar to the maintenance of traffic description of Concept 3. The interchange reconstructions at Martin Luther King Boulevard, North Split, and South Split interchanges would be completed under traffic to maintain connectivity to and from the local street network. Some phased detours and ramp closures might be required.

10.4.3 Neighborhood Connectivity and Visual Continuity

From the connectivity and visual continuity perspective, this concept would have several challenges. For the north leg, the at-grade boulevards would blend into the existing grid layout of downtown, reducing the perception of the existing interstate as a barrier between neighborhoods and downtown. This concept would include numerous intersections with high traffic volumes and turning movements, which would result in greater congestion for motorists along the boulevard and elsewhere on the local street network throughout downtown. Careful attention would need to be paid in creating safe and accessible pedestrian and bicycle facilities within the corridor. This concept would provide good unobstructed visibility through the corridor.

The east leg of the interstate would remain as it exists, built largely on fill directly south of the North Split transitioning into a depressed section toward the South Split, with only certain bridges/underpasses at specific locations allowing people and cars to pass. Because of this constraint, connections would be more limited and directed. In addition to being a physical barrier, the fill also creates a visual barrier limiting views through the interstate. To improve on connectivity on this leg, attention should be paid to creating appropriate-width pedestrian facilities on all streets that pass under the interstate, ensuring that all streets that currently pass under the interstate remain open, and paying specific attention to the design of features that help users feel safer.

Since the south leg would remain in its current form, connectivity and visual challenges would be similar to existing conditions. Connectivity challenges on the south leg would include the existing land uses and the lack of existing multi-modal facilities.

In its current form, West Street's width and traffic levels create a barrier now between downtown and the areas directly west of downtown. The reconstructed West Street would have to allow for the safe movement of vehicles, bikes, and pedestrians to make these connections more substantive. Multi-modal improvements to the intersections would be needed to create safe and usable connections across the corridor. The use of the tunnel for interstate traffic would maintain the open views that currently exist across West Street.

The number of travel lanes and the number of vehicles that would use the boulevards would be significant on both the north leg and on West Street in determining the degree that traffic would create a physical obstruction to connectivity across the corridors.

10.4.4 Right-of-Way and Relocations

Concept 7 is estimated to impact 40 to 50 acres of new right-of-way, which is primarily industrial, railroad, utility, and vacant land uses. It is also estimated to require 30 to 40 relocations which are primarily commercial, industrial, residential, and religious properties. There are several properties along West Street that would require relocation. Right-of-way impacts and relocations may be avoided or minimized during the NEPA process and the design phase.

10.4.5 Historic Resources

Concept 7 would require right-of-way acquisition and several relocations from the Ransom Place Historic District. It may impact the Madame Walker Theatre Building which is individually listed in the National Register. Concept 7 may require strip right-of-way from Military Park, which is listed in the National Register. It would cross the Indianapolis Park and Boulevard System Historic District on the I-70 bridge over the White River. It may be possible to avoid direct impacts to historic properties during the NEPA process and the design phase. Visual and noise effects are possible to adjacent historic properties and would be determined as part of the Section 106 consultation for this concept.

10.4.6 Parks, Recreational Areas, and Trails

Temporary impacts to the Monon Trail; Cultural Trail at 10th Street, Virginia Avenue, Washington Street, and St. Clair Street; Pogues Run Trail; White River Wapahani Trail; and Downtown Canal Trail would occur during construction over or near the trails. Permanent impacts to the trails are not anticipated. There could be an opportunity for trails along the north leg boulevard.

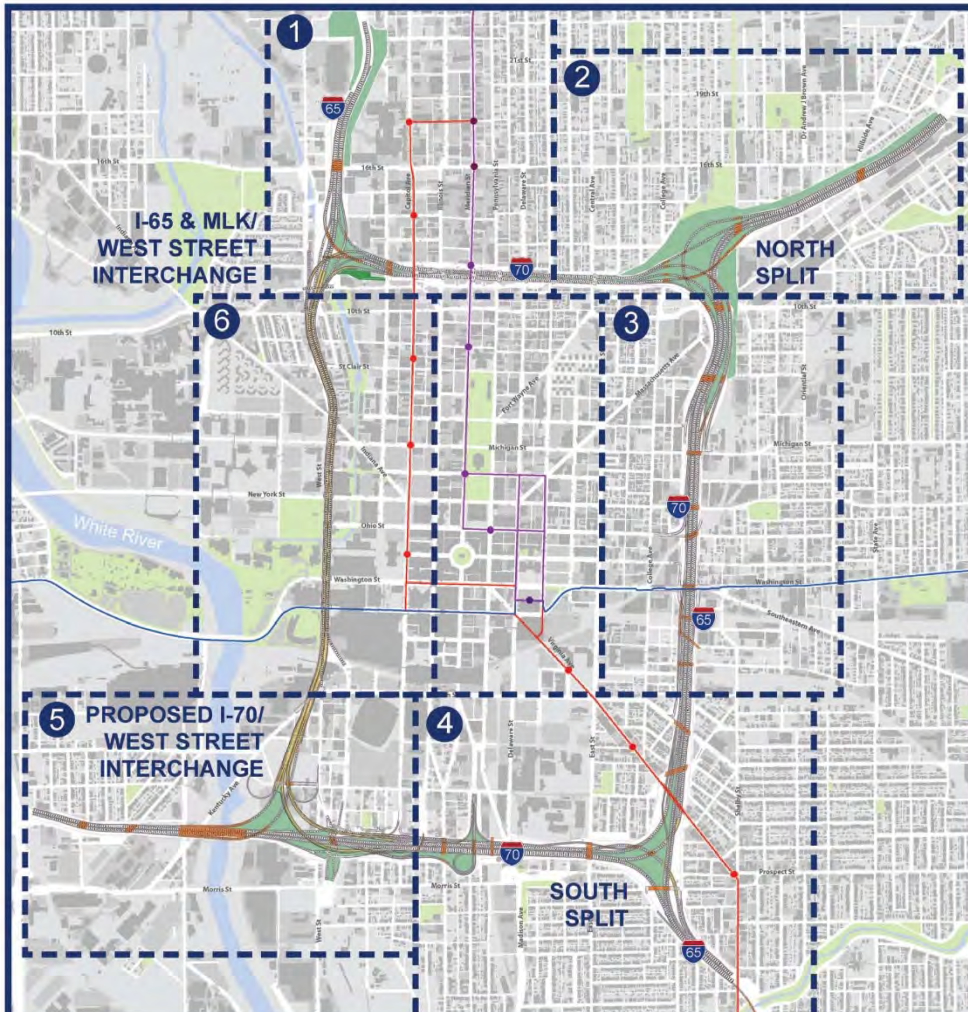
Concept 7 may require strip right-of-way along West Street from the Victory Field and Eiteljorg Museum properties which are within White River State Park. As noted above, it may also require strip right-of-way from Military Park.

10.4.7 Natural Resources

Concept 7 would impact trees within the existing right-of-way planted by local community groups and neighborhoods as well as volunteer trees that have grown naturally. Reconstruction of the I-70 White River Bridge would potentially result in impacts to the White River due to causeways. Impacts to the White River floodway would likely be greater than the other concepts because of the new interchange just east of the bridge.

Concept 7 Map Sheets

New Interstate Link under West Street Boulevard



CONCEPT 7: OVERVIEW

- Provide a tunnel under West Street for I-65 through traffic
- Construct a six-lane divided boulevard on the north leg
- Install traffic signals at all boulevard intersections
- Retain system interchanges for boulevard access

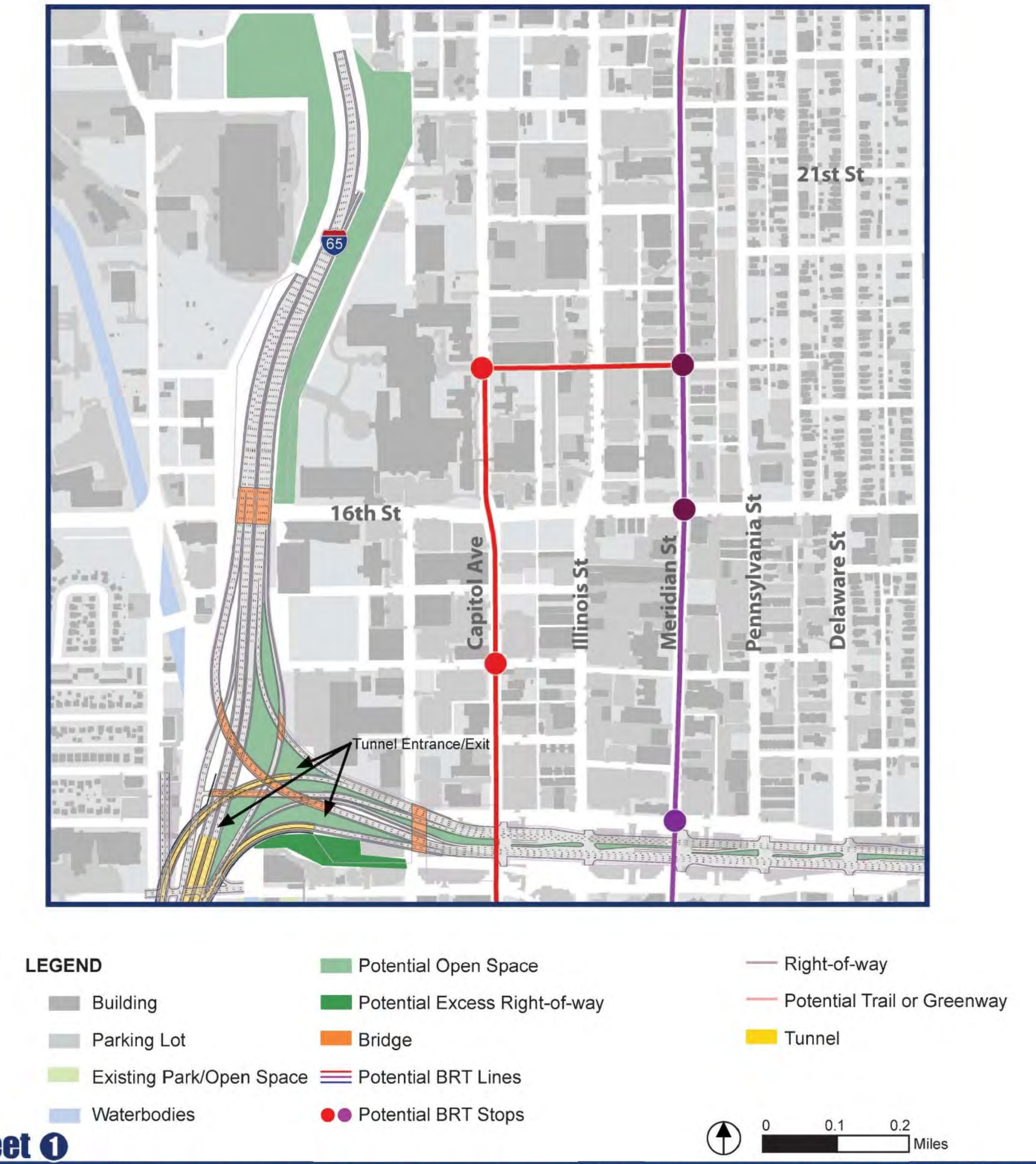
LEGEND

- Sheet
- Building
- Parking Lot
- Existing Park/Open Space
- Waterbodies
- Potential Open Space
- Potential Excess Right-of-way
- Bridge
- Potential BRT Lines
- Potential BRT Stops
- Right-of-way
- Sheet Numbering
- Potential Trail or Greenway
- Tunnel

