

US 169/I-70 North Loop Planning & Environmental Linkages Study



Strategy Evaluation and Screening Methodology Report

April 20, 2018

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List of Acronyms and Abbreviations

Abbreviation	Term/Phrase/Name
ADA	Americans with Disabilities Act
A.M.	Morning
APE	Area of Potential Effect
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
BGPA	Bald and Golden Eagle Protection Act
BMcD	Burns & McDonnell
BMPs	Best Management Practices
C-D	Collector-Distributor
CWA	Clean Water Act
dBA	A-Weighted Decibels
EDR	Environmental Data Resources, Inc.
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
GDAP	Greater Downtown Area Plan
GIS	Geographic Information System

HCM	Highway Capacity Manual
HCS	Highway Capacity Software
I-29	Interstate 29
I-35	Interstate 35
I-70	Interstate 70
Hg	Hg Consult, Inc.
KCATA	Kansas City Area Transportation Authority
KC EDC	Kansas City Economic Development Council
KCK	Kansas City, Kansas
KCMO	Kansas City, Missouri
KDOT	Kansas Department of Transportation
L_{eq}	Equivalent Sound Level
LOS	Level of Service
LUST	Leaking Underground Storage Tank
MARC	Mid America Regional Council
MBTA	Migratory Bird Treaty Act
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MoDOT	Missouri Department of Transportation
MP	Milepost
Mph	Miles Per Hour
MPO	Metropolitan Planning Organization
NAC	Noise Abatement Criteria
NCHRP	National Cooperative Highway Research Program

NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
PEL	Planning and Environmental Linkages
P.M.	Evening
RCBC	Reinforced Concrete Box Culvert
ROW	Right-of-Way
TAZ	Transportation Analysis Zone
TNM	Traffic Noise Model
TOD	Transit-Oriented Development
UG	Unified Government of Wyandotte County/Kansas City, KS
US-169	US Highway 169
USACE	US Army Corps of Engineers
USCG	US Coast Guard
USDOT	US Department of Transportation
USGS	US Geological Survey
USFWS	US Department of Interior Fish and Wildlife Service
UST	Underground storage tank
VMS	Variable Message Sign
Vpd	Vehicles Per Day
Vph	Vehicles per hour
WOUS	Waters of the United States

1. Introduction

The Mid America Regional Council (MARC), in cooperation with the Federal Highway Administration (FHWA); Missouri Department of Transportation (MoDOT); City of Kansas City, Missouri (KCMO); Kansas Department of Transportation (KDOT); and the Unified Government of Kansas City, Kansas and Wyandotte County, KS (UG) is conducting a Planning and Environmental Linkage (PEL) study for an area that includes US-169/I-70/I-35/29/I-670 in Jackson and Clay Counties, Missouri and Wyandotte County, Kansas.

MARC, with its partners, is conducting the US 169/I-70 North Loop PEL Study to assess the existing conditions, identify anticipated problem areas, and develop and evaluate transportation improvements to reduce congestion, enhance connectivity, and improve the safety of US-169 and I-70 within the Study Area. MARC is preparing this PEL study in accordance with Federal Highway Administration (FHWA) guidance for improving and streamlining the environmental process for transportation projects by conducting planning activities before the start of the NEPA process.

The US 169/I-70 North Loop PEL Strategy Evaluation and Screening Methodology (ASM), as described in this document, provides a tiered, decision-making framework to determine if each of the proposed strategies meets the established purpose and need, and then to recommend strategies for further analysis based on an evaluation of how well each strategy addresses measures associated with the needs and goals of the project. The decisions and recommendations made in the PEL Study will be well documented so that they may be used in future NEPA analysis.

The purpose for the project and the established goals are shown in Table 1 below. The first three goals - Improve Physical Conditions, Optimize System Performance, and Improve Safety and Security – also serve as the project needs. By definition, these needs must be resolved by the selected strategy strategy/strategies. In addition, the Strategy and Screening Methodology Report considers the feasibility of proposed strategies by looking at projected improvement costs and ability of a given option to be phased in over time.

Table 1: Purpose and Need

Purpose: The study purpose is to seek the most effective approach to improve the transportation facilities in the Study Area, including the development of strategy strategies, which, when implemented, will meet the identified current and future needs while balancing the interests of the various stakeholders.	
Need	Description
Improve Physical Conditions	Ensure that existing and new transportation assets in the Study Area better serve the region and are maintained in a state of good repair.
Optimize System Performance	Manage the operations of the existing transportation facilities to achieve reliable and efficient performance.
Improve Safety and Security	Identify reasonable improvements to ensure the safety and security of the affected area.
Goals	Description
Improve Transportation Choices	Provide viable, accessible, multi-modal transportation options.
Improve Economic Vitality and Placemaking	Improve transportation and land-use linkages in the Study Area
Improve Sustainability	Protect and enhance the region’s natural, cultural, and social resources. Explore ways to mitigate the adverse impacts of the existing system and proposed strategies.
General Feasibility	Consider the feasibility of delivering the proposed improvements within reasonable financial and schedule constraints.

The first step in the strategy screening process is the development of the *Universe of Strategies (Universe)*, which includes all possible solutions to the transportation problems in the US 169/I-70 North Loop Study Area (Figure 1).

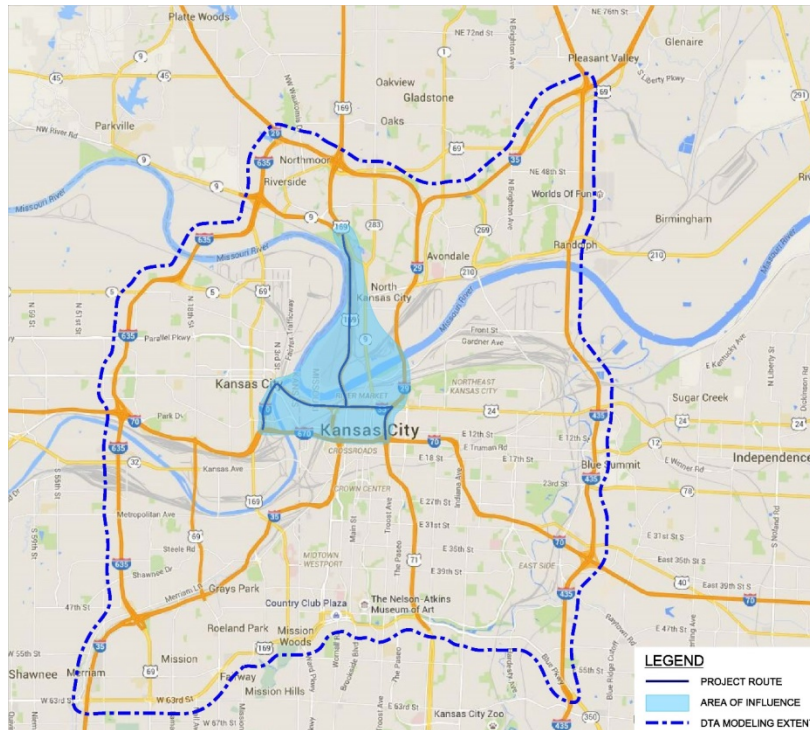


Figure 1: Map of Area

The Universe will include strategies which address needs in the following five geographic areas (Figure 2):

- I-70 North Loop
- Downtown Airport
- West Bottoms
- Buck O’Neil Bridge
- Route 9 (added after Level 1 B analysis)

The strategies for each of these areas will be evaluated separately, which will lead to a group of strategies being recommended for further study in each of the four geographic regions.

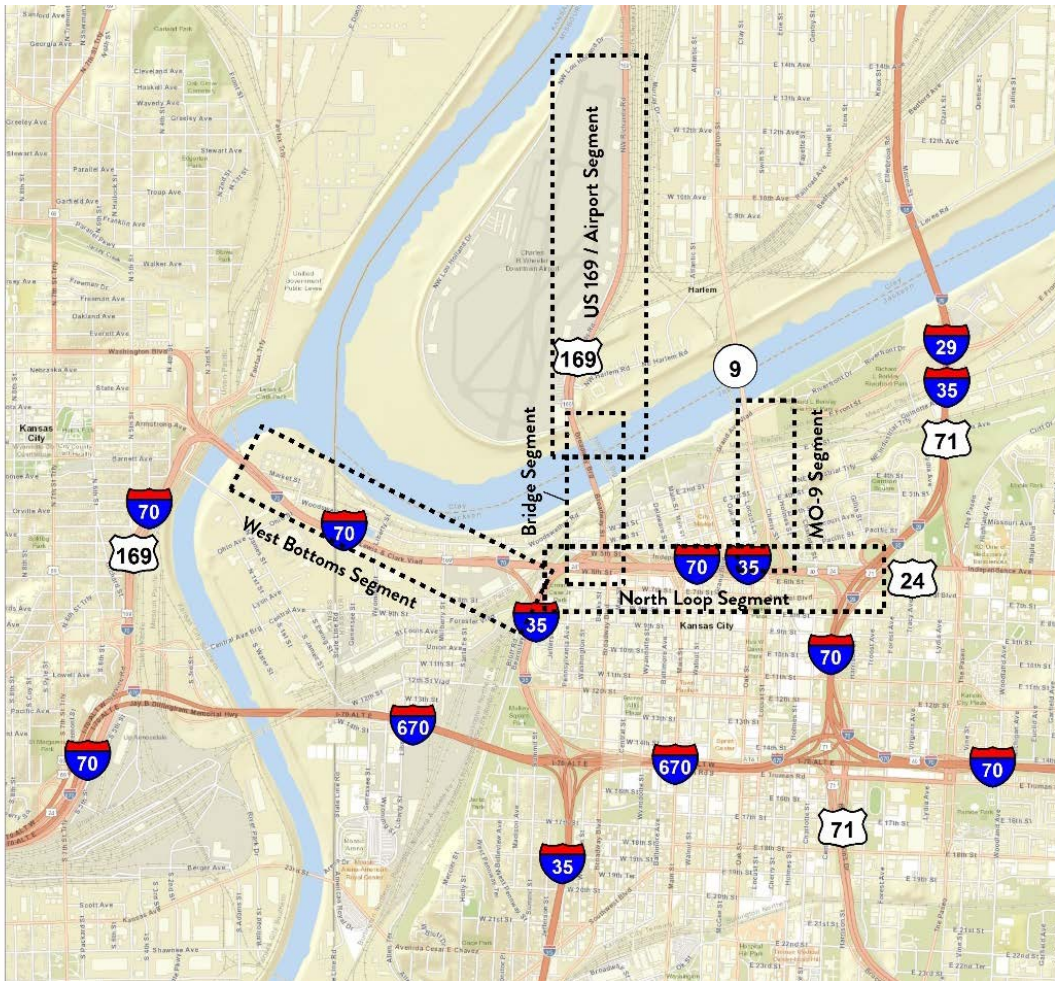


Figure 2: Geographic Regions

2. Concept Screening Framework

Each of the strategies, including the No-Build strategy, will be evaluated using the methodology described in this document. The No-Build concept represents the baseline condition in the study area as if no improvements are implemented other than normal operations and maintenance, which also includes those projects programmed in the fiscally constrained MARC Metropolitan Transportation Plan (MTP) or Transportation Improvement Program (TIP).

The effectiveness of each concept, in terms of meeting the needs of the study area, will be measured against a wide range of criteria defined by the Purpose and Need and the Study Goals. The successful concepts at each level will be advanced to the next screening level for further evaluation, while the unsuccessful concepts will be eliminated from further consideration. Decisions made during the screening process will be thoroughly documented so that they may be relied upon during future studies. Strategies developed subsequent a specific level of screening will be subject to the measures of the previous screenings to demonstrate their value for continued evaluation.

The three screening levels that comprise the CSM include:

- **Level 1A, Fatal Flaw Screening** - The Study Team developed the Universe with input received from stakeholders. Fatal flaw criteria were then utilized to evaluate and screen the Universe against the Purpose and Need. The Study Team, along with representatives from the Mid America Regional Council (MARC) and its partners, convened to review each strategy against each of the defined study needs (Physical Conditions, System Performance, and Safety and Security) in order to gain consensus on the effectiveness of each strategy in meeting each of the three needs. Those strategies that substantially addressed each need were advanced to Level 1B, while those that did not were eliminated from further consideration. The list of the Universe considered during screening process is titled the Refined Strategies List and is included in the Appendix in Table 3. The list also identifies strategies that were eliminated from consideration versus those that were carried throughout the study.
- **Level 1B, the Refinement Process** - In Level 1B analysis, strategies advancing from Level 1A were evaluated. The level of strategy development is sufficient to allow for the qualitative evaluation against the study goals, as shown in the Appendix in Table 5 through Table 8 (pages A-6 to A-9). Level 1B scoring consists of a mostly qualitative analysis, with the study team using quantitative data when available. It should be noted that qualitative analysis scoring, typically 1 to 5 rating, is only meant to distinguish each strategy for that specific measure and should not be used to assess total strategy value across multiple measures. At this level, the strategies are summarized and compared to one another relative to their ability to meet study needs and goals. Input from MARC, its partners and the public were considered during this level of evaluation.

Based on these analyses, strategies that best met the established study goals were advanced to Level 2 as Reasonable Strategies.

- **Level 2, Detailed Evaluation** – In Level 2, the Reasonable Strategies were designed to a level of detail as to define the number of lanes, primary entrance and exit points for roadway access, and to further clarify anticipated right-of-way needs. Additionally, predictive traffic volume data was available to quantitatively predict the specific traffic demand, delay and travel time associated with each strategy. More detailed cost estimates for each strategy were developed at this stage. The level of strategy development was sufficient to allow for the quantitative evaluation against the study goals on the vast majority of measures, as shown in the Appendix in Table 9 through Table 13 (pages A-13 to A-18). The Level 2 screening process identified the strategies that address the transportation needs in each geographic area while highlighting the measures that best differentiate the strategies from one another in that geographic area.

3. Strategy Evaluation Criteria and Measures

Strategy evaluation criteria and measures for the US 169/I-70 North Loop PEL Study are based on both the Purpose and Need and the Study Goals. The following sections provide detailed definitions of each of the evaluation criteria and measures.

3.1 Level 1A

Level 1 screening consisted of a qualitative assessment of the ability of each strategy to meet the Purpose and Need and goals of the project. Each strategy must meet the first three goals, which also serve as the needs for the project, see Table 4 in Appendix.

3.1.1 Need - Improve Physical Conditions

Strategies must ensure that existing and new transportation assets in the Study Area better serve the region and are maintained in a state of good repair.

3.1.2 Need - Optimize System Performance

Manage the operations of the existing transportation facilities to achieve reliable and efficient performance.

3.1.3 Need - Improve Safety & Security

Strategies must ensure the safety and security of the affected area.

3.1.4 Goal - Improve Transportation Choices

Strategies must provide viable, accessible, multi-modal transportation options.

3.1.5 Goal - Improve Economic Vitality and Placemaking

Strategies must improve transportation and land-use linkages in the Study Area.

3.1.6 Goal - Improve Sustainability

Strategies must protect and enhance the region's natural, cultural, and social resources. The study team must explore ways to mitigate the adverse impacts of the existing system and proposed strategies.

3.2 Level 1B

Level 1B is an analysis against measures associated with the study goals. The strategies have been divided into four geographic areas (North Loop, Downtown Airport, West Bottoms, and Buck O'Neil Bridge). Specific measures can vary from geographic area to area depending on the specific opportunities and needs within that area. Some measures, for example number of billboards impacted, are straight forward in what they are capturing. For the purposes of this report, only those measures that require detail in their mean of measure or data collection are detailed below.

3.2.1 Need – Improve Physical Conditions

Measures - Number of Existing Bridges Being Replaced; Area of Existing Pavement Being Replaced; Number of Existing Substandard Geometric Features Replaced (Red/Yellow)

Three different measures are being used to evaluate the ability of each strategy to meet the need of “Improve Physical Condition.” This need, as developed from the project Purpose and Need, is meant to consider the physical condition of the existing roadway and bridge infrastructure within the project study area. The first way this is evaluated is in terms of the amount of existing, in-service infrastructure that will be replaced with any given strategy. It is measured both relative to the area of pavement and number of bridges to be replaced. Given the high importance of the Broadway Bridge’s available service life to the overall project purpose, bridges to be replaced within the “Bridge” geography was provided in terms of area and not just count. There is a high level of variance in these values and as compared to the No-Build strategy.

The other measure quantified the ability of each strategy to improve the number of existing sub-standard geometric features within a given geography. Geometric features focused on the highway and ramp infrastructure and measured the shoulder width curve radii, and number of available ramp lanes. GIS maps of the existing geometric features were developed and color-coded red, yellow and green based on the compliance or deviation from existing design standards. The proposed strategy improvements were overlaid on the GIS data and the number of deficient yellow colored and red colored features were counted and added to the evaluation matrix, see Figure 3 in the Appendix.

3.2.2 Need – Optimize System Performance

Measures - Total Delay, Travel Time, Average Peak Hour Travel Speed, Travel Distance, Ramp LOS

Several different measures are being used in the evaluation matrix to evaluate system performance as it relates to traffic operations. These measures were developed with reference to the MARC Congestion Management Toolbox. Level 1B analysis focused on strategies related to access management, active transportation, highways, and transit. Some areas, including regulatory, land use, parking and TDM strategies were considered beyond the scope of this phase of the study. While the specific strategies are not called out, the various improvement strategies all consider some toolbox recommendations in addition to the underlying concepts for congestion improvement. In addition, several of the analytical methods recommended in the toolbox, including use of a regional travel model, localized analysis, simulation model and HCM software are utilized during the Level 1B and subsequent Level 2 analyses.

This need addresses how each of the improvement strategies will successfully improve the flow of traffic improving level of service (LOS) and travel speed while lowering delay and shortening travel time and distance. One major caveat is that the time the Level 1B screening was performed the traffic assignment models were not sufficiently developed to provide analysis of the future year conditions. For this reason, all the traffic evaluations in Level 1B are qualitative or based on existing year traffic or both.

Where applicable the LOS was determined for each on-ramp and off-ramp based on a Highway Capacity Manual (HCM) analysis, an example is shown in Table 2 below.

Table 2: Example Level of Service (LOS) Ranking

LOS	Intersections		Freeways	
	Control Daily Per Vehicle (sec/veh)		Density (vpmpl or pcpmpl)	
	Signalized Intersections	Unsignalized Intersections	Basic	Merge/Diverge
A	≤ 10	0-10	0-11	0-10
B	> 10-20	> 10-15	> 11-18	> 10-20
C	>20-35	> 15-25	> 18-26	> 20-28
D	>35-55	> 25-35	> 26-35	> 28-35
E	>55-80	> 35-50	> 35-45	> 35
F	>80	> 50	> 45	Demand exceeds capacity

1 Vehicles per Mile per Lane or Passenger Cars per Mile per Lane

In many cases the individual LOSs for the weave areas are likely modeled to perform better than the actual conditions because the HCM does not provide models for weaving areas as short as the ones that exist in the no-build condition. For these locations, the minimal allowable weave length was used. The individual ramp LOSs were then aggregated to provide an overall LOS for each improvement strategy using best engineering judgement.

Average peak hour travel speed was evaluated for only the primary through highway routes. System wide measures including total travel, total travel distance and total peak hour delay were all evaluated qualitatively based on best engineering judgement. These measures are meant to demonstrate how well the overall system would operate in any given improvement scenario. A four-tiered rating from best to worst was provided for these measures. Individually travel times were also estimated to specific critical traffic generators within each geographic region.

3.2.3 Need – Improve Safety and Security

Measures – Bike/Ped Facility Improvement Capacity, Emergency Vehicle Travel Time, Conflict Points

Safety and security of transportation system users is of the utmost importance, and is the major driver of the creation of this project need. Three specific measures we developed for this Level 1B evaluation to address a range of potential system users. One such measure looks at the safety and security of non-motorized users within the corridor by looking at each strategies ability to improve existing bike/ped facilities in a manner consistent with the local prevailing guidance, including the Kansas City Bicycle Plan. This measure provides a qualitative assessment of the volume of existing sidewalks and bike routes within a given geographic region that fall within the footprint of a given improvement strategy. As a planning level analysis, the measure only looks at the capacity of the project to improve existing facilities and was not able to commit to a specific LOS improvement at any given location. This measure focuses on improvement of existing bike/ped facilities. Other measures in the goal section look at expansion of bike/ped facilities.

To evaluate safety for motor vehicles within the study corridor some of the geographic regions have specifically identified existing crash hot spots where specific intersection improvements have been targeted to improve safety. At these locations, the number of conflict points were determined for each

intersection improvement strategy. Conflict points are a widely accepted surrogate measure for intersection safety. Intersections with fewer conflict points are correlated with less crash exposure for drivers and therefore typically have a better safety performance.

Emergency response time to a crash has been shown to have an impact on the severity of the crash. A strategy that reduces emergency response times within the corridor promotes better crash severity outcomes and provides better overall safety for all transportation system users. Similar to other traffic operations measures, the Level 1B evaluation engineering judgement was used to provide a qualitative assessment of the travel time for area emergency response dispatch centers to nodes within the study area.

3.2.4 Goal – Improve Transportation Choice

Measures – Potential for future bike/ped expansion and bus/streetcar integration, bike/ped connectivity (bridge only)

Three measures are being used for the evaluation of each strategies ability to improve transportation mode choice within the study corridor. These measures were directed at the projects ability to improve the two choice transportation modes which are sensitive to the availability of appropriate built infrastructure, bicycle and transit.

Addition of bike/ped accommodations to the Buck O’ Neil bridge represents a major bike/ped linkage and could have large impact on mode choice and multi-modal connectivity within the study array. For this reason, the width of proposed bike/ped facility on the bridge is considered as part of the sustainability goal with the assumption that additional available width will be more inviting and comfortable for a wider array of users.

Both bike/ped and transit measures were evaluated qualitatively based on the ability of each strategy to expand infrastructure within the corridor to meet growing local demand. This differs from similar measures in other categories that evaluate the ability of each strategy to improve existing facilities. To address future bike/ped expansion, the Kansas City Bike plan was utilized to evaluate future planned bike corridors that fall within the study area. To address future transit expansion, existing and future potential bus routes throughout the corridor were overlaid on the improvement strategies. A qualitative assessment was then made regarding how future sidewalk and bus shelter improvements could be accommodated with each improvement strategy.

3.2.5 Goal – Improve Economic Vitality and Placemaking

Measures – Potential to make space available for development, average truck travel time, visual character and aesthetics

The goal of improving of economic vitality and placemaking is a complex and diverse goal and therefore several different measures are being used which cover a wide array of topics. The lone quantitative measure for this goal in the Level 1B analysis was looking at potential space made available for development as either commercial or recreational improvements. Especially for the North Loop area, this measure is incredibly important as it captures how much of the existing right-of-way could be repurposed by shrinking or altogether removing the highway footprint. This measure, provided in acres, was also carried through the other geographies, even though it is less impactful, since the various options vary less in the amount of existing right-of-way that could be repurposed with any given strategy.

Several different qualitative measures were used within this measure. The first, visual character and aesthetics is certainly an important element for consideration though it can be difficult to evaluate. To provide ratings based on a four-tiered rating each strategies ability to provide roadside beautification in keeping with complete street concepts was considered. For the bridge area, special consideration was given to the ability of each bridge alignment to provide aesthetic enhancements. This is directly related to the proximity of the bridge to the airport which has strict elevation controls. For the north loop area, consideration was given to recreational areas that could be created with a reduced highway footprint.

To assess economic vitality ease of access to area freight hubs was considered. For the Level 1B analysis this was provided qualitatively as an assessment of off-peak congestion and ease of direct access. The specific generators within the study corridor are stated in the evaluation matrix and were linked to appropriate freeway entry points into the study corridor.

3.2.6 Goal – Improve Sustainability

Measures – Right-of-way impacts (including EJ/LEP population displacements), impact to cultural and natural resources

Sustainability is an important goal in the purpose and need of this project and is considered in the Level 1B evaluation matrix relative to many of the cultural and environmental resources that is specifically evaluated in all stages of the NEPA process. To develop the sustainability measures numerous resources were referenced including the MARC Natural Resource Inventory, which identifies conservation and restoration priorities throughout the region. The first measure looks at the proposed right-of-way footprint that would be needed for all the strategies being considered. This measure, provided as an area, is only a cursory look at the footprint, based on the plan displays, and does not consider existing property lines, total takes, or other easements necessary for utility or related roadway improvements. This measure looks at both the overall right-of-way footprint and considers what, if any, existing properties have EJ/LEP populations within the study area.

The cultural resource measures examined how many National Register of Historic Places (NRHP) sites or districts and recorded archaeological sites fell within the boundaries of each strategy. The measures provide a quantitative assessment of the number of cultural resource sites potentially impacted and are based upon research conducted by the project team of over a dozen different sources of cultural resource information.

The environmental measures examined how many acres of wetlands, linear feet of floodplain, number of recorded hazardous material sites and parks fell within the boundaries of each strategy. The measures provide a quantitative assessment for each of these features. Acres of wetlands were calculated using National Wetland Inventory mapping data from the U.S. Fish and Wildlife Service (USFWS). Linear feet of floodplain were calculated using floodplain mapping data from the Federal Emergency Management Agency (FEMA). The number of recorded hazardous material sites was identified from a report supplied by Environmental Data Resources (EDR), Inc., a private vendor that searches over 100 federal, tribal, state and local hazardous materials databases. The number of parks were identified from online data obtained from the City of Kansas City, Missouri's Parks Department and the National Park Service's listing of sites receiving Land and Water Conservation Funds.