Key Map

CONCEPT 7: NEW INTERSTATE LINK

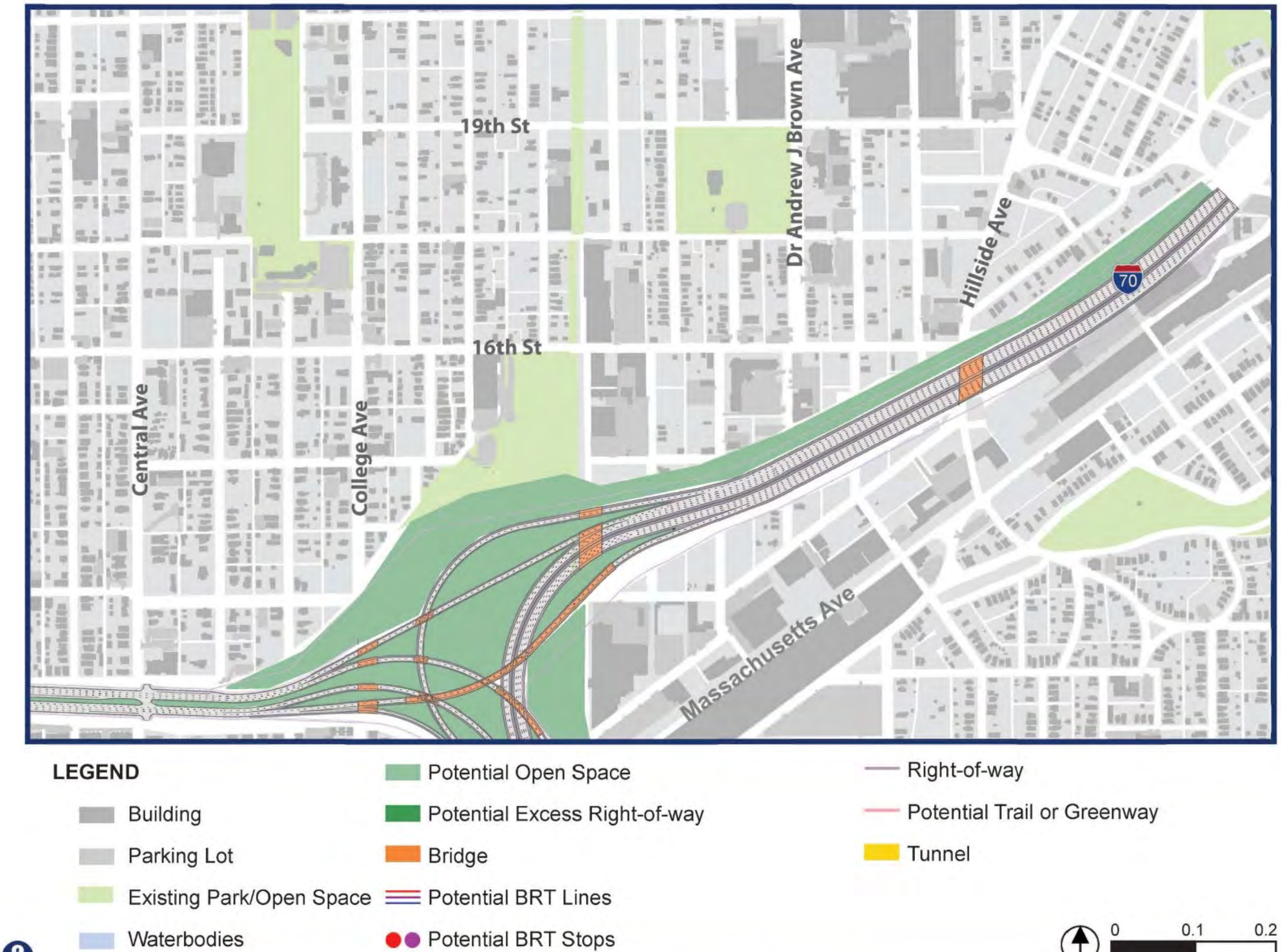
NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 1