3.2.7 Goal – Feasibility

Measures – Cost and opportunity for phased implementation

To understand the feasibility of implementing each strategy in the future, a rough order of magnitude cost is provided for each strategy. These are high level planning cost estimates are based on the volume and complexity of infrastructure to be improved with each strategy. Additionally, for the airport option consideration was given for the ability to phase the improvements in over time.

3.3 Level 2

Level 2 is primarily a quantitative analysis with measures associated with the study needs and goals. Four geographic areas (North Loop, Downtown Airport, West Bottoms, and Buck O’Neil Bridge) were carried forward from the Level 1B analysis. In addition, a fifth geographic area was added for Missouri Highway 9 (Route 9) to capture the strategies and associated impacts with bringing Route 9 to grade. An additional level of precision added from the Level 1B analysis are the interchanges that connect the Bridge and North Loop geographic areas. Since there are distinct means of connecting these two areas with associated benefits and impacts, these four different interchange configurations (4th Direct, Broadway Direct, 5th & 6th Direct and Hybrid) were added to the bridge geographic region as a sub-strategy to the broader bridge location options.

Additional measures were created or modified from the Level 1B analysis to capture elements that were brought forth by the public and stakeholders or elements that became evident in the development of strategies as a measure that differentiates options. Specific measures can vary from geographic area to area depending on the specific opportunities and needs within that geographic area. For the purposes of this report, only measures that were changed from or not covered in the Level 1B description or those that are straight forward are detailed below.

3.3.1 Need – Improve Physical Conditions

Measures – Service Life of River Bridge, Area of Existing Bridges Being Removed; Area of Existing Bridges Left in Place, Area of New Bridges Being Built, Area of Existing Pavement Being Removed or Replaced; Number of Existing Substandard Geometric Features Replaced (Red/Yellow), Maintenance Cost for Existing Bridges Left in Place to 2040, Maintenance Cost for Existing Roadways Left in Place to 2040.

The measures for this need expanded on those utilized in the Level 1B analysis, which were already primarily quantitative. The resolution of measurement has improved in the Level 2 analysis as greater understanding of the specific infrastructure improvements to satisfy each strategy are known. This includes all the measures of pavement and bridge area both to be constructed and removed.

To understand the lifecycle costs associated with the infrastructure to be left in place, long term maintenance costs were added for the existing road and bridge infrastructure that is not being removed or replaced with a given strategy. A 2040 maintenance horizon was used to correlate with the anticipated maintenance free life cycle of the newly constructed road and bridge infrastructure. Roadway and ramp pavement maintenance costs were determined using a five-year overlay cycle based on an initial overlay cost of \$164,000 per lane mile. The total cost for the 20-year life span includes inflation for the overlay once every five years. Inside and outside shoulders were accounted for as an additional lane in each direction. Ramp pavement widths including shoulders were assumed to be the equivalent of two 12’ lanes. The cost used to maintain I-70 and Route 9 roadways (six 12’ lanes with shoulders) was \$7.2M per mile.

The cost used to maintain I-35 (four 12' lanes with shoulders) was \$6.3M per mile. The cost used to maintain ramps was \$1.8M per mile.

3.3.2 Need – Optimize System Performance

Measures - Travel Delay, Travel Time, Travel Speed, Travel Distance, Ramp LOS, Implementation of Applicable MARC Congestion Management Toolbox Strategies, Neighborhood Connectivity

The Optimize System Performance Need is one of the most robustly analyzed needs housing the bulk of the traffic operational analysis. While this memo summarizes the traffic measures that were utilized for overall comparison purposes, the Traffic Report should be consulted for in-depth explanation of the traffic analysis and resulting measures. The Level 2 analysis both expanded on the number of different traffic measures, and dramatically improved upon the number of quantifiable measures that are included. The traffic operations measures area a product primarily of either the DTA model or VISSIM models for travel time, travel speed, travel delay and travel distance. Individual Highway Capacity Manual (HCM) analyses were performed for the ramp Level of Services (LOS). In some locations qualitative measures were utilized when either off-peak conditions were being considered and/or the relative impacts of a different strategy were smaller than the traffic analysis tools would be able to accurately measure and communicate.

The matrix itself details the specific traffic operations measure being employed, the origin and destination of the travel being measured, the time of day (AM/PM peak), and the unit of measure being taken. These measures vary greatly between geographic area depending on the measures critical for assessing operations within that area. All traffic operation measures are using existing year traffic counts unless otherwise noted. The qualitative traffic analyses consider both existing year and 2040 projected traffic conditions.

In the Level 2 analysis, evaluation was performed of each strategy for implementation of strategies from the MARC Congestion Toolbox for congestion. The PEL strategies were evaluated for the degree to which they possess the ability to implement each recommended MARC strategy. The MARC list was first narrowed down to only those strategies that could be implemented by infrastructure projects. Each applicable infrastructure strategy was considered and summarized in the matrix according to its higher strategy grouping. Next, each PEL Strategy was given an implementation score of 0-2 for each applicable infrastructure strategy. A score of 2 indicates that the Strategy explicitly implements the strategy. A score of 1 indicates that the Strategy does not implement the strategy, however, does not preclude future implementation of the strategy. And a score of 0 indicates that the Strategy does not implement the strategy, nor allow the possibility of future implementation. Finally, for each PEL Strategy, the average score for the strategies in each category was calculated and reported in the Evaluation Matrix.

3.3.3 Need – Improve Safety and Security

Measures – Conflict Points, Increase in Delay due to Incident, Ramp Density, Potential for Severe/Fatal Crash Reduction, Bike/Ped facility improvement capacity, Emergency Responder Access, Increase in peak hour delay due to lane closure

In the Level 2 evaluation the same measures of bike/ped safety and security were maintained. To address driver safety, measures were taken to quantify infrastructure elements that are proven to correlate with safety performance. Since crash prediction models are not currently available for systems as complex as are being considered here, analyses focused on systemic measures and those facilities that either currently or are forecasted to have the highest rates of crashes. Ramp density was used as a measure of safety for

the freeway, in part because the existing I-70 has much higher than average ramp density, which is linked to its safety performance. For the arterial system, crossing conflict points were counted at the intersections. Those strategies that limit number of intersections and/or utilize one-way roads can reduce the number of crossing conflicts. Qualitative measures of potential to reduce severe/fatal crashes were used to capture the impacts to safety that are anticipated to be associated with the traffic operations of a given strategy.

Level 2 evaluation also captured the security associated with emergency response access to various neighborhoods or specific stretches of highway. These measures of emergency time, while specific in their origin and destination, are typically qualitative because they are evaluating non-peak travel times.

For North Loop geographic region, system redundancy has been added as a measure of security. This measure aims to capture the impacts of non-reoccurring incidents and congestion. Overall, critical links in the Downtown Loop that are outside of the geographic area have already been considered for the scope, cost, and traffic operations impacts of making improvements at these locations.

3.3.4 Goal – Improve Transportation Choice

Measures – Potential for future bike/ped expansion and bus/BRT/streetcar integration, bike/ped connectivity (bridge only)

The same high-level measures for this goal were primarily carried forward from the Level 1B analysis to the Level 2 analysis. In this study area bicycle, pedestrian, bus, bus rapid transit (BRT), and streetcar present the clear majority of anticipated transportation choice options by volume and predictability. With the Level 2 analysis, a high degree of quantification will be added, including better accounting for any improved connectivity brought through infrastructure improvements, especially new bridge crossings. Given the scale and level of precision of the improvements in the study, it is not yet known the specific pedestrian improvements that will be made. Some specific bicycle facilities were derived with the improvement strategies and are included in the qualitative scores. Input from local stakeholders regarding existing barriers to mode choice will play an important role in developing strategies that accurately account for predicted future improvement.

3.3.5 Goal – Improve Economic Vitality and Placemaking

Measures – Potential to make space available for development, clear title of right-of-way to be released, connectivity to the highway system, visual character and aesthetics, improved neighborhood access

For the Level 2 analysis, understanding was improved of the specific areas of existing highway right-of-way that could become available for commercial or recreational development. In addition to improving the number of geographic areas in which such space is anticipated and quantified, the Level 2 analysis provides approximated values for the land based on current year open market rates for similar property. Through engagement with the project stakeholders it also was made known that the underlying ownership of the right-of-way varies north and south of I-70. These attributes of the existing right-of-way were added to the area of right-of-way that is anticipated to become available.

The same qualitative measures of visual character and aesthetic used in the Level 1B analysis were carried forward for the Level 2 analysis. The study has developed supporting materials to display to the public the anticipated three-dimensional visual representation of various strategies. Neighborhood vitality is also represented by the improved access provided by specific strategies.

3.3.6 Goal – Improve Sustainability

Measures – Right-of-way impacts (including EJ/LEP population displacements), impact to cultural and natural resources

Level 2 analysis will carry forward all the same measures which consist of the environmental resources most typically linked to transportation projects. Two additional environmental measures were developed for the Level 2 analysis. The first is the potential opportunity to make water quality improvements repurposing existing highway right-of-way. The water quality measures evaluated the potential to provide new opportunities to integrate storm water runoff features in each strategy. This concept-level qualitative analysis assesses existing topography and storm water flow patterns and evaluates the availability of any excess right-of-way to pragmatically be converted for use to improve water quality through the implementation of features such as rain gardens, bio-swales, and constructed wetlands.

The additional environmental measure in the Level 2 analysis is general conformity to air quality requirements as approximated utilizing the traffic operations analysis. The Kansas City region's traditional air quality issue has been seasonal exceedance of the ozone standard, especially on hot summer days. The amount of precursor emissions that directly affect ozone levels are a function of total vehicle miles traveled (VMT), speed, and congestion. Other factors that will affect air quality are increased of hybrids and electric vehicles, and clean fuel technology. For the purposes of the high-level analysis for this PEL study, data from the regional DTA model was post-processed to estimate net changes in Total Organic Gasses (TOG), Carbon Monoxide (CO), Nitrogen Oxides (NOx), Carbon Dioxide (CO₂), and Particulate Matter (PM) resulting from the North Loop strategies in comparison with the No-Build condition for the year 2040. Since the diversion of traffic and the effects on speed and delay, transcended throughout the entire DTA system network for each of the strategies, the air quality impacts are most relevantly referenced at the regional level in comparison with confining them to the study area.

Combined peak period changes in key pollutants under the strategies varied by less than 2% in comparison with the No-Build condition for the year 2040. To assess the relative comparative impacts, the average percent change in key pollutant emissions predicted by the DTA was estimated for each strategy and ranked and tabulated in comparison with the No-Build.

The subsequent evaluation of independent projects to support the NEPA process will need to include a more qualitative and quantitative mobile source air toxics analysis (MSAT) to demonstrate conformance with current air quality regulations and standards.

Some additional quantification of right-of-way impacts is also included with the Level 2 analysis.

3.3.7 Goal – Feasibility

Measures – Cost, railroad impacts, aviation impacts, right-of-way impacts and opportunity for phased implementation

Several additional measures of project feasibility were added to the Level 2 analysis. Impacts to critical adjacent land uses, including the railroad and airport were included to account for the impact of specific strategies. Right-of-way impacts were added to this section to capture that different strategies do have different overall footprints as they impact private property. The same measures of cost and opportunity for phased implementation were carried forward from the Level 1B analysis. For use in the Level 2 matrix, the total costs represent the total anticipated construction and design costs to deliver the project. Right-

of-way, utility relocation, environmental study/mitigation and design/construction phase oversight costs are not considered.

4. Matrices

The matrices for Level 1A, Level 1B, and Level 2 analyses shown in the Appendix in Table 4 through Table 13.