CONCEPT 7: NEW INTERSTATE LINK

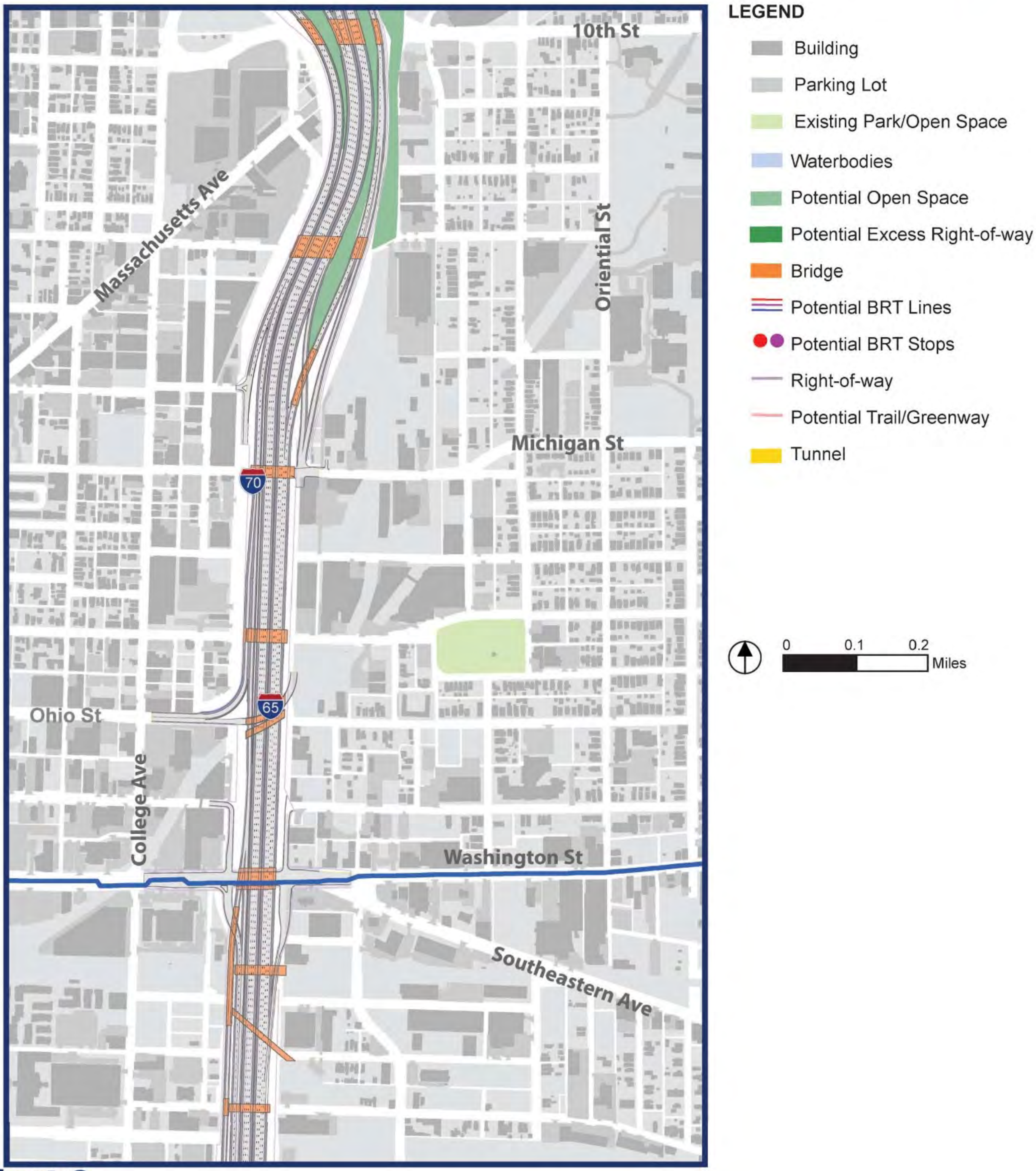
NORTH SPLIT UPGRADES DRIVING PROGRESS



Sheet 2

CONCEPT 7: NEW INTERSTATE LINK

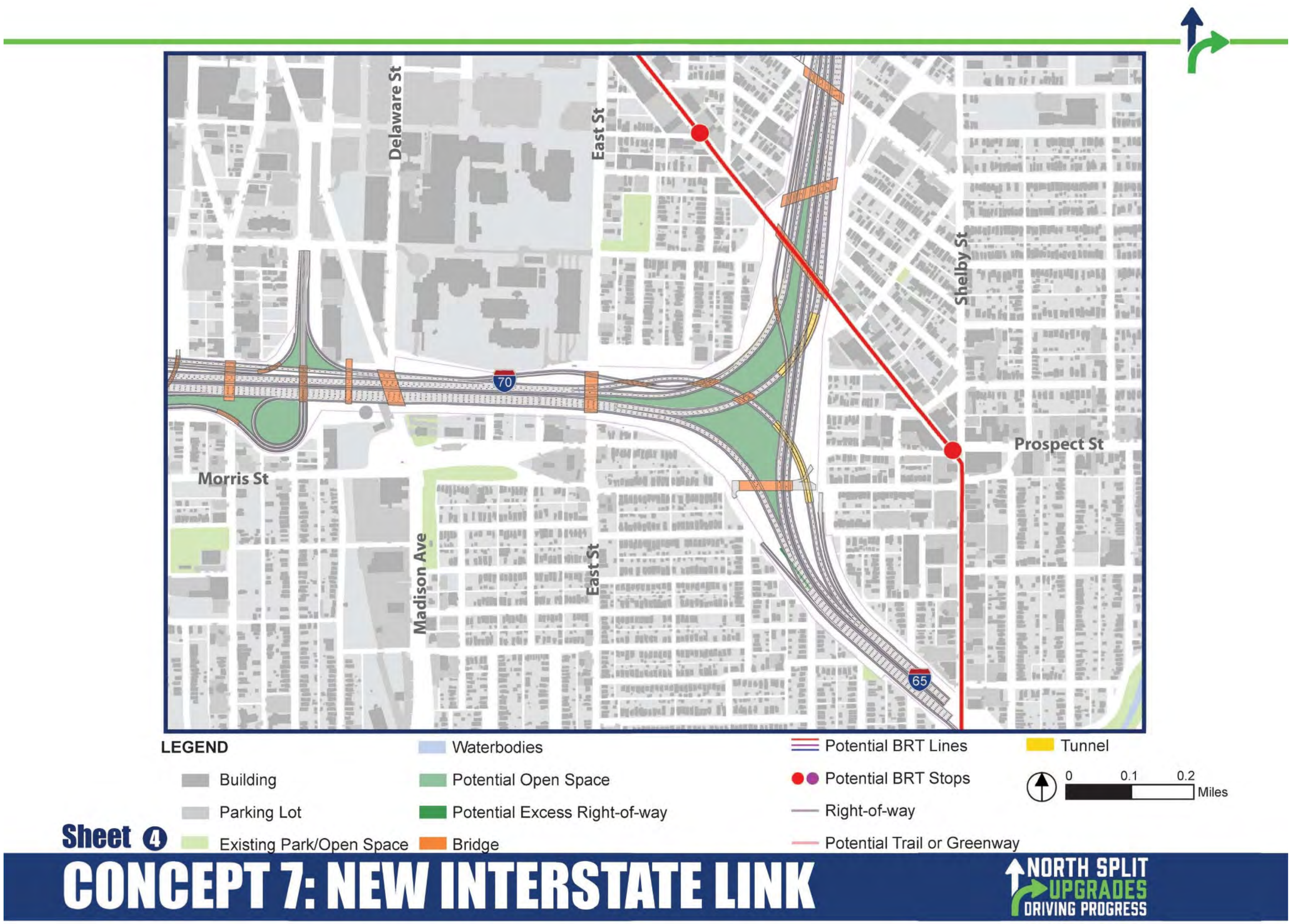
NORTH SPLIT UPGRADES DRIVING PROGRESS

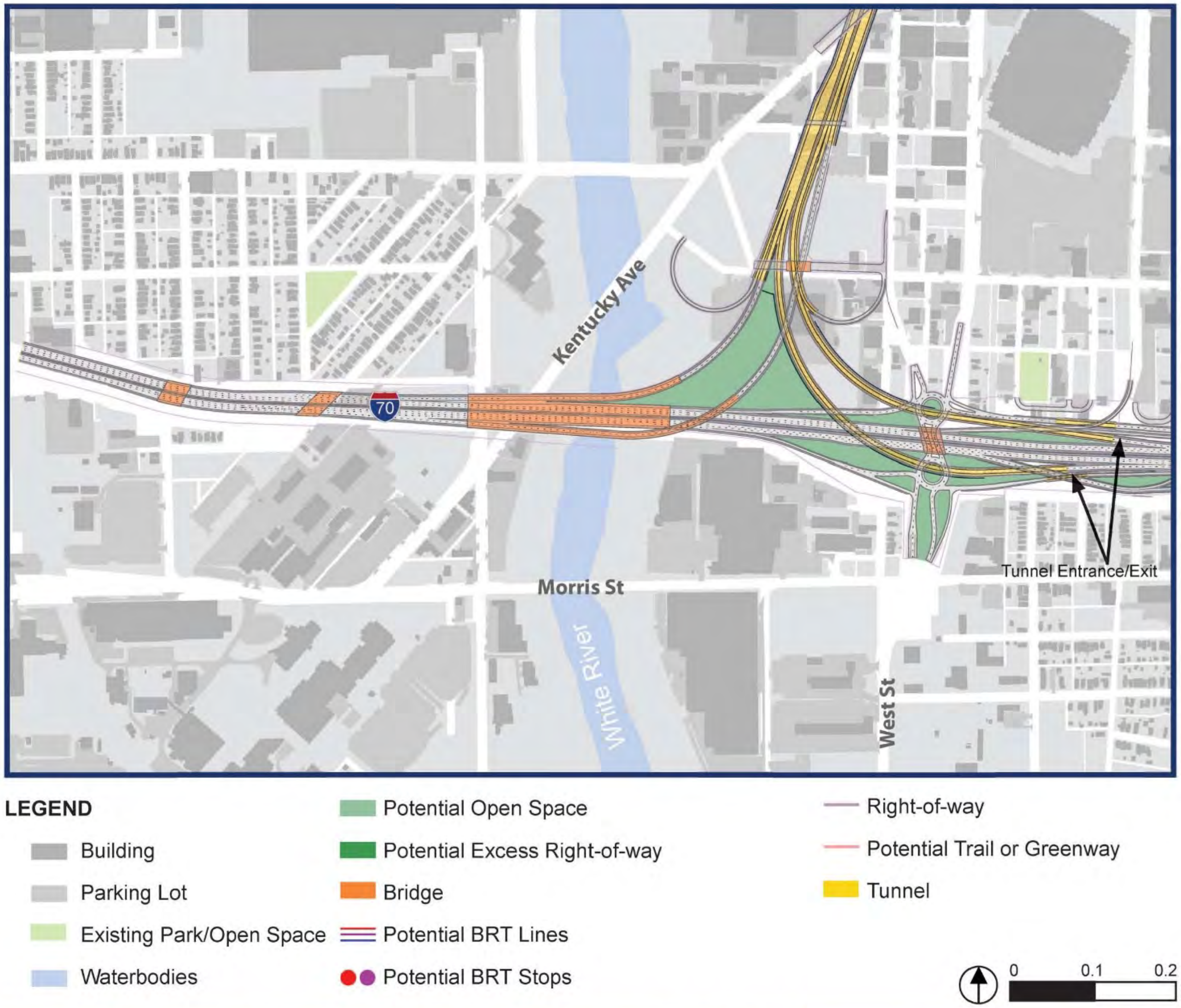


Sheet 3

CONCEPT 7: NEW INTERSTATE LINK

NORTH SPLIT UPGRADES DRIVING PROGRESS


Delaware St
East St
Shelby St
Prospect St
Morris St
Madison Ave
East St
70
65
LEGEND
Building
Parking Lot
Existing Park/Open Space
Waterbodies
Potential Open Space
Potential Excess Right-of-way
Bridge
Potential BRT Lines
Potential BRT Stops
Right-of-way
Potential Trail or Greenway
Tunnel
0
0.1
0.2
Miles
Sheet 4
CONCEPT 7: NEW INTERSTATE LINK
NORTH SPLIT
UPGRADES
DRIVING PROGRESS



Sheet 5

CONCEPT 7: NEW INTERSTATE LINK

NORTH SPLIT UPGRADES DRIVING PROGRESS

Sheet 6

CONCEPT 7: NEW INTERSTATE LINK

NORTH SPLIT UPGRADES DRIVING PROGRESS

11 SUMMARY AND CONCLUSIONS

As stated in **Chapter 1**, the intent of this analysis is to help define the scope of the North Split Project and inform current public dialogue regarding the downtown interstate system. This analysis does not make a specific recommendation for a future downtown system. Defining a vision for downtown interstates would require additional study with extensive community input. This analysis is intended to provide a baseline for discussion.

The North Split Project needs to move forward due to the deteriorated condition of the existing infrastructure. The existing bridges are structurally deficient and the pavement is aged beyond its useful life. Detailed technical studies and community involvement activities will be conducted in a NEPA process. Developing project-level alternatives is the next step for the North Split Project.

11.1 Summary of Concept Reviews and Conclusions Related to the North Split Project

The performance, cost, and impact of each concept reviewed in this analysis is summarized in this section, with conclusions of how the concept would interact with, or limit reconstruction options for the North Split interchange. Key information developed for each concept is presented in **Table 11-1**.

Table 11-1: Summary of Performance, Cost, and Impacts

CONCEPT	PERFORMANCE	COST	IMPACTS			
	Total Network Delay (compared to existing)	Estimated Cost	Time of Construction	Visual/ Connectivity	Right-of-Way (Total Area)	Relocations (properties)
Concept 1 No-Build (Maintain Existing)	No Change	---	---	No Change	No Change	No Change
Concept 2 Transportation System Management	---	---	---	---	---	---
Concept 3 Upgrade Existing Interstates	**10% less** delay (AM) **6% less** delay (PM)	**$900 M - $1.6 B**	**5 years**	Mixed/Good	**1-5 Acres**	5-10
Concept 4 Depress Downtown Interstates	**10% less** delay (AM) **6% less** delay (PM)	**$1.5 B - $2.4 B**	**6 years**	Good/Good	**5-10 Acres**	10-15
Concept 5 At-Grade Boulevards to Replace Interstates	**40% more** delay (AM) **145% more** delay (PM)	**$500 M - $900 M**	**4 years**	Good/Mixed	**1-5 Acres**	1-5
Concept 6 At-Grade Boulevards and Interstate Tunnels	**9% less** delay (AM) **3% more** delay (PM)	**$3.3 B - $5.5 B**	**10 years**	Good/Mixed	**5-10 Acres**	5-10
Concept 7 West Street Interstate Tunnel and Boulevard	**23% more** delay (AM) **24% more** delay (PM)	**$1.6 B - $2.6 B**	**7 years**	Mixed/Mixed	**40-50 Acres**	30-40

11.1.1 Concept 1 No-Build (Maintain Existing)

With the No-Build Concept, the existing downtown interstate system would be maintained with no operational improvements. The number of lanes and their locations would remain the same, and the existing ramp connections to local streets would not change. Additional detail regarding Concept 1 is provided in **Chapter 4** of this report.

Performance

Key performance measures for Concept 1 were estimated by modeling conditions in and near the downtown area. A key parameter is total delay experienced by all vehicles in the traffic study area during peak hours. Values for the No-Build Concept provide the baseline for comparison with all other alternatives. Estimated delay with Concept 1 is shown below.

Total delay (AM Peak)	**21,346 hrs**
Total delay (PM Peak)	**23,471 hrs**

Although operations could be improved at some locations, the existing downtown interstate system performs relatively well in serving regional travel needs. Traffic volumes vary from around 109,000 vehicles per day on the south leg of the inner loop to 161,000 vehicles per day on the east leg of the inner loop, and the North Split interchange alone sees 214,000 vehicles per day. The existing downtown interchanges and numerous grade crossings (bridges) provide good access and allow city streets to cross the interstates from all directions without conflict.

Cost

Although no capital improvements are assumed in Concept 1, investment would still be required over time to operate and maintain the aging system, including rehabilitation or replacement of deteriorated pavement and bridges throughout the downtown interstate system. Over the next 30 years, the cost to maintain the inner loop is estimated to be approximately $437 million.

Impacts

There would be no impacts due to capital improvement projects, but there would be impacts associated with maintenance activities as the infrastructure continues to age and deteriorate, and requires replacement or reconstruction of system components. These impacts would include traffic disruption associated with ramp and mainline interstate closures to replace bridges or pavement, and other impacts ordinarily experienced with construction activities.

11.1.2 Concept 2 Transportation System Management

With Concept 2, the term “transportation system management” refers to actions that would reduce traffic demand on the downtown interstate system. This could provide greater flexibility for considering concepts with lower traffic capacity than the existing downtown interstates. The following potential actions were reviewed for Concept 2:

- Diversion of through interstate trips to I-465
- Diversion of downtown interstate trips to transit
- Diversion of downtown interstate trips with tolling

Each of these actions was reviewed to identify the potential to divert traffic from downtown interstates. The results are described in **Chapter 5** and are summarized below.

Diversion to I-465

Traffic that could potentially be diverted from downtown interstates to the I-465 beltway was assumed to be trips that originate on an interstate at I-465, pass through the downtown on an interstate highway, and leave the area on an interstate at I-465. These trips were estimated by three methods: tracing the path of trips in the 9-county travel demand model, tracing travel paths using location-based services of smart phones, and testing diversion with unlimited capacity on I-465 using the 9-county travel demand model.

All three methods indicated approximately 10% of the trips on downtown interstates during peak periods are through trips. Diverting all or a portion of these trips would not materially affect the performance measures of the concepts explored in this analysis.

Diversion to Transit

The transit system of the Indianapolis Region is undergoing a major transformation as a result of planning studies over the past 10 years and investments funded by new local taxes dedicated to transit. Work is beginning this year on the first of three bus rapid transit (BRT) lines, and major service improvements are being initiated by IndyGo. IndyGo service improvements are assumed in the nine-county travel demand model of the IMPO. The models used in this analysis are derived from the IMPO model, so the increased ridership from the service changes is already accounted for. An analysis of potential users of the new BRT lines indicates that most traffic diversion from BRT will be on local streets rather than interstates.

Diversion with Tolling

Selective tolling strategies on interstates inside I-465 could conceivably be used to divert through traffic to I-465 and reduce the volume of traffic on downtown interstates. The review of through traffic on interstates indicates that less than 10% of downtown traffic is through traffic during peak periods, so this would not be an effective strategy for significant diversion.

11.1.3 Concept 3 Upgraded Interstates

This concept would involve full reconstruction of I-65 and I-70 through downtown, using the same general alignment and configuration that exists today. The existing roadways, bridges, and connections to local streets would be upgraded to meet future traffic demands, improve traffic flow, eliminate operational deficiencies, and improve safety. Details regarding this concept are provided in **Chapter 6**.

Performance

The performance of Concept 3 was estimated by modeling conditions in and near the downtown area in terms of total delay for all vehicles in the traffic study area during peak hours. Performance would be improved with Concept 3, with a reduction in delay in both periods. This is expected since system changes would be designed specifically for this purpose. The change in total delay with Concept 3 compared with existing conditions is shown below.

Total delay (AM Peak)	**19,156 hrs (10% less than existing)**
Total delay (PM Peak)	**22,034 hrs (6% less than existing)**

Cost

Estimated construction cost is provided as a range due to the level of uncertainty at this conceptual stage. Construction and O&M cost estimates are based on a series of assumed changes and the results have been compared with similar projects elsewhere. The estimated capital cost range and an estimate of annual O&M cost for Concept 3 are provided below:

Construction Cost	**$900 M - $1.6 B**
Annual O&M Cost	**$3 M**

Impacts

Traffic levels on local streets would not change appreciably with this concept. At most locations, traffic would vary by less than 10% during peak hours compared to existing conditions. Construction impacts are estimated to occur for about five years downtown. One to five acres of new right-of-way would likely be acquired, with five to 10 relocations. Connectivity and visual quality would be mixed, with improved landscaping and design elements, but minimal changes to existing configurations. By using modern design techniques, bridges over cross streets would have longer spans providing more room for pedestrians

Interaction with the North Split Project

Upgrading the downtown interstate system as described for Concept 3 would be consistent with upgrading the North Split interchange at its current location. No modifications would be needed to connect the reconstructed interchange to the rest of the corridor.

11.1.4 Concept 4 Upgraded and Depressed Interstates

This concept assumes I-65 and I-70 would be completely reconstructed through downtown as a depressed system. It would have the same number of lanes and interchange configurations as Concept 3. The interstates would be below ground level and most crossing streets would pass over, instead of under, the interstates. This concept is described in detail in **Chapter 7**.

Performance

Key performance measures for Concept 4 are the same as Concept 3 since the only difference in the layouts is the elevation of the interstate. Performance of downtown interstates would be improved, with reduced delay. The change in total delay with Concept 4 compared with existing conditions is shown below.

Total delay (AM Peak)	**19,156 hrs (10% less than existing)**
Total delay (PM Peak)	**22,034 hrs (6% less than existing)**

Cost

Estimated construction cost is provided as a range due to the level of uncertainty at this conceptual stage. Construction and O&M cost estimates are based on a series of assumed changes and the results have been compared with similar projects elsewhere. The estimated capital cost range and an estimate of annual O&M cost for Concept 4 are provided below:

Construction Cost	**$1.5 B - $2.4 B**
Annual O&M Cost	**$6 M**

The actual cost of Concept 4 could exceed the maximum value in the above range based on conditions encountered in future engineering for underground systems. A more reliable estimate of feasibility and cost would require detailed site-specific evaluation of groundwater levels, geotechnical conditions, and type and location of major utilities. These factors could vary by location throughout the inner loop, causing depression of roadways to be more expensive at some locations than others.

Impacts

Traffic estimates on most local streets are the same as with Concept 3, with variations less than 10% during peak hours compared to existing conditions. It is estimated that impacts due to construction would exist for about six years at some locations in the downtown, and that five to 10 acres of new right-of-way would be acquired with 10 to 15 relocations. Connectivity and visual quality would be good, since the interstate would be below ground at most locations.

Interaction with the North Split Project

Because of the difference in elevations, an above-grade North Split interchange would have to be significantly modified or replaced if downtown interstates were depressed. It might be possible to retain portions of the interior components of the interchange with Concept 4, but this cannot be confirmed without detailed design.

It is likely that the North Split reconstruction will need to occur before a commitment to depress downtown interstates. Based on current cost considerations and the condition of the existing roadways, it is prudent to reconstruct the interchange at its existing elevation to tie with existing interstates on each leg. This would be done recognizing substantial reconstruction would be needed later if Concept 4 is implemented.

11.1.5 Concept 5 At-Grade Boulevards to Replace Existing Interstates

This concept assumes I-65 and I-70 are replaced with at-grade, six-lane boulevards on all three legs of the inner loop. The boulevards would be low-speed, divided roadways with a landscaped median in the center and landscaped buffers on both sides. Signalized intersections would be provided at all crossing streets. Details regarding this concept are provided in **Chapter 8**.

Performance

Key performance measures were estimated by modeling conditions in and near the downtown area. The change in total delay with Concept 5 compared with existing conditions is shown below.

Total delay (AM Peak)	**29,907 hrs (40% more than existing)**
Total delay (PM Peak)	**57,553 hrs (145% more than existing)**

The performance of roadways in the project area would be very poor. Delays would be much higher if the existing interstates were replaced by boulevards. Traffic increases on routes in and near downtown would be substantial. Congestion from these higher volumes would be multiplied as all motorists entering or leaving downtown would be required to pass through signalized boulevard intersections, which would be serving large volumes of traffic in all directions. Major factors contributing to the large increases in system delay are listed below.

- Daily traffic volumes on the inner loop range from 109,000 to 161,000 vehicles per day.
- The capacity of a six-lane boulevard, which would be extremely congested, is less than 50,000 vehicles per day. West Street, for example, currently carries around 38,000 vehicles per day.
- More than half the existing interstate traffic would need to use local streets due to the elimination of the interstate facility within the downtown area.
- Streets that currently pass under the interstates as they enter and leave downtown would be forced through boulevard intersections operating at capacity.
- These conditions would occur on all three sides of downtown with boulevards.
- The boulevards would be congested through most of the day due to the large difference in capacity of the boulevards and the interstate highways approaching downtown.

Traffic levels would increase on many downtown streets, but especially on West Street, Virginia Avenue, and College Avenue, since grade separations are assumed for these routes due to their proximity to remaining interchanges.

Cost

Estimated construction cost is provided as a range due to the level of uncertainty at this conceptual stage. Construction and O&M cost estimates are based on a series of assumed changes and the results have been compared with similar projects elsewhere. The estimated capital cost range and an estimate of annual O&M cost for Concept 5 are provided below:

Construction Cost	**$500 M - $900 M**
Annual O&M Cost	**$2 M**

The cost range shown above is only for the inner loop boulevards. The investment in local streets that would be required due to increased traffic volumes downtown and in adjacent neighborhoods is not included in these estimates.

Impacts

Traffic impacts would be substantial on local streets downtown and over a large area as motorists avoid driving through downtown. The high level of congestion would compromise safety for motorists, bicycle traffic, and pedestrians. It is estimated that impacts due to construction would exist for about four years at some locations in the downtown, and that one to five acres of new right-of-way would be acquired with one to five relocations. This could be offset by reduced need for existing right-of-way at many locations along the boulevards. Visual quality would be good since the boulevards would be at grade, but connectivity would be compromised by the high traffic levels.

Interaction with the North Split Project

If the adjacent legs of the inner loop were converted to boulevards, the North Split interchange would have to be significantly modified or replaced. It might be possible to retain portions of the interior components of the interchange with Concept 5, but this would have to be confirmed during design. Portions of the interstate and ramp lanes might remain in place but be unused. These areas would likely be separated with barriers or pavement markings.

It is likely that the North Split reconstruction will occur before there is a commitment to replace the interstates with boulevards as assumed in Concept 5. Based on current cost considerations and the condition of existing roadways, it is prudent to reconstruct the interchange at its existing elevation to tie with existing interstates on each leg. This would be done recognizing that substantial reconstruction would be needed later if Concept 5 was implemented.

11.1.6 Concept 6 At-Grade Boulevards with Interstate Tunnels

This concept is similar to Concept 5 on the surface, as six-lane boulevards would be constructed on the three legs of the inner loop, but in this case, tunnels would be added on the three legs to serve interstate traffic traveling through downtown. The interstates would provide uninterrupted service for traffic moving through the downtown area and the boulevards would collect and distribute traffic from the downtown arterial street grid. Details regarding this concept are provided in **Chapter 9**.

Performance

Key performance measures were estimated by modeling conditions in and near the downtown area. The change in total delay compared with existing conditions is shown below.

Total delay (AM Peak)	**19,506 hrs (9% less than existing)**
Total delay (PM Peak)	**24,197 hrs (3% more than existing)**

Performance would not be impacted significantly. The change in total delay on roadways in the project area would be modest in both peak hours. Total delay would be lower during the morning peak and higher during the afternoon peak. In urban areas, traffic volumes are typically higher in the afternoon peak compared to the morning peak. It is likely that the higher traffic volumes leaving downtown in the evening would experience delay as they pass through the signalized boulevard intersections.

Cost

Estimated construction cost is provided as a range due to the level of uncertainty at this conceptual stage. Construction and O&M cost estimates are based on a series of assumed changes and the results have been compared with similar projects elsewhere. The estimated capital cost range and an estimate of annual O&M cost for Concept 6 are provided below:

Construction Cost	**$3.3 B - $5.5 B**
Annual O&M Cost	**$7 M**

The actual cost of Concept 6 could vary based on conditions encountered in future engineering for underground systems. A more reliable estimate of feasibility and cost would require detailed site-specific evaluation of groundwater levels, geotechnical conditions, and type and location of major utilities.

Impacts

Most traffic volume changes on individual routes would be modest. The largest changes would be on streets that link with grade separations over the inner loop, as drivers avoid the signalized intersections of the boulevards. It is estimated that impacts due to construction would exist for about 10 years at some locations in the downtown, and that five to 10 acres of new right-of-way would be acquired with five to 10 relocations. This could be offset by reduced need for existing right-of-way at many locations along the boulevards. Connectivity and visual quality would be good, since the boulevards would be at grade.

Interaction with the North Split Project

If the adjacent legs of the inner loop were converted to boulevards and tunnels were constructed for the interstates, the North Split interchange would have to be replaced. It is likely that the North Split reconstruction will occur before there is a commitment to install boulevards and tunnels as assumed in Concept 6. Based on current cost considerations and the condition of the existing roadways, it is prudent to reconstruct the interchange at its existing elevation to tie with existing interstates on each leg. This would be done recognizing that substantial reconstruction would be needed later if Concept 6 was implemented.

11.1.7 Concept 7 New Interstate Link under West Street Boulevard

With this concept, a new interstate link would be provided on the west side of downtown to link I-65 at the Martin Luther King Boulevard/West Street interchange with I-70 at the West Street interchange. I-65 would be routed through a tunnel on this alignment under West Street, then would follow I-70 east on the south leg of the inner loop to rejoin existing I-65 at the South Split interchange. The north leg of the inner loop would be reconstructed as a six-lane boulevard. West Street would also be reconstructed as a six-lane boulevard over the new I-65 tunnel. Details regarding this concept are provided in **Chapter 10**.

Performance

Key performance measures for Concept 7 were estimated by modeling conditions in and near the downtown area. The total delay compared with existing conditions is shown below:

Total delay (AM Peak)	**26,347 hrs (23% more than existing)**
Total delay (PM Peak)	**29,176 hrs (24% more than existing)**

The performance of roadways in the project area would be poor. Delays would be higher during both peak hours if the north leg is replaced by a boulevard. Traffic volumes would be about one-third higher than existing on the south leg as I-65 traffic diverts to the new route, and traffic volumes would be lower on the north and east legs.

The intent in this concept was to divert I-65 traffic to the new west leg so a boulevard could be constructed to serve the reduced traffic volumes on the north leg. The model does not show sufficient traffic diverting away from the north leg for the north boulevard to operate efficiently. During peak hours, this boulevard would operate in a similar manner to those in Concept 5, with extensive delays on the boulevard and intersecting streets. These conditions would probably not last all day since the volumes feeding this segment would be lower than with Concept 5.

Traffic inside the inner loop traveling to and from the south and east would increase sharply during both peak hours, in the range of 21% to 32%, because travel in and out of downtown in these directions would not be impeded by boulevard intersections.

Cost

Estimated construction cost is provided as a range due to the level of uncertainty at this conceptual stage. Construction and O&M cost estimates are based on a series of assumed changes and the results have been compared with similar projects elsewhere. The estimated capital cost range and an estimate of annual O&M cost for Concept 7 are provided below:

Construction Cost	**$1.6 B - $2.6 B**
Annual O&M Cost	**$4.5 M**

The actual cost of Concept 7 could vary based on conditions encountered in future engineering for underground systems. A more reliable estimate of feasibility and cost would require detailed site-specific evaluation of groundwater levels, geotechnical conditions, and type and location of major utilities.

Impacts

Traffic inside the inner loop traveling to and from the south and east would increase sharply during both peak hours. Traffic to and from the north would be 25% lower than existing. These patterns suggest motorists are avoiding the congested signalized boulevard intersections on the north leg and using routes that cross the east or south legs. It is estimated that impacts due to construction would exist for about seven years at some locations in the downtown, and that 40 to 50 acres of new right-of-way would be acquired with 30 to 40 relocations. This could be offset by reduced need for existing right-of-way along the north boulevard. Connectivity and visual quality would be mixed, since the boulevards would be at grade on two legs, but the other two legs would not change.

Interaction with the North Split Project

Since the east and south interchange legs would be unchanged with this concept, the upgraded North Split interchange would work relatively well with Concept 7. Details would need to be determined during design, but the transition from the interchange to the I-65 north leg would likely occur west of the bridges over College Avenue. The North Split project design would not be significantly compromised if Concept 7 was ultimately constructed.

11.2 Conclusion

Based on this analysis, the environmental study of the North Split project will advance and the scope of the project will be defined in the NEPA process to address the immediate needs of the interchange. Project-level alternatives for the EA will be developed that best meet the project purpose and needs while minimizing impacts on the surrounding environment. Comments on this analysis will be considered in developing these project-level alternatives. Efforts will be made to minimize the width and footprint, and to make other adjustments to respond to community concerns.

Concepts for the inner loop interstate system are larger in size and scope than the North Split Project and would take many years to plan, study, design, and implement. The current condition of the interchange requires that it be reconstructed in the near term (next two to four years), and that it must connect and work effectively with the interstate system that currently exists.

This analysis recognizes plans for the inner loop could evolve in the future, and portions of the North Split interchange may need to be modified or replaced to fit with larger system changes. That future expense does not prohibit options for the future system, nor does it preclude the North Split Project from moving forward to link with the existing interstate system and meet near term needs.