Appendix

Figure 3: Sample Geometrics Features Assessment

Figure 2.7 - Outside Ramp Shoulder Widths



Figure 2.8 - Inside Ramp Shoulder Widths



Figure 2.9 - Ramp Radii



Table 3: Refined Conceptual Build Strategies

**Refined Conceptual Build Strategies
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New Buck O'Neil Bridge	Exhibit	Description	Comments	Status
Rehabilitate the Existing O'Neil Bridge (No-Build Condition)	A1	Rehabilitation of the existing bridge as currently programmed would consist of a \$30 (verify budget with MoDOT) million project and would restore the structure to satisfactory physical condition, and would extend the expected life of the bridge an additional 35 years.	This is considered the No-Build condition as it constitutes the future condition of the bridge absent the construction of a replacement structure. Connections with Broadway and I-35 could be improved under this strategy by a total reconstruction of the existing interchange with a high capacity type interchange such as a single point urban, or possibly diverging diamond.	
Western Alignment	A2	Approximate 28 degree skew to river. Most direct connection to I-35.	Indirect access to Broadway requires series of tandem turns at grade. US 169 connects directly with flyover ramps to I-35 with local access provided at a service interchange connecting with 4th and 5th Street (or 5th and 6th Street) and the existing Broadway interchange at I-70. Least impact to right of way but most challenging railroad impacts. Also, closest to runway approach and requires longest navigation span with highest structure skew.	
Central Alignment	A3	Approximate 20 degree skew to river. South abutment approximately half-way between the existing bridge at Broadway and I-35 at the west side of the loopSplit interchange to provide Direct Connection to I-35 and existing Broadway I-70 Interchange.	Northbound I-35 to US 169 left or right split. Final Alignment to be determined to balance grades and impacts to properties on west side of Broadway. The concept for connections to I-35 and the CBD entails a bifurcation of the alignment into separate flyover ramps to I-35 and local service ramps towards the existing Broadway interchange at 4th & 5th Street (or 5th & 6th St). Highest right of way impacts but less challenging railroad impacts in comparison with western alignment.	
Adjacent Alignment	A4	Approximate 10 degree skew to river. Location just upstream of existing bridge. Requires reconfiguration of existing Broadway interchange.	Complexity of construction adjacent to the existing bridge and least efficient traffic connection with I-35. Would require extensive structures to provide direct connection to I-35. Least impacts to right of way and railroad. Furthest separation from approach airspace, and shortest navigation span and smallest skew to channel.	
New Bridge with Rehabilitation and Re-purposed O'Neil Bridge	A5	Construction of a new bridge at either the previously described A1 or A2 alternative locations, combined with the rehabilitation of the existing bridge.	Under this concept, the new bridge would carry the west loop traffic, and the existing bridge would be configured to carry downtown and I-70 traffic, and a dedicated bike/pedestrian facility.	
Combination New Bridge with New Railroad Bridge	A6	Construction of a structure that combines a new highway bridge with a replacement of the existing Hannibal Bridge that carries the BNSF railway.	Maximizes efficiency of the freight rail movements by increasing track speeds currently controlled by tight horizontal curvature at both approaches to the existing bridge. Addresses long term potential for expanding transit service to the north although any extension of fixed rail transit is currently planned along Route 9 and the Heart of America Bridge.	

Bridge Connection	Exhibit	Description	Comments	Status
<i>Alternatives for Bridge Connection with I-35 and Broadway</i>				
I-35 Direct and Broadway Direct	AB1	Direct Single Lane ramps between Bridge and I-35 (NB and SB). Multi-lane ramps between Bridge and Broadway, tying in North of 5th street intersection. Elimination of both Woodswether Bridge and Broadway/4th Street direct connection.	AB1 is compatible with Bridge Alternatives A2, A3, and A4. Separates direct I-35/US-169 traffic from Downtown and River Market traffic. I-70/US-169 traffic still required to traverse Broadway/5th Street intersection.	
Hybrid Interchange at Broadway	AB2	Hybrid Interchange just North of Broadway/5th Street intersection. Direct Bridge connection to Broadway (NB and SB). Single lane ramp from interchange to I-35 SB (bypassing 5th street). Multi-lane ramp from EB 6th Street (South of I-70) to Interchange NB (bypassing Broadway and 5th Street). Elimination of both Woodswether Bridge and Broadway/4th Street direct connection.	AB2 is compatible with Bridge Alternatives A1 and A4. Similar to existing condition. Dangerous connection between Broadway and 4th Street removed. NB I-35 to NB US-169 traffic separated from Broadway traffic by new bypass. SB US-169 to SB I-35 traffic able to bypass 5th Street intersection. I-70/US-169 traffic still required to traverse Broadway/5th Street intersection.	
I-35 Direct and Connections w/ 4th Street	AB3	Direct single lane ramps between Bridge and I-35 (NB and SB). Bridge SB off-ramp to Beardsley/4th Street intersection. Bridge NB on-ramp from 4th Street, West of Broadway. Broadway surface intersections with 3rd, 4th, and 5th Streets. 3rd Street and 4th Street intersections may be consolidated to support traffic operations.	AB3 is compatible with Bridge Alternatives A2 and A3. Separates direct I-35/US-169 traffic from Downtown and River Market traffic. Greatly simplifies Broadway/5th Street intersection. Facilitates Broadway connection to River Market (via 3rd and 4th). I-70 to US-169 connection (both EB and WB) similar to existing condition. Connections from SB US-169 to I-70 occur from various downtown connections depend on the North Loop strategy. The costs of structure to connect SB US-169 directly to EB or WB I-70 are disproportionate with the volume of traffic served by this movement.	
I-35 Direct and Connections w/ 5th & 6th Streets	AB4	Direct single lane ramps between Bridge and I-35 (NB and SB). Bridge SB off-ramp to Beardsley at 4th Street intersection with downtown connection to 6th Street from Beardsley Road. Bridge NB on-ramp from 5th Street, West of Broadway. Broadway surface intersections with 3rd, 4th, and 5th Streets. Extension of 6th Street to Beardsley Road. On-ramp from 5th Street intersection to WB I-70. Exit Ramp from EB I-70 to 6th Street similar to existing conditions. Elimination of Woodswether Bridge.	AB4 is compatible with Bridge Alternatives A2 and A3. Separates direct I-35/US-169 traffic from Downtown and River Market traffic. Greatly simplifies Broadway/5th Street intersection. Facilitates Broadway connection to River Market (via 3rd and 4th). Connections from SB US-169 to I-70 occur from various downtown connections depend on the North Loop strategy. The costs of structure to connect SB US-169 directly to EB or WB I-70 are disproportionate with the volume of traffic served by this movement.	

Refined Conceptual Build Strategies

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North Loop	Exhibit	Description	Comments	Status
ACCESS CONSOLIDATION Re-Use I-70 Mainline and Consolidation of Ramps and Access Points	B1	Access Consolidation. Replicates the design concept that was developed in 2003 to support the original I-29/I-35 corridor EIS.	In addition to the consolidation of ramp and access points, the freeway-to-freeway interchange connections with Route 9 (Heart of America bridge) are removed and replaced with the reconnection of Independence Avenue between at-grade intersections at Grand and Charlotte and at-grade intersections. Options being considered as requested by Confluence include the addition of a WB I-70 exit to Independence at Grand, a SB I-35 exit to Independence at Harrison, and an EB Connection from 6th St to Independence (Profile to get over Charlotte and the I-70 requires 6% slopes each side over I-70 for the tri-level network).	
New Collector Distributor (CD) System	B2	Removes short sections of auxiliary lanes from the existing I-70 mainline and constructs a new CD System within the I-70 right-of-way to consolidate and distribute access into the River Market and CBD		
Compressed Footprint Strategies			Enhanced lid opportunities and development expansion potential	
COMPRESSED FOOTPRINT (South Option)	B3-6a	Compressed I-70 Along South Side of Corridor with Access at Independence Ave. Roundabout and Oak Trafficway	Two-Way, 6-Lane Independence Avenue, 6th Street Closed, Two-Way, 4-Lane 6th Street. All development opportunities in River Market and Along MO-9 Corridor. MO-9 Direct Connections removed. No added Opportunities to connect River Market and Downtown. Access to WB I-70 and SB I-35 from Independence Ave removed.	
COMPRESSED FOOTPRINT (North Option)	B3-6b	Compressed I-70 Along North Side of Corridor with Access at Broadway and Oak Trafficway	Two-Way, 6-Lane Independence Avenue Closed and Consolidated with Two-way, 4-Lane 6th Street. Development Opportunities split between downtown and MO-9 Corridor. Development Opportunities to connect Downtown with River Market with Lid over I-70 between Wyandotte and Grand may be considered in the future. MO-9 Direct Connections removed.	
COMPRESSED FOOTPRINT (Center Option) Compressed Footprint on Existing Mainline Location	B3-7	Compressed I-70 Along Centerline of existing I-70	Splits development opportunity areas on both sides of the compressed footprint. Independence Avenue treatment on north side and 6th Street on south side can be combination of either the north or south compressed footprint options (B3-1 or B3-3) Two-Way, 6-Lane Independence Avenue Closed and Consolidated with Two-way, 4-Lane 6th Street. MO-9 Direct Connections removed.	
Reconfiguration Strategies				
Reconfiguration of the Downtown Loop to One-Way Directional	B4	Reconfigures the entire loop system to carry traffic one-way in the counter clockwise direction.	All current ramp movements from the clockwise direction would be eliminated.	
Reconfiguration of the Downtown Loop to One-Way Directional with CD System	B5	Mimics Strategy B4 and includes a CD system in the opposing direction to mitigate the major missing directional connections on the east and west legs of the loop.		
Reconfiguration of the Downtown Loop to Partial One-Way Directional	B6	Reconfigures the downtown loop to partial one-way counter clockwise circulating interstate system.	Northbound I-35 is carried on the east side of the loop and southbound I-35 is carried on the west side of the loop. I-70 (north loop) and I-670 (south loop) are maintained as two-way interstates.	
Redesignate and Reclassify North Loop			Highest level of development and placemaking opportunities. Traffic diversion of north leg I-70 traffic is a concern. Detailed traffic modeling required to fully assess secondary impacts and traffic mitigation needs	
REDESIGNATE AND RECLASSIFY (Independence Ave Parkway)	B7-1	North Loop (I-70) freeway and right-of-way relinquished and existing north-south street system reconnects CBD with River Market area. I-35 routed to south loop and I-670 redesignated as I-70. Independence Avenue converted to Parkway and connected across Oak Trafficway, 6th Street two-way between Broadway and Charlotte.	Downtown and River Market connections somewhat improved between 6th Street and Independence Avenue, Split Diamond Interchange with I-35 between 7th Street and Independence Avenue. Additional development potential at Independence Ave and I-35 NW corner with cul-de-sac. At-grade intersections for MO-9 with 3rd and 5th Street, facilitating enhanced connectivity for River Market and Columbus Park. Traffic mitigation measures include extension of NB on-ramp as third lane to the US 169 split, widening of I-70 EB to two lanes from SW quadrant of the loop to Baltimore, and reconfiguration of EB lanes at I-70/I-35/ US 71 connections at the SE quadrant.	
6th Street to Independence Avenue Connection	B7-2	I-670 connection to Downtown via 6th Street with connection to Independence Avenue with Grade Separation at Oak Trafficway	Downtown and River Market connections improved between 6th Street and Independence Avenue, Modified Diamond Interchange at Independence Avenue and I-35, Grade Separated Oak Trafficway between River Market and Columbus Park, Traffic Calming effect with Independence Avenue cut off within River Market and through traffic using 6th Street	
Highway to Boulevard Concept	B8	Maintain existing I-70 alignment, but drop lanes and reduce speed to reclassify as a Boulevard between Charlotte and Broadway. Ramp access to and from Locust.	Primary issue with this strategy is speed: resulting "boulevard" section would be very short (approx. 1 mile). Could create a hazard for traffic to slow down, and then speed back up at limits of section. This strategy is very similar to the "Compressed Footprint on Existing Mainline Location" strategy (B3-7).	

Refined Conceptual Build Strategies

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Harlem / Wheeler Airport Access	Exhibit	Description	Comments	Status
Interchange Improvements				
Half Diamond Interchange with Existing Harlem Road Access	C1	A half diamond interchange, with the exit and entrance ramps on the right-hand side.	Harlem Road Eastbound and Westbound traffic remain in the existing location and condition (separated with individual railroad under crossings) and connect to Richards Road, which is relocated slightly west. Re uses the existing bridges under the BNSF tracks into Harlem.	
Half Diamond Interchange with Direct Connection to Northbound Richards Road	C2	Similar to strategy C1 except US-169 NB exit ramps connects to Richards Road		
Half Diamond Interchange with Relocated Harlem Railroad Crossing and Improved Direct Connection to Northbound Richards Road	C3	Similar to strategy C1 except the Harlem Road railroad crossing is relocated	The complex intersection in Strategy W2 is replaced with traditional intersection due to the removed Harlem Road connection.	
Half Diamond Interchange with Split Lou Holland Undercrossing	C4	Similar to strategy C1 except Northbound Lou Holland drive splits near the levee retaining wall and provided direct connection to Northbound US-169 and Richards Road via a weaving movement.		
Half Diamond Interchange with New Single Harlem Road Railroad Crossing	C5	A half diamond interchange, with the exit and entrance ramps on the right-hand side. Harlem Eastbound and Westbound traffic is brought together for a single railroad undercrossing.		
Button-Hook Interchange with Relocated Harlem Railroad Crossing	C6	A half diamond interchange with button-hook style ramps, along with the exit and entrance ramps on the right-hand side. The Harlem Road railroad undercrossing is relocated either to the North or South.		
Auxiliary Improvements				
Right In Right Out 1	RIRO 1	Improve existing RIRO by providing additional length to existing accel/decel lanes	Provides SB US-169 connectivity into the Airport near VML. 2nd SB US-169 movement provided further north.	
Right In Right Out 2	RIRO 2	Improve existing RIRO by providing separated accel/decel lanes	Provides dedicated accel/decel lane similar to an interchange ramp. 2nd SB US-169 movement provided further north.	
Northern Access Connection to US-169	N. Intchg	SB on and off ramp connections and NB On ramp Connections	This configuration provides additional movements into and out of the airport in order to provide at least 2 entrance and exit locations into the airport.	