NORTH SPLIT UPGRADES DRIVING PROGRESS

SYSTEM-LEVEL ANALYSIS

https://northsplit.com/project-documents/system-level-analysis/

In response to feedback from the community, INDOT decided to look at a range of concepts for the entire downtown Indianapolis interstate system. INDOT initiated a System-Level Analysis to assess the performance, cost and impact of seven concepts for I-65 and I-70 through downtown Indianapolis.

Concept	Performance	Costs		Impacts		
	Total Network Delay (compared to existing)	Estimated Costs	Time of Construction	Visual/ Connectivity	ROW Total Area	Relocations (Properties)
1 - No Build	No change	No change	--	No change	No change	No change
2 - TSM	--	--	--	--	--	--
3 - Upgrade Existing Interstates	10% less delay (AM) 6% less delay (PM)	$900M - $1.6B	5 years	Mixed/Good	1-5 acres	5-10
4 - Depress Downtown Interstates	10% less delay (AM) 6% less delay (PM)	$1.5B - $2.4B	6 years	Good/Good	5-10 acres	10-15
5 - Boulevards to Replace Interstates	40% more delay (AM) 145% more delay (PM)	$500M - $900M	4 years	Good/Mixed	1-5 acres	1-5
6 - Boulevards and Tunnels	9% less delay (AM) 3% more delay (PM)	$3.3B - $5.5B	10 years	Good/Mixed	5-10 acres	5-10
7 - West St. Interstate Tunnel and Boulevard	23% more delay (AM) 24% more delay (PM)	$1.6B - $2.6B	7 years	Mixed/Mixed	40-50 acres	30-40

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Download the System-Level Analysis

The information from the analysis does not make a final recommendation on the downtown interstate system, but the facts will inform the process moving forward for the North Split interchange. INDOT held an **open house on May 23** to discuss the System-Level Analysis and next steps for the project.
The following documents provide additional details about the System-Level Analysis:

System-Level Analysis Fact Sheet
Downtown Interstate Daily Traffic Volume Document
Myth vs Fact Document

Concept Details:

- **No-Build and TSM**
- **Upgrade Existing Interstates**
- **Depress Downtown Interstates**
- **Boulevards**
- **Boulevards + Tunnels**
- **New Interstate Link**

I-65/I-70 NORTH SPLIT PROJECT FACT SHEET

System-Level Analysis for Downtown Interstates

May 2018

Based on input from the community, the Indiana Department of Transportation (INDOT) conducted a System-Level Analysis for the downtown Indianapolis interstates.

The purpose of the analysis is to define the scope of the North Split Project – aimed at rehabilitating the I-65/I-70 North Split interchange to improve safety and address deteriorating bridge and pavement conditions in the project area – and inform current public dialogue about the future of downtown Indianapolis interstates.

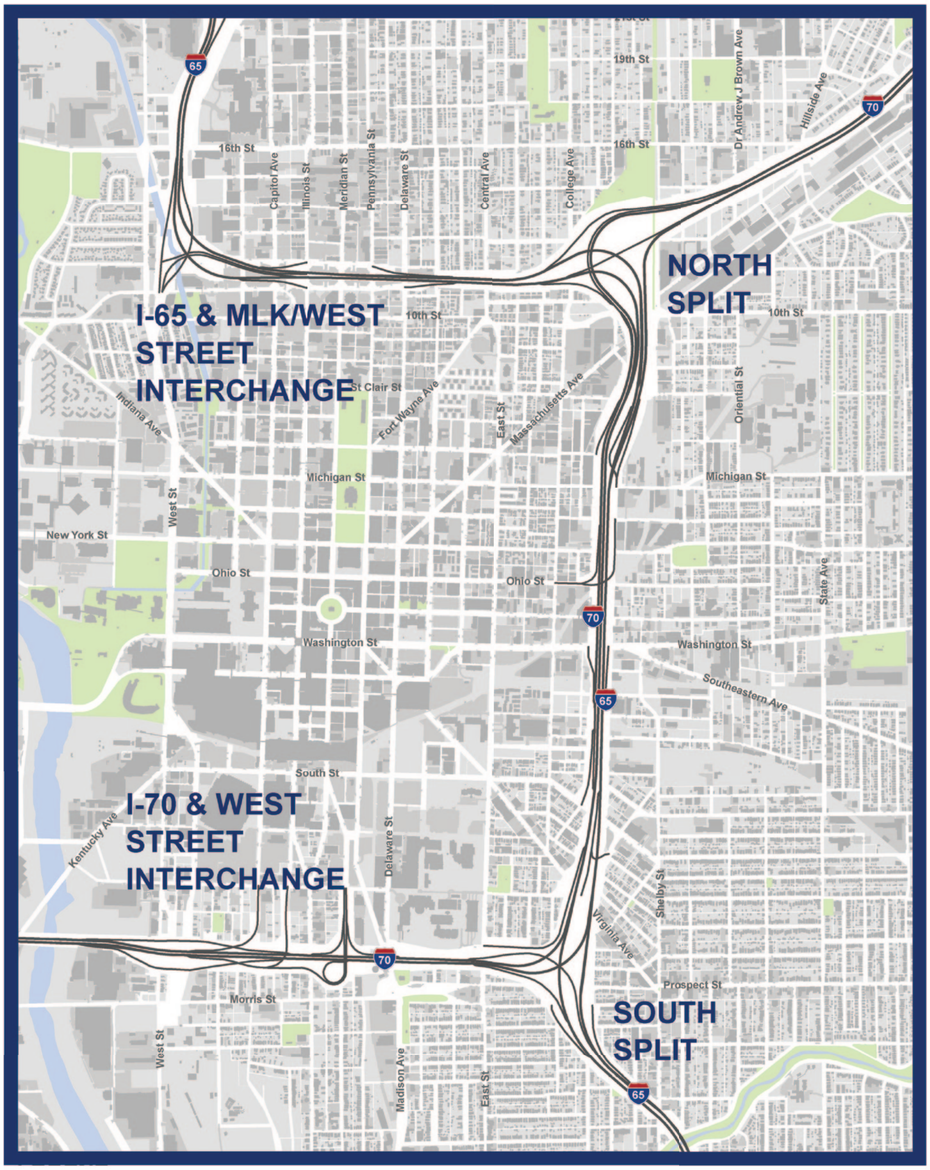
While the analysis provides an initial baseline for public dialogue regarding potential major changes to downtown interstates, it does not make a specific recommendation for a future system. Rather, this analysis will inform the project-level National Environmental Policy Act (NEPA) evaluation for the North Split Project. The objective at this stage is to advance the North Split Project to maintain the existing interchange in a safe, functioning condition and to do so with an understanding of downtown interstate system options.

Decommissioning Existing Interstates

One approach suggested to INDOT by the community was to decommission (or remove) the existing interstate system. As part of this analysis, INDOT reviewed urban freeway treatments nationwide.

Research showed that decommissioning typically works for facilities with low traffic volumes, short sections of uncompleted freeways, barriers to waterfronts, segments remaining after tunneling or realignment, or parallel freeways to serve the diverted traffic.

One focus of INDOT's System-Level Analysis was to understand how decommissioning has worked in other cities, and determine what could be possible in Indianapolis.



KNOW THE FACTS

CONCEPTS REVIEWED

Seven concepts were reviewed in the System-Level Analysis, some of which were suggested by engaged citizens. The asterisk denotes those concepts presented by community groups.

① NO-BUILD: MAINTAIN EXISTING

This concept would maintain the existing interstate system with no operational improvements. The number of lanes and their locations would remain the same, and the existing ramp connections to local streets would not change.

② TSM: TRANSPORTATION SYSTEM MANAGEMENT – DIVERT TRAFFIC TO I-465 OR TO TRANSIT*

The traffic volumes on the various legs of the downtown interstate system range from 109,000 to 161,000 vehicles per day. The term TSM refers to actions that would reduce traffic demand on the system. Three potential actions were reviewed including diversion of through trips to I-465, diversion of downtown interstate trips to transit, and diversion of trips with tolling. Through trips are categorized as interstate trips from outside I-465, through downtown, to outside I-465.

③ UPGRADE EXISTING INTERSTATES

This concept would involve a full reconstruction of I-65 and I-70 through downtown, using the same general alignment and configuration that exists today. There would be bridge rehabilitation/replacement and pavement replacement throughout, ramp and interchange improvements to reduce conflicts, and added lanes in some locations to reduce congestion and increase safety.

④ DEPRESS DOWNTOWN INTERSTATES*

This concept would involve a full reconstruction of I-65 and I-70 as a depressed system. It is assumed to have the same number of lanes and interchanges as Concept 3 (upgrade existing interstates), but the interstates would be below ground level and most crossing streets would pass over the interstate instead of under.

⑤ REPLACE INTERSTATES WITH AT-GRADE BOULEVARDS*

In this concept, I-65 and I-70 would be replaced with at-grade, six-lane boulevards on all three legs of the inner loop. The boulevards would be low-speed, divided roadways with landscaped medians in the center and landscaped buffers on both sides. In this concept, there would be signalized intersections at all major cross streets.

⑥ CONSTRUCT AT-GRADE BOULEVARDS + INTERSTATES IN TUNNELS*

This concept would replace I-65 and I-70 with boulevards plus tunnels to serve traffic through downtown. The boulevards would be the same as described above, with six-lane freeway sections in tunnels underneath and signalized intersections at all cross streets.

⑦ CONSTRUCT NEW LINK + NEW I-65 WEST LEG TUNNEL

The downtown inner loop today is missing a link on the west side. This concept would construct a new west leg interstate link in a tunnel under West Street. I-65 would be rerouted under West Street, then on to the south leg of the inner loop to rejoin the existing I-65 at the South Split interchange. The north leg of the inner loop and West Street would both be reconstructed as six-lane boulevards.

COMPONENTS REVIEWED

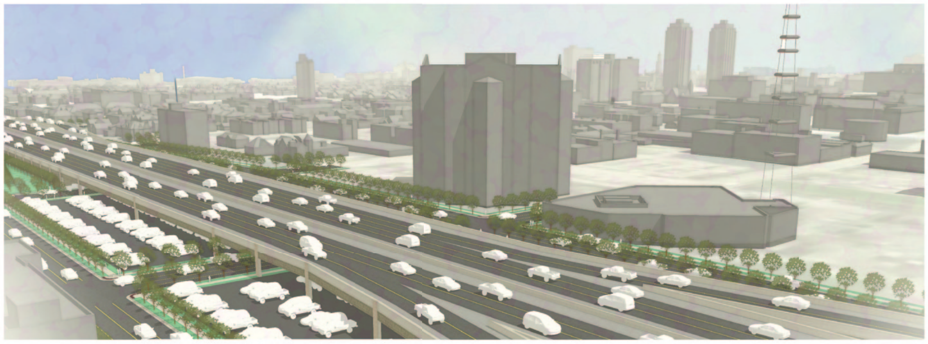
The System-Level Analysis reviewed the performance, cost and impacts of each concept.

PERFORMANCE
How well does the roadway system function?

COST
How much will it cost to construct?

IMPACTS
How does it impact downtown and neighborhood traffic, connectivity, right-of-way needs, historic resources, recreational areas and trails, and natural resources?

Sample Depressed Interstate
Does not represent final design



Sample Upgraded Interstate
Does not represent final design

TSM ANALYSIS RESULTS

The three transportation system management actions examined in the System-Level Analysis showed similar results.

① DIVERSION TO I-465

Through trips were estimated in three ways – tracing trips using the Indianapolis Metropolitan Planning Organization's (IMPO's) travel demand model, tracing trips using location-based services of smartphones, and testing unlimited capacity on I-465 using the IMPO's model. Each estimate showed only about 10 percent of downtown interstates trips were through trips during peak periods. This means diverting through trips to I-465 would not materially affect performance of the concepts.

② DIVERSION TO TRANSIT

Ridership from current IndyGo service changes is accounted for in travel demand models. The analysis of Bus Rapid Transit ridership showed inner loop traffic reduction less than one percent. Most traffic diversion will be from local streets, not interstates. Therefore, diverting trips to transit would not materially affect performance of the concepts.