West Bottoms	Exhibit	Description	Comments	Status
Roadway network changes to mitigate possible closure of Woodswether viaduct and connection to Broadway				
Half Diamond Interchange at Wyoming Street	D1	Provides partial interchange access into and out of the West Bottoms from I-70. Reduces impacts to the existing Kansas City Missouri Waste Water Treatment Facility.	Partial interchange access will create difficulties in obtaining an approved access modification to the interstate. Steep profile grades for both the onramp and offramp from I-70. This will could result in operational and safety concerns. Impacts the proposed expansion of the Kansas City Missouri waste water treatment facility in the north-east quadrant of I-70 and Wyoming Street.	
Half Tight Diamond Interchange option on the Kansas Side at Ohio Street	D1a	Eliminate impact to the Kansas City Missouri waste water treatment facility. Provides additional weaving space between I-35 directional ramps.	Partial interchange access. This will be a significant concern in obtaining an approved access modification to the interstate. Steep grades from I-70 to Ohio Street. Impacts several businesses and parking areas on both sides including a large area of truck and trailer parking for UPS.	
Full Diamond Interchange at Wyoming Street	D2	Provides all traffic movements between I-70 and Wyoming Street.	Inadequate weave, merge, acceleration, and deceleration distance for the I-35 directional ramps on the east side and the future Phase 2 of the LCV. Wyoming Street Traffic to WB I-70 would require 3 lane changes to access the future WB I-70 in Phase 2 of the LCV project. Impacts both the existing and proposed expansion area of the Kansas City Missouri waste water treatment facility.	
Folded Diamond Interchange at Wyoming Street	D3	Eliminates impacts to the existing Kansas City Missouri waste water treatment facility in the NW quadrant of I-70 and Wyoming Street. Provides all movements to and from I-70 at Wyoming Street. Provides additional separation distance from future Phase 2 construction of the LCV.	Folded diamond on the northside of I-70 impacts entire property for the proposed location for the expansion of the Kansas City Missouri waste water treatment facility. Requires acquisition of Geo. E. Fern Co. building and large dual sided Lamar outdoor advertising billboard. Tight loop ramps on steep grades to and from I-70 will create operational and safety issues. The proximity of WB I-70 offramp to Woodswether Road would create a difficult turning movement for trucks wanting to go EB on Woodswether Road.	
Partial Folded Diamond Interchange at Wyoming Street	D4	Eliminates impacts to the existing Kansas City Missouri waste water treatment facility in the NW quadrant of I-70 and Wyoming Street. Eliminates tight radius (20 mph) loop ramp for EB I-70.	Inadequate weave, merge, acceleration, and deceleration distance for the I-35 directional ramps on the east side and the future Phase 2 of the LCV. Only 430' of weaving distance between EB I-70 onramp and SB I-35 directional ramp. EB I-70 onramp traffic will have to shift two (2) lanes to continue EB on I-70. Wyoming Street traffic to WB I-70 would require 3 lane changes to access the future WB I-70 in Phase 2 of the LCV project.	
Madison Ave to Sante Fe St	D5	New connection between Woodswether and Forrester	Added Roadway to construct and maintain between Madison and 8th Street, Multiple intersections for trucks to navigate. Need to review intersection improvements to facilitate traffic diverted from Woodswether Road (added turn lanes, improved turn radius, signals, etc)	
Mulberry St to Forrester Rd	D6	Utilize existing Mulberry St between Woodswether and Forrester	Uses existing street network. Multiple intersection turning movements for trucks to navigate. Need to review intersection improvements to facilitate traffic diverted from Woodswether Road (added turn lanes, improved turn radius, signals, etc)	
Wyoming St to Forrester Rd	D7	Utilize existing Wyoming St between Woodswether and Forrester	Uses existing street network. Fewest intersection turning movements for trucks to navigate. Need to review intersection improvements to facilitate traffic diverted from Woodswether Road (added turn lanes, improved turn radius, signals, etc). longest route to replace Woodswether Road connection	
4th Street to Woodswether Bridge	D8	Construct new bridge, extending 4th Street West from Beardsley Road to Woodswether. New bridge would cross both BNSF and UP tracks.	Achieving desired clearance at the railroad tracks would be difficult. Also, significant ROW take required on Woodswether.	

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West Bottoms	Exhibit	Description	Comments	Status
Roadway network changes to mitigate possible closure of Woodswether viaduct and connection to Broadway				
Half Diamond Interchange at Wyoming Street	D1	Provides partial interchange access into and out of the West Bottoms from I-70. Reduces impacts to the existing Kansas City Missouri Waste Water Treatment Facility.	Partial interchange access will create difficulties in obtaining an approved access modification to the interstate. Steep profile grades for both the onramp and offramp from I-70. This will could result in operational and safety concerns. Impacts the proposed expansion of the Kansas City Missouri waste water treatment facility in the north-east quadrant of I-70 and Wyoming Street.	
Half Tight Diamond Interchange option on the Kansas Side at Ohio Street	D1a	Eliminate impact to the Kansas City Missouri waste water treatment facility. Provides additional weaving space between I-35 directional ramps.	Partial interchange access. This will be a significant concern in obtaining an approved access modification to the interstate. Steep grades from I-70 to Ohio Street. Impacts several businesses and parking areas on both sides including a large area of truck and trailer parking for UPS.	
Full Diamond Interchange at Wyoming Street	D2	Provides all traffic movements between I-70 and Wyoming Street.	Inadequate weave, merge, acceleration, and deceleration distance for the I-35 directional ramps on the east side and the future Phase 2 of the LCV. Wyoming Street Traffic to WB I-70 would require 3 lane changes to access the future WB I-70 in Phase 2 of the LCV project. Impacts both the existing and proposed expansion area of the Kansas City Missouri waste water treatment facility.	
Folded Diamond Interchange at Wyoming Street	D3	Eliminates impacts to the existing Kansas City Missouri waste water treatment facility in the NW quadrant of I-70 and Wyoming Street. Provides all movements to and from I-70 at Wyoming Street. Provides additional separation distance from future Phase 2 construction of the LCV.	Folded diamond on the northside of I-70 impacts entire property for the proposed location for the expansion of the Kansas City Missouri waste water treatment facility. Requires acquisition of Geo. E. Fern Co. building and large dual sided Lamar outdoor advertising billboard. Tight loop ramps on steep grades to and from I-70 will create operational and safety issues. The proximity of WB I-70 offramp to Woodswether Road would create a difficult turning movement for trucks wanting to go EB on Woodswether Road.	
Partial Folded Diamond Interchange at Wyoming Street	D4	Eliminates impacts to the existing Kansas City Missouri waste water treatment facility in the NW quadrant of I-70 and Wyoming Street. Eliminates tight radius (20 mph) loop ramp for EB I-70.	Inadequate weave, merge, acceleration, and deceleration distance for the I-35 directional ramps on the east side and the future Phase 2 of the LCV. Only 430' of weaving distance between EB I-70 onramp and SB I-35 directional ramp. EB I-70 onramp traffic will have to shift two (2) lanes to continue EB on I-70. Wyoming Street traffic to WB I-70 would require 3 lane changes to access the future WB I-70 in Phase 2 of the LCV project.	
Madison Ave to Sante Fe St	D5	New connection between Woodswether and Forrester	Added Roadway to construct and maintain between Madison and 8th Street. Multiple intersections for trucks to navigate. Need to review intersection improvements to facilitate traffic diverted from Woodswether Road (added turn lanes, improved turn radius, signals, etc)	
Mulberry St to Forrester Rd	D6	Utilize existing Mulberry St between Woodswether and Forrester	Uses existing street network. Multiple intersection turning movements for trucks to navigate. Need to review intersection improvements to facilitate traffic diverted from Woodswether Road (added turn lanes, improved turn radius, signals, etc)	
Wyoming St to Forrester Rd	D7	Utilize existing Wyoming St between Woodswether and Forrester	Uses existing street network. Fewest intersection turning movements for trucks to navigate. Need to review intersection improvements to facilitate traffic diverted from Woodswether Road (added turn lanes, improved turn radius, signals, etc). longest route to replace Woodswether Road connection	
4th Street to Woodswether Bridge	D8	Construct new bridge, extending 4th Street West from Beardsley Road to Woodswether. New bridge would cross both BNSF and UP tracks.	Achieving desired clearance at the railroad tracks would be difficult. Also, significant ROW take required on Woodswether.	

Refined Conceptual Build Strategies

February 20, 2018

MO-9 Connection	Exhibit	Description	Comments	Status
MO-9 Connection				
<i>Alternatives for MO-9 Connection to North Loop, River Market, and Columbus Park</i>				
No Build Option	E1	Existing Condition. Bridge On- and Off-ramp connections to 3rd Street. No MO-9 connection to 3th Street, Independence Ave, or 6th Street. MO-9 direct ramp connections to EB and WB I-70. EB I-70 to NB MO-9 direct connection. No connection from WB I-70 to NB MO-9.	Only compatible with North Loop "No Build" Alternative. Not compatible with other North Loops Alternatives unless those alternatives are modified to keep some of the existing ramps/connections.	
All At-Grade Connections, Existing MO-9 Alignment	E2a	At-grade intersections for MO-9 with 3rd Street, 3th Street, Independence Ave, and 6th Street. Partial reconstruction of HOA Bridge, South of gore, to meet 3rd Street (intersection slightly perched). Extension of Independence Ave to meet MO-9. Elimination of all direct connection ramps between MO-9 and I-70.	E2a is compatible with North Loop Alternatives B1, B3-6a, B3-6b, B3-7, and B7-1. Facilitates significantly improved connectivity from River Market and Columbus Park to CBD, MO-9, and I-70, and vice-versa. Provides alternative access route to River Market. Opens up property for redevelopment along the West side of MO-9, and a small plot on the East side. Requires modification of HOA Bridge to facilitate the drop in grade, including a new span over the Streetcar maintenance tracks. Does not improve Oak Trafficway connection to Oak and Locust Streets.	
All At-Grade Connections, Western Offset of MO-9 Alignment	E2b	Variant of E2a with MO-9 alignment offset to the West between HOA Bridge and Independence Ave.	E2b is compatible with North Loop Alternatives B1, B3-6a, B3-6b, B3-7, and B7-1. Similar to E2a. Differs from E2a by shifting property for redevelopment from West side of MO-9 to East side.	
South At-Grade Connections	E3	No change to existing condition at 3rd Street and 3th Street. At-grade intersections for MO-9 with Independence Ave and 6th Street. Extension of Independence Ave to meet MO-9. Elimination of all direct connection ramps between MO-9 and I-70.	E3 is compatible with North Loop Alternatives B1, B3-6a, B3-6b, and B3-7. Facilitates integration of existing MO-9 with various North Loop Alternatives. Opens up property for redevelopment along the West side of MO-9, and a small plot on the East side. No modification to HOA Bridge required. Does not improve connectivity for River Market and Columbus Park, with respect to existing condition. Does not improve Oak Trafficway connection to Oak and Locust Streets.	
South At-Grade Connections with Split Lanes	E4	No change to existing condition at 3rd Street and 3th Street. At-grade intersections for MO-9 with Independence Ave and 6th Street. Extension of Independence Ave to meet MO-9. Addition of Page Street bridge over I-70, parallel to existing MO-9 bridge, to facilitate split lanes (NB/SB) over I-70. Elimination of all direct connection ramps between MO-9 and I-70.	E4 is compatible with North Loop Alternatives B1, B3-6a, B3-6b, and B3-7. Facilitates integration of existing MO-9 with various North Loop Alternatives. Opens up small plots of property for redevelopment along the East and West sides of MO-9. No modification of HOA Bridge required. Improves Oak Trafficway connection to Oak and Locust Streets. Does not improve connectivity for River Market and Columbus Park, with respect to existing condition.	
Global Strategies				
<i>Overall strategies for improving traffic across entire study area.</i>				
Transit Connectivity		When possible, strategies in all regions should provide flexibility for future expansion of metro and regional transit systems.	This includes both the Streetcar and Bus Rapid Transit Systems.	
Bike and Pedestrian Connectivity		When possible, strategies in all regions should provide opportunities for expansion of the existing bicycle and pedestrian network.	This includes, but is not limited to, bike/ped paths, designated bike lanes, sidewalks, and connections with existing bike/ped infrastructure. The focus is primarily on bike/ped access for recreational, placemaking, and quality-of-life purposes, and not necessarily on alternative commuter routes.	