③ DIVERSION WITH TOLLING

Tolls on interstates inside I-465 could be used to divert through traffic to I-465. However, because only 10 percent of trips on downtown interstates in peak periods are through trips, diverting these trips to I-465 with tolls would not materially affect performance of the concepts.

CONCEPT	PERFORMANCE	COST	IMPACTS			
	Total Network Delay (Compared to Existing)	Estimated Cost	Time of Construction	Visual/ Connectivity	Right-of-Way (Total Area)	Relocations (Properties)
CONCEPT 1 No-Build (Maintain Existing)	No Change	No Change	---	No Change	No Change	No Change
CONCEPT 2 Transportation System Management	---	---	---	---	---	---
CONCEPT 3 Upgrade Existing Interstates	10% less delay (AM) 6% less delay (PM)	**$900 M - $1.6 B** (+$3 M/yr O&M)	**5 years**	Mixed/Good	**1-5 Acres**	5-10
CONCEPT 4 Depress Downtown Interstates	10% less delay (AM) 6% less delay (PM)	**$1.5 B - $2.4 B** (+$6 M/yr O&M)	**6 years**	Good/Good	**5-10 Acres**	10-15
CONCEPT 5 Boulevards to Replace Interstates	40% more delay (AM) 145% more delay (PM)	**$500 M - $900 M** (+$2 M/yr O&M)	**4 years**	Good/Mixed	**1-5 Acres**	1-5
CONCEPT 6 Boulevards and Interstate Tunnels	9% less delay (AM) 3% more delay (PM)	**$3.3 B - $5.5 B** (+$7 M/yr O&M)	**10 years**	Good/Mixed	**5-10 Acres**	5-10
CONCEPT 7 West Street Interstate Tunnel and Boulevard	23% more delay (AM) 24% more delay (PM)	**$1.6 B - $2.6 B** (+$4.5 M/yr O&M)	**7 years**	Mixed/Mixed	**40-50 Acres**	30-40

CONCLUSIONS

The conclusions of the System-Level Analysis include the following:

- As a matter of public safety, the North Split interchange needs to be reconstructed in the next two to four years.
- The interchange will need to work effectively with the interstate system that currently exists.
- Major changes to the configuration of the inner loop system would take many years to plan, study, design, and implement.
- The future expense of modifying the North Split interchange does not prohibit options for the future system, nor does it preclude this project from moving forward.

The entire System-Level Analysis can be found on the North Split Project website: **www.northsplit.com.**

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NORTH SPLIT UPGRADES DRIVING PROGRESS

Concept 1
NO-BUILD: MAINTAIN EXISTING

OVERVIEW

With the No-Build Concept, the existing downtown interstate system would be maintained with no operational improvements.

The number of lanes and their locations would remain the same, and the existing ramp connections to local streets would not change

QUICK FACTS

PERFORMANCE

Key performance measures for Concept 1 were estimated by modeling conditions in and near the downtown area. A key parameter is total delay experienced by all vehicles in the traffic study area during peak hours. Values for the No-Build Concept provide the baseline for comparison with all other alternatives. Estimated delay with Concept 1 is shown below.

- Total delay (AM Peak) 21,346 hrs
- Total delay (PM Peak) 23,471 hrs

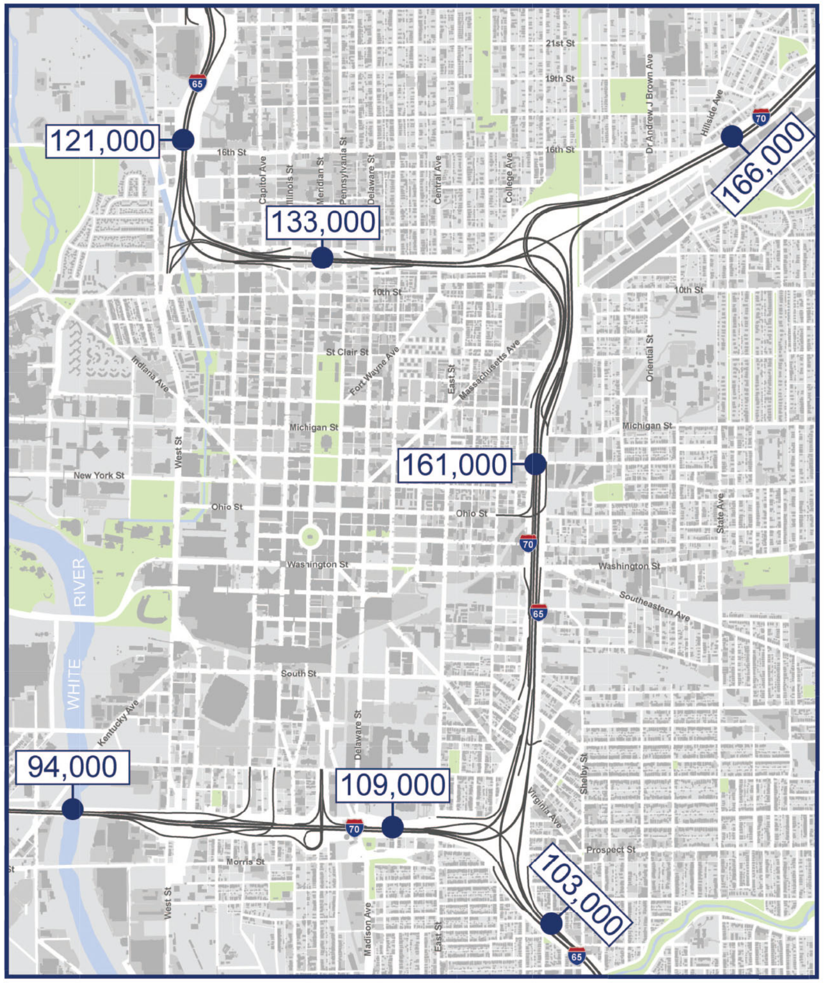
COST

Although no capital improvements are assumed in Concept 1, investment would still be required over time to operate and maintain the aging system, including rehabilitation or replacement of deteriorated pavement and bridges throughout the downtown interstate system.

Over the next 30 years, the cost to maintain the inner loop is estimated to be approximately $437 million.

IMPACT

There would be no impacts due to capital improvement projects, but there would be impacts associated with maintenance activities as the infrastructure continues to age and deteriorate, and requires replacement or reconstruction of system components These impacts would include traffic disruption associated with ramp and mainline interstate closures to replace bridges or pavement, and other impacts ordinarily experienced with construction activities.

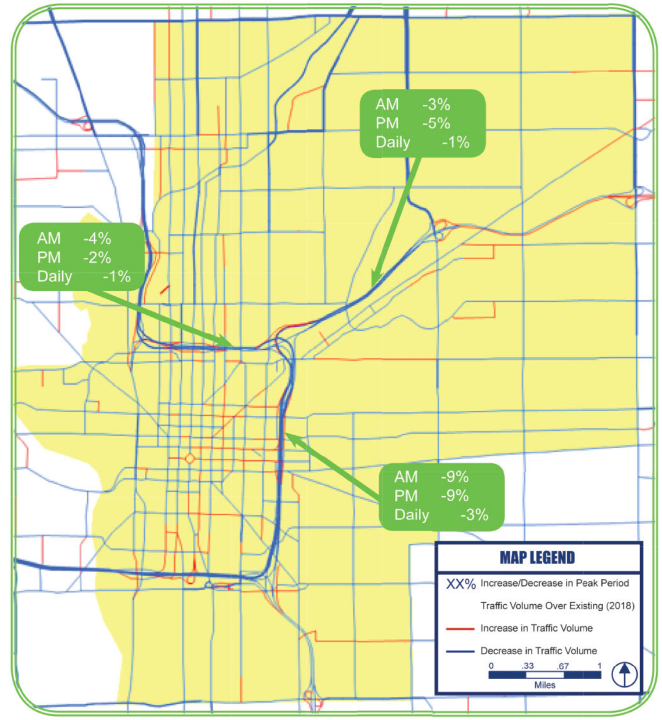


Downtown Interstates Daily Traffic Volumes

NORTH SPLIT UPGRADES DRIVING PROGRESS

Concept 2
TSM: TRANSPORTATION SYSTEM MANAGEMENT

Traffic Volume Change: with Unlimited Capacity (10 Lanes) on I-465

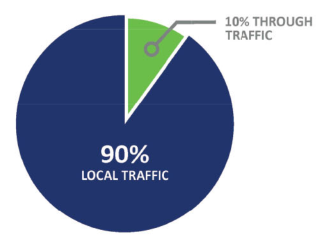


OVERVIEW

With Concept 2, the term "transportation system management" refers to actions that would reduce traffic demand on the downtown interstate system. This could provide greater flexibility for considering concepts with lower cost and impact. The following potential actions were reviewed for Concept 2:

- Diversion of through interstate trips to I-465
- Diversion of downtown interstate trips to transit
- Diversion of downtown interstate trips with tolling

I-465 DOWNTOWN LOOP
TRAFFIC TYPOLOGIES



THROUGH TRAFFIC VS LOCAL TRAFFIC

Through traffic is traffic traveling on interstates to destinations outside of I-465, while local traffic is traffic traveling on interstates to destinations within or near downtown Indianapolis.

Diversion to I-465

Traffic that could potentially be diverted from downtown interstates to the I-465 beltway was assumed to be trips that originate on an interstate at I-465, pass through the downtown on an interstate highway, and leave the area on an interstate at I-465. These trips were estimated by three methods: tracing the path of trips in the 9-county MPO travel demand model, tracing travel paths using location-based services of smart phones, and testing diversion with unlimited capacity on I-465 using the MPO's model.

All three methods indicated approximately 10% of the trips on downtown interstates during peak periods are through trips. Diverting all or a portion of these trips would not materially affect the performance measures of the concepts explored in this analysis

Diversion to Transit

The transit system of the Indianapolis Region is undergoing a major transformation as a result of planning studies over the past 10 years and investments funded by new local taxes dedicated to transit. Work is beginning this year on the first of three bus rapid transit lines, and major service improvements are being initiated by IndyGo. IndyGo service improvements are assumed in the nine-county travel demand model of the IMPO. The models used in this analysis are derived from the IMPO model, so the increased ridership from the service changes is already accounted for. An analysis of potential users of the new BRT lines indicates that most traffic diversion from BRT will be on local streets rather than interstates.

Diversion to Tolling

Selective tolling strategies on interstates inside I-465 could conceivably be used to divert through traffic to I-465 and reduce the volume of traffic on downtown interstates. The review of through traffic on interstates indicates that less than 10% of downtown traffic is through traffic during peak periods, so this would not be an effective strategy for significant diversion.

NORTH SPLIT UPGRADES DRIVING PROGRESS

Concept 3
UPGRADE EXISTING

NORTH SPLIT UPGRADES
DRIVING PROGRESS

Prototypical View
View of I-65 at Meridian Street Looking East

Prototypical View
View of I-65 at Delaware Street Looking West

OVERVIEW

This concept would involve full reconstruction of I-65 and I-70 through downtown, using the same general alignment and configuration that exists today.

The existing roadways, bridges, and connections to local streets would be upgraded to meet future traffic demands, improve traffic flow, eliminate operational deficiencies, and improve safety.

QUICK FACTS

PERFORMANCE

The performance of Concept 3 was estimated by modeling conditions in and near the downtown area in terms of total delay for all vehicles in the traffic study area during peak hours. Performance would be improved with Concept 3, with a reduction in delay in both periods. This is expected since system changes would be designed specifically for this purpose. The change in total delay with Concept 3 compared with existing conditions is shown below.