Table 4: Level 1A Matrix - Initial Screening

NORTH LOOP PLANNING AND ENVIRONMENTAL LINKAGES STUDY

Initial Screening of Partial List of Build Strategies

Study Management Team Meeting - May 16, 2017

SMT COLLECTIVE SCORING - MAY 16, 2017

Conceptual Build Strategies				Improve Physical Conditions	Optimize System Performance	Improve Safety & Security	Improve Transp. Choices	Improve Economic Vitality and Placemaking	Improve Environn Sustainability	AVE. SCORE	SCREENED
Exhibit	Description	Comments									
O'Neil Bridge Strategies											
Rehabilitation	Use In Place	Coordinated w/5th / 6th Interchange Imp & other local interchange improvements									
New Bridge											
Location Alternative 1	A1	Largest Skew Angle to Nav Channel	Can combine with alternate local access scenarios. Left split probably requires I-35 designation to south loop								
Location Alternative 2	A2	Lesser Skew Angle to Nav Channel	Alternate sub-alignments on south side. Can combine with alternate local access scenarios. Left split probably requires I-35 designation to south loop								
Location Alternative 3	A3	Existing Skew Angle to Nav Channel as Existing	Connects with existing Broadway interchange at 5th and 6th OR Alternative Interchange Strategies depending on traffic								
New Bridge and Repurpose		Existing Bridge used for local access	Highly improbable - additional bridge in system and ownership								
Highway Strategies (Med Impact - Med Range)											
Interchange Improvements											
5th/6th Street	c1	SPUI, DDI, etc.	Independent or in conjunction with other medium and high impact strategies								
Route 9/Independence Avenue	c2	At-grade intersection at Independence. Removes system to system connection	Links Columbus Park with River Market. Independent or in conjunction with other medium and high impact strategies								
Highway Strategies (High Impact - Long Range)											
I-70 Mainline Reconfiguration											
North Loop Access Modifications	B1	I-29 / I-35 EIS North Loop Alternative B. Uses existing mainline with elimination and consolidation of access ramps.	Some traffic relief but does not provide any additional development potential in comparison with other strategies								
Mainline Collector Distributor	B2	At mainline elevation-separated auxiliary lane	Through traffic relief only but CD requires upstream decision points, and additional pavement to be constructed and maintained. No additional development opportunities.								
Compressed Footprint Mainline (North or South)	B3	Tight adjacent frontage roads. Shorter bridges	Enhanced lid opportunities and development expansion potential								
Loop System Reconfiguration											
Total One Way Circulation	B4, B5	Counter Clockwise Circulation	With or without SB CD on east leg for connection to SB 71 and EB I-70 & NB CD on west leg for access to 12th Street, O'Neil Bridge, and north side of CBD								
Partial One-way Circulation	B6	Two-Way on north and south legs	Maintains continuity on I-670 and I-70, splits I-35								
Redesignate and Reclassify North Loop	B7	Includes Arterial Couplet - 6th and Independence	diversion of north leg I-70 traffic is a concern. Detailed traffic modeling required to fully assess secondary impacts and traffic mitigation needs.								

Table 5: Level 1B Matrix - North Loop

I-70 PEL North Loop Strategy Evaluation Matrix												
				Measures	Units	No-Build	Alternative B1	Alternative B3-6A	Alternative B3-6B	Alternative B3-7	Alternative B7-1	
N E E D S	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITY	Number of Existing Bridges Being Replaced	Area							
			Area of Existing Pavement Being Replaced	Area								
	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count								
			Number of Existing Substandard Geometric Features Replaced (Yellow)	Count								
	OPTIMIZE SYSTEM PERFORMANCE	REGIONAL CONNECTIONS	NORTHLAND	Will Alternative Improve Travel Time	1-4 (Best to Worst)							
			WYANDOTTE CO. AND KC, KANSAS	Will Alternative Improve Travel Time	1-4 (Best to Worst)							
			SOUTHERN KC and JOHNSON CO.	Will Alternative Improve Travel Time	1-4 (Best to Worst)							
		DOWNTOWN LOOP	MAINLINE TRAFFIC SPEED	Average Peak Hour Travel Speed	1-4 (Best to Worst)							
			EXIT AND ENTRANCE RAMP PERFORMANCE	LOS (HCM)	1-4 (Best to Worst)							
		SYSTEM-WIDE	TRAFFIC CONGESTION	Total Peak Hour Delay	1-4 (Best to Worst)							
IMPROVE SAFETY AND SECURITY	VEHICULAR TRAFFIC	NUMBER OF CONFLICT POINTS	Ramp Density	Ramps per Mile								
		BIKE/PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY	Potential to Allow for Improve existing Bike/Ped Facilities	1-4 (Best to Worst)							
	IMPROVE EMERGENCY RESPONSE TIMES		Will Alternative Improve Emergency Vehicle Travel Time?	1-4 (Best to Worst)								
	G O A L S	IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT BIKE KC PLAN		Potential for Bike/Ped Network Expansion	1-4 (Best to Worst)						
ACCOMMODATE EXISTING AND FUTURE TRANSIT			Potential for Bus/Streetcar Integration	1-4 (Best to Worst)								
IMPROVE ECONOMIC VITALITY AND PLACEMAKING		REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area							
		ENHANCE REGIONAL FREIGHT HUBS	PORT OF KC	Average Truck Travel Time	1-4 (Best to Worst)							
			RAIL YARDS	Average Truck Travel Time	1-4 (Best to Worst)							
IMPROVE SUSTAINABILITY		PROMOTE QUALITY PLACES		DOWNTOWN AIRPORT	Average Truck Travel Time	1-4 (Best to Worst)						
		MAINTAIN/ IMPROVE MULTI-MODAL CONNECTIONS	COMMUNITY IMPACTS		Visual Character and Aesthetics	1-4 (Best to Worst)						
			ROW IMPACTS	CULTURAL RESOURCES		Potential to meet regional Bike Plan	1-4 (Best to Worst)					
				NATURAL RESOURCES		Residential	Area					
		FEASIBILITY	TOTAL COST	COMMUNITY IMPACTS		Commercial	Area					
EJ/LEP POPULATIONS DISPLACED				Residential	Area							
CULTURAL RESOURCES				Commercial	Area							
NATURAL RESOURCES				NRHP Sites Impacted	Count							
CULTURAL RESOURCES				NRHP Districts Impacted	Count							
CULTURAL RESOURCES				Documented Archeology Sites	Count							
CULTURAL RESOURCES				Hazmat Sites Impacted	Count							
CULTURAL RESOURCES				Parks Impacted	Count							
CULTURAL RESOURCES				Wetlands Impacted	Area (Acres)							
CULTURAL RESOURCES				Floodplains Impacted	Linear Feet Crossed							
FEASIBILITY		TOTAL COST		Planning Level Construction Cost Estimate (Bridge)	Dollars							
FEASIBILITY		TOTAL COST		Planning Level Construction Cost Estimate (Roadway)	Dollars							

Roadway cost w/o SPUI

Alternatives

- B1 Preservation and Ramp Consolidation (2002 North Loop Master Plan from I-35/I-29 EIS)
- B3-6A Traffic Thru with Development (compressed) with access on ends with optional access in middle - South (offset roundabouts option)
- B3-6B Traffic Thru with Development (compressed) with access on ends with optional access in middle - North (offset roundabouts option)
- B3-7 Traffic Thru with Development (compressed) with access on ends with optional access in middle - Center (tight half SPUI at Oak/route 9)
- B7-1 Close-off I-70 and replaced with arterials on both sides

Table 6: Level 1B Matrix – Downtown Airport

Downtown Airport Strategy Evaluation Matrix									
				Measures	Units	No-Build	Alternative C1	Alternative C4	Alternative C5
		Area of Existing Pavement Being Replaced	Area						
	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count					
			Number of Existing Substandard Geometric Features Replaced (Yellow)	Count					
OPTIMIZE SYSTEM PERFORMANCE	LOCAL ACCESS	AIRPORT	Total Delay at Airport Entrances	Hours					
		HARLEM	Travel Time from US 169 into Harlem	Red, Yellow, Green					
	US 169	US 169 TRAVEL SPEED	Average Peak Hour Travel Speed	Red, Yellow, Green					
		EXIT AND ENTRANCE RAMP PERFORMANCE	LOS (HCM)	LOS					
IMPROVE SAFETY AND SECURITY	VEHICULAR	Total Number of Conflict Points		Count					
	BICYCLE/PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY		Does Alternative Allow for Improve existing Bike/Ped Facilities	Qualitative				
	IMPROVE EMERGENCY RESPONSE TIMES		Will Alternative Improve Emergency Vehicle Travel Time?		Qualitative				
GOALS	IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT BIKE KC PLAN		Potential for Bike/Ped Network Expansion	Qualitative				
		ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Bus/Streetcar Integration	Qualitative				
	IMPROVE ECONOMIC VITALITY AND PLACEMAKING	REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development		Area			
		ENHANCE REGIONAL FREIGHT HUBS	PORT OF KC		Average Truck Travel Time	Red, Yellow, Green			
			RAIL YARDS		Average Truck Travel Time	Red, Yellow, Green			
			DOWNTOWN AIRPORT		Average Truck Travel Time	Red, Yellow, Green			
		PROMOTE QUALITY PLACES		Visual Character and Aesthetics		Qualitative			
	IMPROVE SUSTAINABILITY	MAINTAIN/ IMPROVE MULTI-MODAL CONNECTIONS		Potential to meet regional Bike Plan		Qualitative			
		COMMUNITY IMPACTS	ROW IMPACTS		Residential	Area			
					Commercial	Area			
EJ/LEP POPULATIONS DISPLACED			Residential	Area					
			Commercial	Area					
PROTECT CULTURAL/NATURAL RESOURCES		CULTURAL RESOURCES		NRHP Sites Impacted		Count			
				NRHP Districts Impacted		Count			
				Documented Archeology Sites		Count			
	Hazmat Sites Impacted			Count					
	Parks Impacted			Count					
	NATURAL RESOURCES			Wetlands Impacted		Area (Acres)			
		Floodplains Impacted		Linear Feet Crossed					
FEASIBILITY	TOTAL COST		Planning Level Construction Cost Estimate		Dollar Range				

Alternatives

No-Build

Only valid with No-Build Bridge Option

C1

Half diamond NB only (use existing railroad bridges at Harlem Road)

C4

New alternative developed by Chip Tousinsky with Russ J and presented to KCAD 7-19

C5

Half diamond NB only (new single bridge, wider with realigned Harlem Road)

All Options Include North area folded diamond with improved SB off, same NB on, and new SB on

Table 7: Level 1B Matrix - West Bottoms

West Bottoms Strategy Evaluation Matrix								
			Measures	Units	No-Build	Alternative D6	Alternative D7	
N E E D S	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITIES	Number of Existing Bridges Being Replaced	Area			
				Area of Existing Pavement Being Rehabilitated	Area			
		GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count			
				Number of Existing Substandard Geometric Features Replaced (Yellow)	Count			
	OPTIMIZE SYSTEM	LOCAL ACCESS	I-70 TO LOCATION X	Average Peak Hour Commute Travel Time	Red, Yellow, Green			
	IMPROVE SAFETY AND SECURITY	VEHICULAR TRAFFIC	WILL ALTERNATIVE IMPROVE TOTAL NUMBER OF CONFLICT POINTS			Qualitative		
BIKE/PEDESTRIAN		BICYCLE/PEDESTRIAN SAFETY	Does Alternative Allow Improvements to existing Bike/Ped Facilities		Qualitative			
IMPROVE EMERGENCY RESPONSE TIMES			Will Alternative Improve Emergency Vehicle Travel Time?		Qualitative			
G O A L S	IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT BIKE KC PLAN		Potential for Bike/Ped Network Expansion	Qualitative			
		ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Bus/Streetcar Integration	Qualitative			
	IMPROVE ECONOMIC VITALITY AND PLACEMAKING	REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area			
		ENHANCE REGIONAL FREIGHT HUBS	West Bottoms	Average Truck Travel Time	Red, Yellow, Green			
		PROMOTE QUALITY PLACES		Visual Character and Aesthetics	Qualitative			
	IMPROVE SUSTAINABILITY	COMMUNITY IMPACTS	ROW IMPACTS		Residential	Area		
					Commercial	Area		
			EJ/LEP POPULATIONS DISPLACED		Residential	Area		
		PROTECT CULTURAL/NATURAL RESOURCES			Commercial	Area		
			CULTURAL RESOURCES		NRHP Sites Impacted	Count		
					NRHP Districts Impacted	Count		
					Documented Archeology Sites	Count		
			Hazmat Sites Impacted	Count				
NATURAL RESOURCES		Parks Impacted	Count					
		Wetlands Impacted	Area (Acres)					
		Floodplains Impacted	Linear Feet Crossed					
FEASIBILITY	TOTAL COST			Planning Level Construction Cost Estimate (Bridge)	Dollars			
				Planning Level Construction Cost Estimate (Roadway)	Dollars			

Alternatives

D6

Mulberry roadway improvement w/ Woodswether viaduct repurpose, local widening at Beardsley at sharp EB rt and ramp to WB I-70

D7

Wyoming roadway improvement w/ Woodswether viaduct repurpose, local widening at Beardsley at sharp EB rt and ramp to WB I-70

Table 8: Level 1B Matrix – Buck O’Neil Bridge

River Bridge + Connections to North Loop Evaluation Matrix									
				Measures	Units	Alternative A1 / No Build	Alternative A2	Alternative A3	Alternative A4
				NEEDS	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITY	Service Life of River Bridge	Years
Area of Existing Bridges Being Replaced	Area								
Area of Existing Pavement Being Replaced	Area								
GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count						
		Number of Existing Substandard Geometric Features Replaced (Yellow)	Count						
OPTIMIZE SYSTEM PERFORMANCE	US 169	MAINLINE TRAFFIC SPEED	Average Peak Hour Travel Speed		1-4 (Best to Worst)				
	INTERSECTION PERFORMANCE		US 169/INDEPENDENCE AVE (Broadway / 5th Ave)		LOS (HCM)	1-4 (Best to Worst)			
	TRAFFIC CONGESTION		Total Peak Hour Delay		Hours				
	PEAK PERIOD TRAVEL TIME	FREEWAY	Airport to 12th Street Interchange		1-4 (Best to Worst)				
LOCAL		Airport to 6th Street Intersection	1-4 (Best to Worst)						
IMPROVE SAFETY AND SECURITY	VEHICULAR TRAFFIC	CONFLICT POINTS AT BRIDGE TERMINALS		Qualitative					
	BIKE/ PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY		Does Alternative Allow for Improve existing Bike/Ped Facilities	Qualitative				
	IMPROVE EMERGENCY RESPONSE TIMES			Travel Time for Emergency Responders to Airport	Qualitative				
GOALS	IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT BIKE KC PLAN		Potential for Bike/Ped Network Expansion	1-4 (Best to Worst)				
		ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Bus/Streetcar Integration	1-4 (Best to Worst)				
		BIKE/ PEDESTRIAN RIVER CROSSING		Width of bike/ped accomodation on bridge	Width (feet)				
	IMPROVE ECONOMIC VITALITY AND PLACEMAKING	REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area				
		ENHANCE REGIONAL FREIGHT HUBS	RAIL YARDS	Average Truck Travel Time	1-4 (Best to Worst)				
			DOWNTOWN AIRPORT	Average Truck Travel Time	1-4 (Best to Worst)				
	PROMOTE QUALITY PLACES		Visual Character and Aesthetics		1-4 (Best to Worst)				
	IMPROVE SUSTAINABILITY	COMMUNITY IMPACTS	ROW IMPACTS	Residential	Area				
				Commercial	Area				
				EJ/LEP POPULATIONS DISPLACED	Residential	Area			
PROTECT CULTURAL/NATURAL RESOURCES		CULTURAL RESOURCES	NRHP Sites Impacted	Count					
			NRHP Districts Impacted	Count					
			Documented Archeology Sites	Count					
			Hazmat Sites Impacted	Count					
NATURAL RESOURCES	Parks Impacted	Count							
	Wetlands Impacted	Area (Acres)							
	Floodplains Impacted	Linear Feet Crossed							
FEASIBILITY	TOTAL COST		Planning Level Construction Cost Estimate	Dollar Range					
	OPPORTUNITY FOR PHASED IMPLEMENTATION			Qualitative					

Alternatives

- A1 No Build: Rehabilitate the Existing O’Neil Bridge
- A2 Western Alignment - Skewed approximately 28 degree to the Missouri River
- A3 Central Alignment - Skewed approximately 20 degree to the Missouri River
- A4 Eastern Alignment - Skewed approximately 10 degree to the Missouri River

Table 9: Level 2 Matrix - North Loop

I-70 PEL North Loop Strategy Evaluation Matrix											
				Measures	Units	No-Build	B1	B3-6a	B3-6b	B3-7	B7-1
						Access Consolidation	Compressed Footprint (South)	Compressed Footprint (North)	Compressed Footprint (Existing)	Reclassify I-70 (Independence Ave. Parkway)	
IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITY	Area of Existing Bridges being Removed	Area (SF)							
			Area of Existing Bridges Left in Place	Area (SF)							
	Maintenance Cost for Existing Bridges Left in Place to 2040		Dollars								
	Area of New Bridges being Built		Area (SF)								
	Maintenance Cost for Existing Roadways Left in Place to 2040		Dollars								
	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Area of Existing Pavement being Removed or Replaced	Area (SF)							
			Number of Existing Substandard Geometric Features Removed or Replaced (Red)	Count							
			Number of Existing Substandard Geometric Features Removed or Replaced (Yellow)	Count							
N E D S	REGIONAL CONNECTIONS	CONNECTIONS MOST SENSITIVE TO STRATEGIES ARE LISTED HERE - (see "Travel Times" Matrix from DTA for full results)	Travel Time Origin: I-35 SB (NE Corner) Dest: I-35 SB (SW Corner)	AM (Min.) PM (Min.)							
			Travel Time Origin: I-35 NB (SE Corner) Dest: I-35 NB (NE Corner)	AM (Min.) PM (Min.)							
			Travel Time Origin: I-70 WB (SE Corner) Dest: I-70 WB (NW Corner)	AM (Min.) PM (Min.)							
			Travel Time Origin: I-70 EB (NW Corner) Dest: I-70 EB (SE Corner)	AM (Min.) PM (Min.)							
			Travel Time Origin: I-670 EB (SW Corner) Dest: I-70 EB (SE Corner)	AM (Min.) PM (Min.)							
			Travel Time Origin: I-70 WB (SE Corner) Dest: I-670 WB (SW Corner)	AM (Min.) PM (Min.)							
	OPTIMIZE SYSTEM PERFORMANCE	DOWNTOWN LOOP	MAINLINE TRAFFIC SPEED	Average Peak Hour Travel Speed on I-70 EB	MPH (AM / PM)						
				Average Peak Hour Travel Speed on I-70 WB	MPH (AM / PM)						
				Average Peak Hour Travel Speed on I-670 EB	MPH (AM / PM)						
				Average Peak Hour Travel Speed on I-670 WB	MPH (AM / PM)						
				Average Peak Hour Travel Speed on I-35 NB	MPH (AM / PM)						
				Average Peak Hour Travel Speed on I-35 SB	MPH (AM / PM)						
	SYSTEM-WIDE	TRAFFIC CONGESTION	Total Peak Hour Delay (DTA System Total Network)	AM Delay (Min.) PM Delay (Min.)							
			Total Peak Hour Delay (DTA System within cordon line)	AM Delay (Min.) PM Delay (Min.)							
			Total Travel Time - Vehicle Hours Traveled (DTA System Total)	AM (Hrs.) PM (Hrs.)							
		TOTAL TRAVEL	Total Daily Travel Distance (DTA System Total)	AM (VMT) PM (VMT)							
	IMPLEMENTATION OF APPLICABLE MARC CONGESTION MANAGEMENT TOOLBOX STRATEGIES	ACCESS MANAGEMENT STRATEGIES	Examples: Left Turn Restrictions, Minimum Intersection Spacing, Roundabouts, Frontage Roads, etc.	0-2 (Implementation)							
ACTIVE TRANSPORTATION STRATEGIES		Examples: Designated Bike Lanes, Exclusive Non-Motorized ROW, etc.	0-2 (Implementation)								
HIGHWAY STRATEGIES		Examples: Geometric Improvements, HOV Lanes, Acceleration/Deceleration Lanes, etc.	0-2 (Implementation)								
TRANSIT STRATEGIES		Examples: Dedicated ROW for Transit	0-2 (Implementation)								
TRANSPORTATION OPERATIONS & MGMT STRATEGIES		Examples: Reversible Traffic Lanes, Turn Restrictions, etc.	0-2 (Implementation)								
IMPROVE SAFETY AND SECURITY	DRIVER SAFETY	RAMP DENSITY	Ramp Density on I-70	Ramps per Mile							
		CONFLICT POINTS	Number of Conflict Points	Count							
		INTERSTATE TRAFFIC	Potential for Severe/Fatal Crash Reduction	1-4 (Best to Worst)							
		LOCAL ROAD SYSTEM	Potential for Severe/Fatal Crash Reduction	1-4 (Best to Worst)							
	RESILIENCE	SYSTEM REDUNDANCY	Increase in Total Peak Hour Delay (Network-wide) from a blocked lane on I-70	Delta Delay (Min.)							
	BIKE/PEDESTRIAN	BIICYCLE/PEDESTRIAN SAFETY	Potential for safety improvements to existing Bike/Ped Facilities	1-4 (Best to Worst)							
	IMPROVE EMERGENCY RESPONSE TIMES	Highway Access from KCFD Station 25 (401 E. Missouri Ave)	1-4 (Best to Worst)								

G O A L S	IMPROVE TRANSPORTATION CHOICES		CONTRIBUTE TO/COMPLEMENT GREATER KC REGIONAL BIKEWAY PLAN	Potential for expansion of existing Bike/Ped Facilities	1-4 (Best to Worst)						
			ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Independence BRT Integration	1-4 (Best to Worst)					
					Potential for Streetcar Integration	1-4 (Best to Worst)					
	IMPROVE ECONOMIC VITALITY AND PLACEMAKING		REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area (Acres)					
					Potential to Make Space Available for Commercial/Recreational Development	Land Value (\$)					
					Clear title of existing right-of-way to be released	1-4 (Best to Worst)					
			ENHANCE REGIONAL FREIGHT HUBS		PORT OF KC/WEST BOTTOMS	Connectivity to Highway System	1-4 (Best to Worst)				
					FAIRFAX	Connectivity to Highway System	1-4 (Best to Worst)				
	DOWNTOWN AIRPORT	Connectivity to Highway System			1-4 (Best to Worst)						
	PROMOTE QUALITY PLACES		Visual Character and Aesthetics	1-4 (Best to Worst)							
	IMPROVE SUSTAINABILITY		COMMUNITY IMPACTS		ROW IMPACTS	Residential	Area (Acres)				
					Commercial	Area (Acres)					
			EJ/LEP POPULATIONS DISPLACED		Residential	Number of Residences					
					Commercial	Number of Businesses					
			PROTECT CULTURAL/NATURAL RESOURCES		CULTURAL RESOURCES		NRHP Sites Impacted	Count			
							NRHP Districts Impacted	Count			
							Documented Archeology Sites	Count			
					NATURAL RESOURCES		Hazmat Sites Impacted	Count			
							Improvement Opportunities Water Quality and Stormwater	1-4 (Best to Worst)			
			Parks Impacted		Area (Acres)						
Wetlands Impacted		Area (Acres)									
PUBLIC HEALTH		AIR QUALITY	General Conformity Analysis of Required Pollutants	Tons per year							
FEASIBILITY		ROW ISSUES		Number of tracts with anticipated right-of-way acquisition challenges	Count						
		TOTAL COST		Planning Level Construction Cost Estimate	Dollars						