- Total delay (AM Peak) 19,156 hrs (10% less than existing)
- Total delay (PM Peak) 22,034 hrs (6% less than existing)

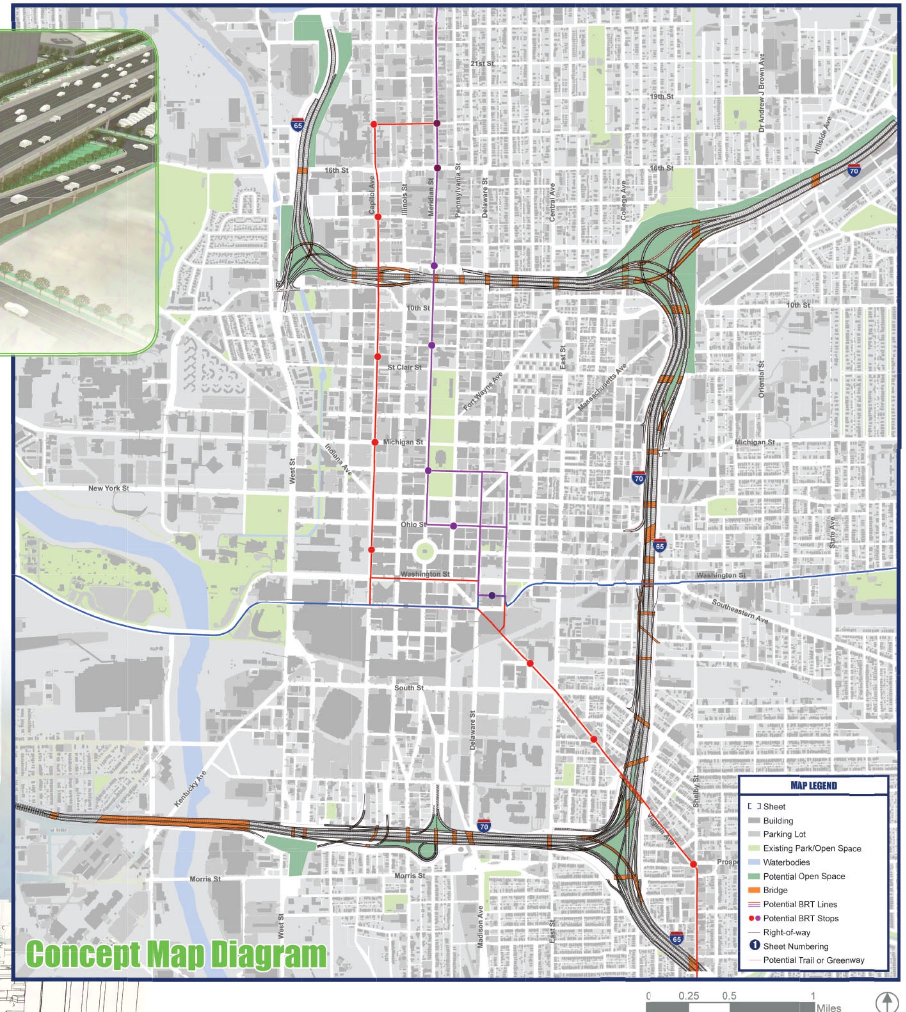
COST

Construction Cost
- $900 M - $1.6 B

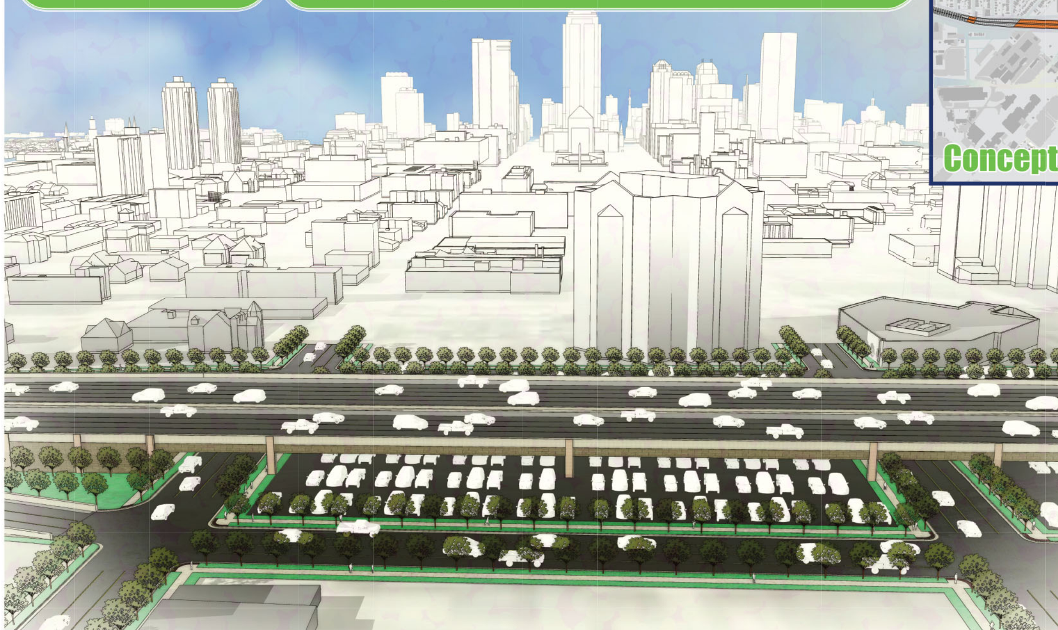
Annual O&M Cost
- Cost $3 M

IMPACT

Traffic levels on local streets would not change appreciably with this concept. Construction impacts are estimated to occur for about five years downtown. One to five acres of new right-of-way would likely be acquired, with five to 10 relocations. Visual quality would be mixed, with improved landscaping and design elements, but minimal changes to existing configurations. Connectivity could be improved by using modern design techniques, bridges over cross streets would have longer spans providing more room for pedestrian access under the interstates.



Concept Map Diagram



Prototypical View
View of I-65 at Meridian Street and Pennsylvania Street Looking South

Typical Cross Sections

Above: I-65/I-70 at New York Street
Center: I-65 at Pennsylvania Street
Below: I-65 at Alabama Street

Concept 4
DEPRESSED INTERSTATE

Prototypical View
View of I-65 at Illinois Street Looking East

Prototypical View
View of I-65 at Meridian Street Looking East

OVERVIEW

This concept assumes I-65 and I-70 would be completely reconstructed through downtown as a depressed system. It would have the same number of lanes and interchange configurations as Concept 3.

The interstates would be below ground level and most crossing streets would pass over, instead of under, the interstates.

QUICK FACTS

PERFORMANCE

Key performance measures for Concept 4 are the same as Concept 3 since the only difference in the layouts is the elevation of the interstate. Performance of downtown interstates would be improved, with reduced delay. The change in total delay with Concept 4 compared with existing conditions is shown below.

- Total delay (AM Peak) 19,156 hrs (10% less than existing)
- Total delay (PM Peak) 22,034 hrs (6% less than existing)

COST

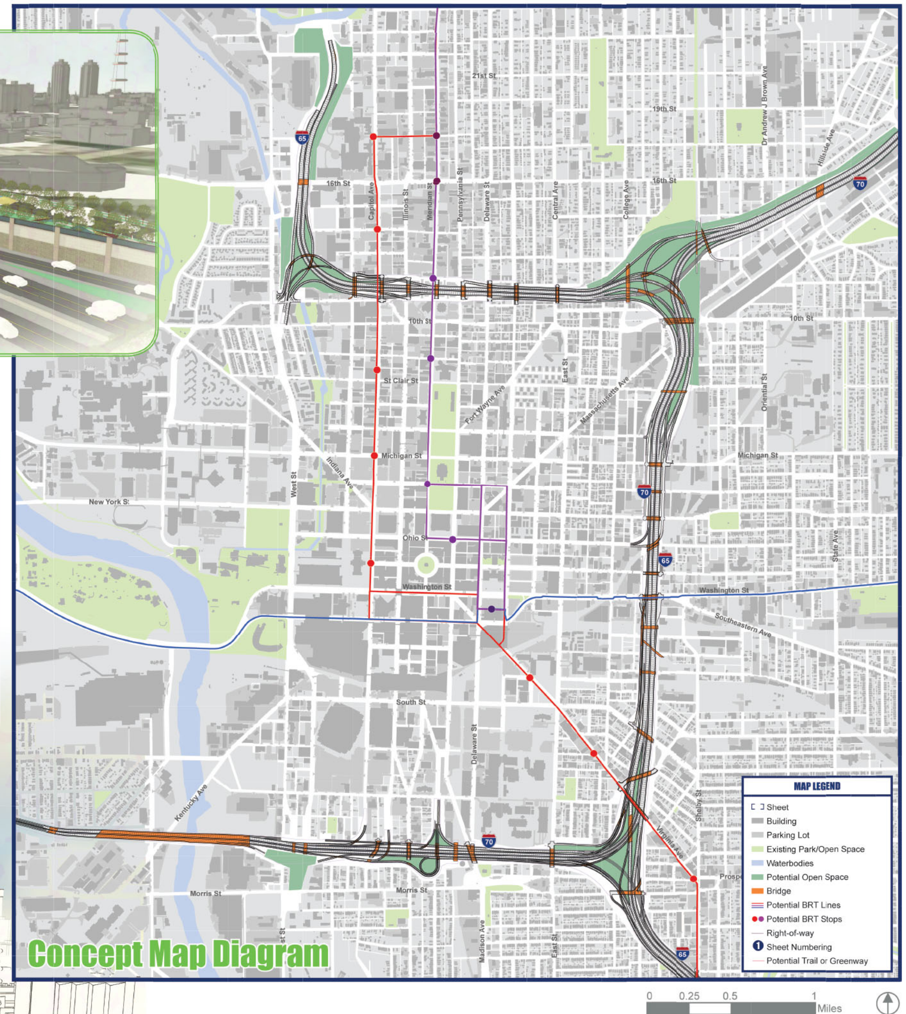
Construction Cost
- $1.5 B - $2.4 B

Annual O&M Cost
- Cost $6 M

IMPACT

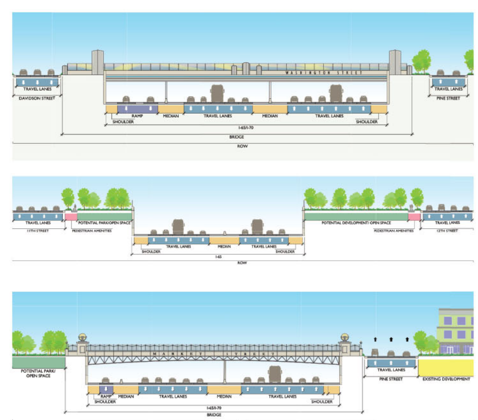
Traffic estimates on most local streets are the same as with Concept 3. Construction impacts would exist for about six years at some locations in the downtown, and five to 10 acres of new right-of-way would be acquired with 10 to 15 relocations. Connectivity and visual quality would be good, since the interstate would be below ground at most locations.

Prototypical View
View of I-65 at Meridian Street and Pennsylvania Street Looking South



Concept Map Diagram

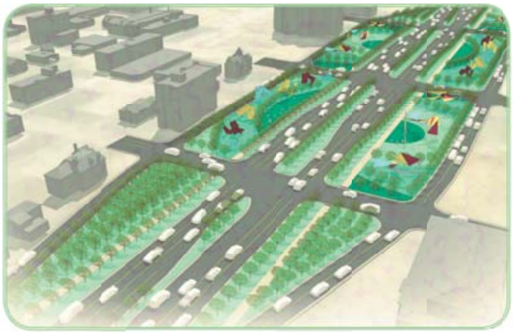
Typical Cross Sections



Above: I-65/I-70 at Washington Street Bridge
Center: I-65 Near Meridian Street
Below: I-65/I-70 at Market Street Bridge

NORTH SPLIT UPGRADES
DRIVING PROGRESS

Concept 5 BOULEVARD



Prototypical View
View of Boulevard at Meridian Street and Pennsylvania Street Looking Southeast Showing Park and Open Space

Prototypical View
View of New Boulevard at Illinois Street Looking West Showing Potential Development

OVERVIEW

This concept assumes I-65 and I-70 are replaced with at-grade, six-lane boulevards on all three legs of the inner loop.

The boulevards would be low-speed, divided roadways with a landscaped median in the center and landscaped buffers on both sides. Signalized intersections would be provided at all crossing streets.

QUICK FACTS

PERFORMANCE

Key performance measures were estimated by modeling conditions in and near the downtown area. The change in total delay with Concept 5 compared with existing conditions is shown below.

- Total delay (AM Peak) 29,907 hrs (40% more than existing)
- Total delay (PM Peak) 57,553 hrs (145% more than existing)

COST

Construction Cost
- $500 M - $900 M

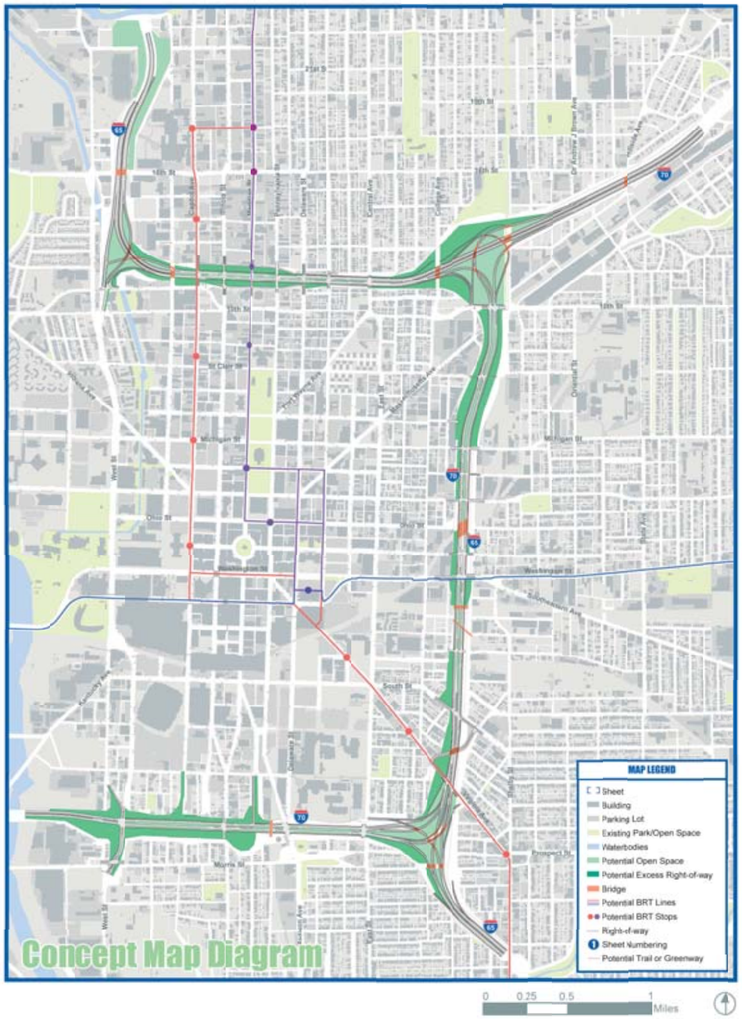
Annual O&M Cost
- Cost $2 M

NOTE: The above costs are only those for the boulevards. The investment in local streets required due to increased traffic volumes downtown and in adjacent neighborhoods is not included in these estimates.

IMPACT

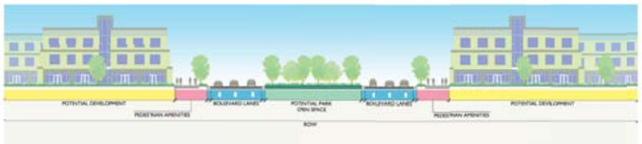
Traffic impacts would be substantial on local streets downtown and over a large area as motorists avoid driving through downtown. The high level of congestion would compromise safety for motorists, bicycle traffic, and pedestrians. Impacts due to construction would exist for about four years at some locations in the downtown, and one to five acres of new right-of-way would be acquired with one to five relocations. This could be offset by reduced need for existing right-of-way at many locations along the boulevards. Visual quality would be good since the boulevards would be at grade, but connectivity would be compromised by the high traffic levels.

Prototypical View
View of New Boulevard at Meridian Street and Pennsylvania Street Looking South Showing Potential Development



Concept Map Diagram

Typical Cross Section
REPLACE INTERSTATE WITH AT-GRADE BOULEVARDS (Split Boulevard with Development in Center) Boulevard between Meridian and Pennsylvania Street



Typical Cross Section
REPLACE INTERSTATE WITH AT-GRADE BOULEVARDS (Split Boulevard with Development Outside) Boulevard between Meridian and Pennsylvania Street

NORTH SPLIT UPGRADES DRIVING PROGRESS

Concept 6
BOULEVARD + TUNNEL

Prototypical View
View of New Boulevard at Pennsylvania Street Looking West Showing Potential Development

Prototypical View
View of Boulevard and I-65 Tunnel at Illinois Street Looking West Showing Park and Open Space

OVERVIEW

This concept is similar to Concept 5 on the surface, as six-lane boulevards would be constructed on the three legs of the inner loop, but in this case, tunnels would be added on the three legs to serve interstate traffic traveling through downtown.

The interstates would provide uninterrupted service for traffic moving through the downtown area and the boulevards would collect and distribute traffic from the downtown arterial street grid.

QUICK FACTS

PERFORMANCE

Key performance measures were estimated by modeling conditions in and near the downtown area. The change in total delay compared with existing conditions is shown below.

- Total delay (AM Peak) 19,506 hrs (9% less than existing)
- Total delay (PM Peak) 24,197 hrs (3% more than existing)

COST

Construction Cost
- $3.3 B - $5.5 B

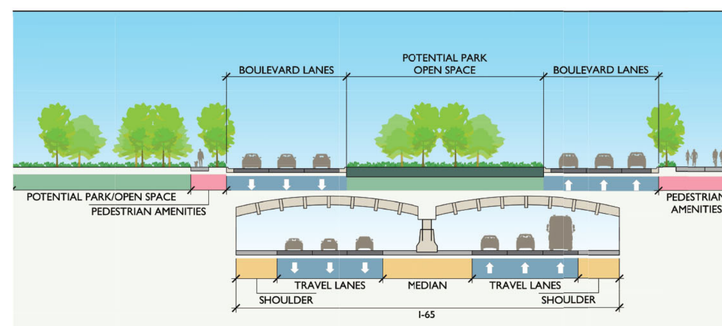
Annual O&M Cost
- Cost $7 M

IMPACT

Most traffic volume changes on individual routes would be modest. The largest changes would be on streets that link with grade separations over the inner loop, as drivers avoid the signalized intersections of the boulevards. Impacts due to construction would exist for about 10 years at some locations in the downtown, and five to 10 acres of new right-of-way would be acquired with five to 10 relocations. This could be offset by reduced need for existing right-of-way at many locations along the boulevards. Visual quality would be good, since the boulevards would be at grade. Connectivity would be mixed.

Concept Map Diagram

Prototypical View
View of Boulevard over I-65 Tunnel at Meridian Street and Pennsylvania Street Looking South Showing Park and Open Space



Typical Cross Section
AT-GRADE BOULEVARDS WITH INTERSTATES IN TUNNELS
I-65 between Meridian and Pennsylvania Street

NORTH SPLIT UPGRADES
DRIVING PROGRESS

Concept 7
NEW INTERSTATE LINK

Prototypical View
View of I-65 and West Street Interchange Looking South

Prototypical View
View of West Street Over New Interstate Tunnel Looking North Towards New York Street

OVERVIEW

With this concept, a new interstate link would be provided on the west side of downtown to link I-65 at the Martin Luther King Boulevard/West Street interchange with I-70 at the West Street interchange.

I-65 would be routed through a tunnel on this alignment under West Street, then would follow I-70 east on the south leg of the inner loop to rejoin existing I-65 at the South Split interchange.

The north leg of the inner loop would be reconstructed as a six-lane boulevard. West Street would also be reconstructed as a six-lane boulevard over the new I-65 tunnel.

QUICK FACTS

PERFORMANCE

Key performance measures for Concept 7 were estimated by modeling conditions in and near the downtown area. The total delay compared with existing conditions is shown below.

- Total delay (AM Peak) 26,347 hrs (23% more than existing)
- Total delay (PM Peak) 29,176 hrs (24% more than existing)

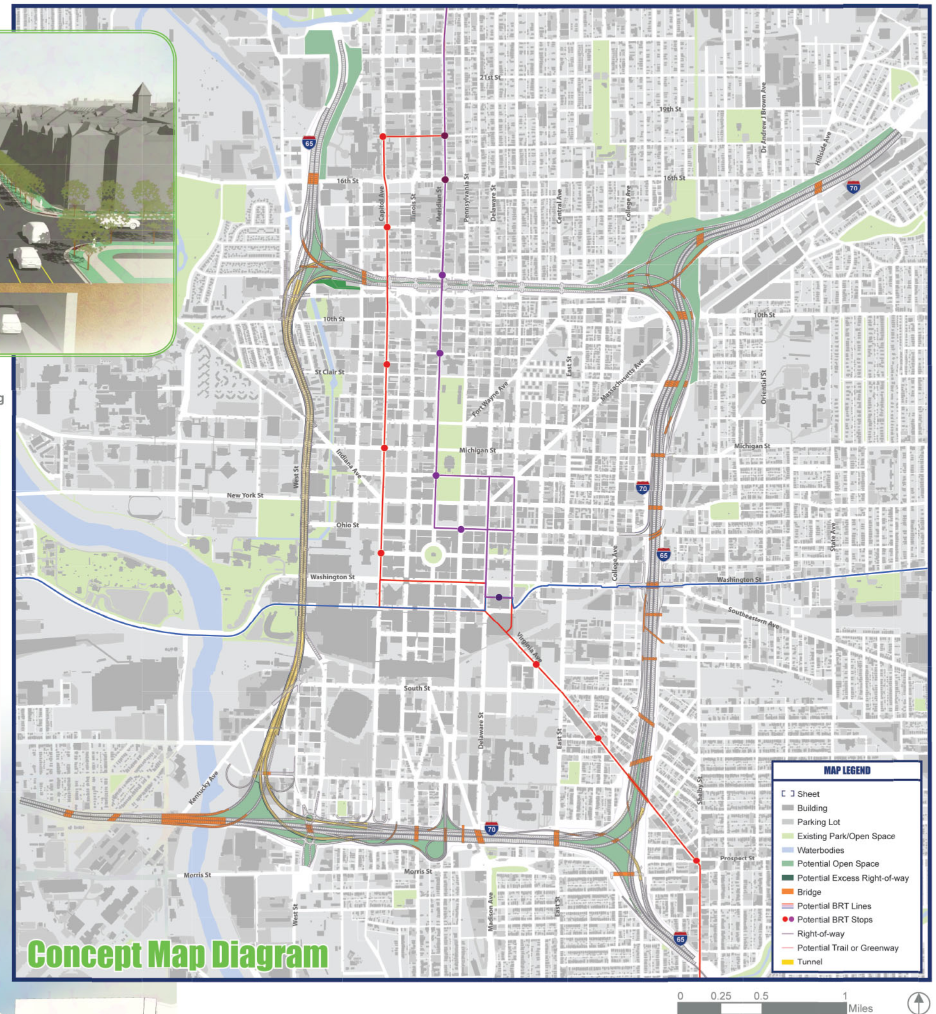
COST

Construction Cost
- $1.6 B - $2.6 B

Annual O&M Cost
- $4.5 M

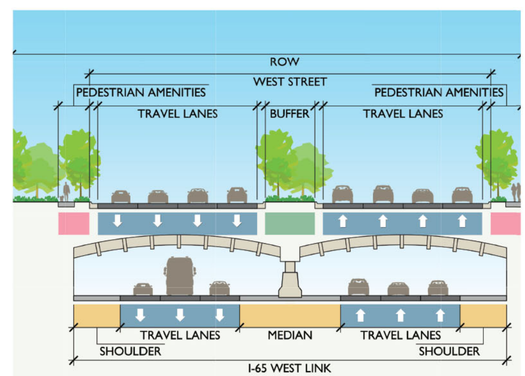
IMPACT

Traffic inside the inner loop traveling to and from the south and east would increase sharply during both peak hours. Traffic to and from the north would be 25% lower than existing. These patterns suggest motorists are avoiding the congested signalized boulevard intersections on the north leg and using routes that cross the east or south legs. Impacts due to construction would exist for about seven years at some locations in the downtown, and 40 to 50 acres of new right-of-way would be acquired with 30 to 40 relocations. This could be offset by reduced need for existing right-of-way along the north boulevard. Connectivity and visual quality would be mixed, since the boulevards would be at grade on two legs, but the other two legs would not change.



Concept Map Diagram

Prototypical View View of West Street Over New Interstate Tunnel Looking South



Typical Cross Section
New West Street Interstate Link
West Street at Washington Street

NORTH SPLIT UPGRADES DRIVING PROGRESS