Table 10: Level 2 Matrix – Downtown Airport

Downtown Airport Strategy Evaluation Matrix										
			Measures	Units	No-Build	C1	C4	C5		
						Half Diamond Intrchg w/ Existing Harlem Access	Half Diamond Intrchg w/ Split Lou Holland Undercrossing	Half Diamond Intrchg w/ New Harlem Single Harlem Railroad Xing		
NEEDS	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITIES	Area of Existing Bridges being Removed	Area (SF)					
				Area of Existing Bridges Left in Place	Area (SF)					
	Area of New Bridges being Built			Area (SF)						
	Area of Existing Pavement Being Replaced			Area (SF)						
	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count						
			Number of Existing Substandard Geometric Features Replaced (Yellow)	Count						
			LOCAL ACCESS		HARLEM	Connectivity between US-169 and Harlem	1-4 (Best to Worst)			
			US 169		US 169 TRAVEL SPEED	Average Peak Hour Travel Speed (AM / PM)	MPH			
	IMPLEMENTATION OF APPLICABLE MARC CONGESTION MANAGEMENT TOOLBOX STRATEGIES	EXIT AND ENTRANCE RAMP PERFORMANCE	NB Off-Ramp, South of Harlem Rd.		2040 AM / PM LOS					
			NB On-Ramp, North of Harlem Rd.		2040 AM / PM LOS					
			SB Off-Ramp, Right-in, Right-out		2040 AM / PM LOS					
			SB On-Ramp, Right-in, Right-out		2040 AM / PM LOS					
			NB On-Ramp at North Interchange		2040 AM / PM LOS					
			SB Off-Ramp at North Interchange		2040 AM / PM LOS					
			SB On-Ramp at North Interchange		2040 AM / PM LOS					
			ACCESS MANAGEMENT STRATEGIES		Examples: Left turn restrictions, minimum intersection spacing, etc.	0-2 (Implementation)				
		ACTIVE TRANSPORTATION STRATEGIES		Examples: Designated Bike Lanes, Exclusive Non-Motorized ROW, etc.	0-2 (Implementation)					
		HIGHWAY STRATEGIES		Examples: Geometric Improvements, HOV Lanes, Acceleration/Deceleration Lanes, etc.	0-2 (Implementation)					
TRANSIT STRATEGIES		Examples: Dedicated ROW for Transit	0-2 (Implementation)							
TRANSPORTATION OPERATIONS & MGMT STRATEGIES		Examples: Reversible Traffic Lanes, Turn Restrictions, etc.	0-2 (Implementation)							
IMPROVE SAFETY AND SECURITY	DRIVER SAFETY	CONFLICT POINTS	Total Number of Conflict Points	Count						
	BICYCLE/PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY	Potential for safety improvements to existing Bike/Ped Facilities	1-4 (Best to Worst)						
	IMPROVE EMERGENCY RESPONSE TIMES		Improvement in KCFD Access between Downtown Airport Station and Harlem	1-4 (Best to Worst)						
IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT BIKE KC PLAN		Potential for expansion of existing Bike/Ped Facilities	1-4 (Best to Worst)						
	ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Bus/Streetcar Integration	1-4 (Best to Worst)						
IMPROVE ECONOMIC VITALITY AND PLACEMAKING	REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area (Acres)						
	ENHANCE REGIONAL FREIGHT HUBS	DOWNTOWN AIRPORT	Connectivity to Highway System	1-4 (Best to Worst)						
	PROMOTE QUALITY PLACES		Visual Character and Aesthetics	1-4 (Best to Worst)						
GOALS	IMPROVE SUSTAINABILITY	COMMUNITY IMPACTS	ROW IMPACTS	Residential	Area (Acres)					
			Commercial	Area (Acres)						
		EI/LEP POPULATIONS DISPLACED	Residential	Number of Residences						
			Commercial	Number of Businesses						
	PROTECT CULTURAL/NATURAL RESOURCES	CULTURAL RESOURCES	NRHP Sites Impacted	Count						
			NRHP Districts Impacted	Count						
			Documented Archeology Sites	Count						
			Hazmat Sites Impacted	Count						
	NATURAL RESOURCES	Parks Impacted	Area (Acres)							
		Wetlands Impacted	Area (Acres)							
Floodplains Impacted		Linear Feet Crossed								
Public Health		AIR QUALITY	General Conformity Analysis of required pollutants	Tons per year						
FEASIBILITY	ROW ISSUES	Difficulty of RR Easement Acquisition & Construction		1-4 (Best to Worst)						
TOTAL COST	Planning Level Construction Cost Estimate		Dollars							

Table 11: Level 2 Matrix – West Bottoms

West Bottoms Strategy Evaluation Matrix									
				Measures	Units	No-Build	D6 Mulberry St. to Forrester Rd.	D7 Wyoming St. to Forrester Rd.	D8 4th St. to Woodswether Bridge
	NEEDS	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITIES	Area of Existing Bridges being Removed	Area (SF)			
Area of Existing Bridges Left in Place					Area (SF)				
Area of New Bridges being Built					Area (SF)				
Area of Existing Pavement Being Removed or Replaced					Area (SF)				
GEOMETRY		POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count					
			Number of Existing Substandard Geometric Features Replaced (Yellow)	Count					
OPTIMIZE SYSTEM PERFORMANCE		LOCAL ACCESS	CONNECTION FROM WOODSWETHER BUSINESSES TO HIGHWAY ACCESS	Improvement of Highway Access for Woodswether businesses. Origin: Woodswether/Madison Intersection. Destination: Broadway/5th Street Intersection.	1-4 (Best to Worst)				
		IMPLEMENTATION OF <u>APPLICABLE</u> MARC CONGESTION MANAGEMENT TOOLBOX STRATEGIES	ACCESS MANAGEMENT STRATEGIES	Examples: Left Turn Restrictions, Minimum Intersection Spacing, Roundabouts, Frontage Roads, etc.	0-2 (Implementation)				
			ACTIVE TRANSPORTATION STRATEGIES	Examples: Designated Bike Lanes, Exclusive Non-Motorized ROW, etc.	0-2 (Implementation)				
			HIGHWAY STRATEGIES	Examples: Geometric Improvements, HOV Lanes, Acceleration/Deceleration Lanes, etc.	0-2 (Implementation)				
			TRANSIT STRATEGIES	Examples: Dedicated ROW for Transit	0-2 (Implementation)				
IMPROVE SAFETY AND SECURITY		DRIVER SAFETY	NUMBER OF CONFLICT POINTS	Number of conflict points	Count				
		BIKE/PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY	Potential for safety improvement to existing Bike/Ped Facilities	1-4 (Best to Worst)				
		IMPROVE EMERGENCY RESPONSE TIMES		Access to Woodswether businesses from KCFD Station 25 (401 E. Missouri Ave.)	1-4 (Best to Worst)				
IMPROVE TRANSPORTATION CHOICES		CONTRIBUTE TO/COMPLEMENT GREATER KC REGIONAL		Potential for expansion of existing Bike/Ped facilities	1-4 (Best to Worst)				
	ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Bus/Streetcar Integration	1-4 (Best to Worst)					
IMPROVE ECONOMIC VITALITY AND PLACEMAKING	REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area (Acres)					
	ENHANCE REGIONAL FREIGHT HUBS	PORT OF KC	Improvement of Woodswether Terminal to 5th & Broadway	1-4 (Best to Worst)					
GOALS	PROMOTE QUALITY PLACES		Visual Character and Aesthetics	1-4 (Best to Worst)					
	COMMUNITY IMPACTS	ROW IMPACTS	Residential	Area (SF)					
			Commercial	Area (SF)					
		EJ/LEP POPULATIONS DISPLACED	Residential	Number of Residences					
			Commercial	Number of Businesses					
	PROTECT CULTURAL/NATURAL RESOURCES	CULTURAL RESOURCES	NRHP Sites Impacted	Count					
			NRHP Districts Impacted	Count					
			Documented Archeology Sites	Count					
Hazmat Sites Impacted			Count						
NATURAL RESOURCES	Parks Impacted	Area (Acres)							
	Wetlands Impacted	Area (Acres)							
FEASIBILITY	RAILROAD ISSUES		Difficulty of RR Easement Acquisition & Construction	1-4 (Best to Worst)					
	ROW ISSUES		Number of tracts with anticipated right-of-way acquisition issues	Count					
	TOTAL COST		Planning Level Construction Cost Estimate	Dollars					

Table 12: Level 2 Matrix – Buck O’Neil Bridge

		River Bridge + Connections to North Loop Evaluation Matrix												
				A1	A2			A3			A4			
				Rehab Existing Bridge (No Build)	Western Alignment			Central Alignment			Adjacent Alignment			
					AB1: I-35 & Broadway Direct Crossing	AB3: I-35 & 4th Direct Crossing	AB4: I-35, 5th, & 6th Direct Crossing	AB1: I-35 & Broadway Direct	AB3: I-35 & 4th Direct Crossing	AB4: I-35, 5th, & 6th Direct Crossing	AB1: I-35 & Broadway Direct	AB2: Hybrid Interchange		
		Measures	Units											
NEEDS	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITY	Service Life of River Bridge	Years									
				Area of Existing Bridges being Removed	Area (SF)									
Area of Existing Bridges Left in Place	Area (SF)													
Area of New Bridges being Built	Area (SF)													
NEEDS	IMPROVE PHYSICAL CONDITIONS	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Area of Existing Pavement Being Removed or Replaced	Area (SF)									
				Number of Existing Substandard Geometric Features Replaced (Red)	Count									
NEEDS	IMPROVE PHYSICAL CONDITIONS	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Yellow)	Count									
NEEDS	OPTIMIZE SYSTEM PERFORMANCE	US 169	MAINLINE TRAFFIC SPEED	Average Peak Period Travel Speed, SB at AM Peak Hour	MPH									
				Average Peak Period Travel Speed, NB at PM Peak Hour	MPH									
		TRAFFIC CONGESTION	US-169 (at Airport) TO I-35 (at 12th Street)	Total Peak Hour Delay	Delay (Min.)									
				SB at AM Peak Hour	Travel Time (Min.)									
		FREEWAY TRAVEL TIMES	US-169 (at Airport) TO I-70 (at Stateline)	NB at PM Peak Hour	Travel Time (Min.)									
				WB at AM Peak Hour	Travel Time (Min.)									
			US-169 (at Airport) TO I-70 (at Broadway)	NB at PM Peak Hour	Travel Time (Min.)									
				EB at AM Peak Hour	Travel Time (Min.)									
		LOCAL CONNECTIVITY	DOWNTOWN	Origin: US-169 at Airport. Destination: Broadway/6th Street Intersection.	Travel Time (Min.)									
				RIVERMARKET	Origin: US-169 at Airport. Destination: Broadway/4th Street Intersection.	Travel Time (Min.)								
		LOCAL CONNECTIVITY	ACCESS MANAGEMENT STRATEGIES	ACTIVE TRANSPORTATION STRATEGIES	Examples: Left Turn Restrictions, Minimum Intersection Spacing, Roundabouts, Frontage Roads, etc.	0-2 (Implementation)								
					Examples: Designated Bike Lanes, Exclusive Non-Motorized ROW, etc.	0-2 (Implementation)								
					Examples: Geometric Improvements, HOV Lanes, Acceleration/Deceleration Lanes, etc.	0-2 (Implementation)								
					Examples: Dedicated ROW for Transit	0-2 (Implementation)								
					Examples: Reversible Traffic Lanes, Turn Restrictions, etc.	0-2 (Implementation)								
IMPROVE SAFETY AND SECURITY	DRIVER SAFETY	CONFLICT POINTS AT BRIDGE TERMINALS	Number of conflict points	Count										
			RESILIENCE	INCIDENT ON BRIDGE	Increase in Delay due to Incident on Bridge	1-4 (Best to Worst)								
	BIKE/PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY	Potential for safety improvements to existing Bike/Ped Facilities	1-4 (Best to Worst)										
			IMPROVE EMERGENCY RESPONSE TIMES	Emergency Responder Access to Bridge and ramps.	1-4 (Best to Worst)									
IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT GREATER KC REGIONAL BIKE/ PEDESTRIAN RIVER CROSSING	Potential for expansion of existing Bike/Ped Facilities	1-4 (Best to Worst)											
		Width of Bike/Ped accommodation on bridge	Width (Feet)											
GOALS	IMPROVE ECONOMIC VITALITY AND PLACEMAKING	ENHANCE REGIONAL FREIGHT HUBS	PORT OF KC/WEST BOTTOMS	Connectivity to Highway System	1-4 (Best to Worst)									
				FAIRFAX	Connectivity to Highway System	1-4 (Best to Worst)								
				DOWNTOWN AIRPORT	Connectivity to Highway System	1-4 (Best to Worst)								
	IMPROVE SUSTAINABILITY	PROMOTE QUALITY PLACES	COMMUNITY IMPACTS	ROW IMPACTS	Visual Character and Aesthetics	1-4 (Best to Worst)								
					Residential	Area (Acres)								
					Commercial	Area (Acres)								
					Number of tracts with anticipated ROW acquisition	Count								
					Anticipated complexity of right-of-way acquisition	1-4 (Best to Worst)								
					Billboards	Count								
					Residential	Number of Residences								
Commercial	Number of Businesses													
IMPROVE SUSTAINABILITY	EJ/LEP POPULATIONS DISPLACED	CULTURAL RESOURCES	NATURAL RESOURCES	NHRP Resources (or Potentially Eligible) Impacted	Count									
				Documented Archeology Sites	Count									
				Hazmat Sites Impacted	Count									
				Improvement Opportunities Water Quality and Stormwater	1-4 (Best to Worst)									
				Parks/Trails Impacted	Count									
IMPROVE SUSTAINABILITY	PROTECT CULTURAL/NATURAL RESOURCES	CULTURAL RESOURCES	NATURAL RESOURCES	Wetlands Impacted	Area (Acres)									
				Floodplains Impacted	Linear Feet Crossed									
FEASIBILITY	PUBLIC HEALTH	AIR QUALITY		General Conformity Analysis of Required Pollutants	Tons per Year									
				RAILROAD ISSUES	Difficulty of RR Easement Acquisition & Construction	1-4 (Best to Worst)								
				AIRPORT ISSUES	Aviation Impacts during Construction	1-4 (Best to Worst)								
				TOTAL COST	Planning Level Construction Cost Estimate	Dollars								
				OPPORTUNITY FOR PHASED IMPLEMENTATION		1-4 (Best to Worst)								

Table 13: Level 2 Matrix – I-70/Route 9

		I-70/Route 9 Strategy Evaluation Matrix								
				Measures	Units	E1 No-Build	E2a All At-Grade Crossings, Existing Alignment	E2b All At-Grade Crossings, Western Alignment	E3 South At-Grade Connections	E4 South At-Grade Connections/ Split Lanes
NEEDS	IMPROVE PHYSICAL CONDITIONS	INFRASTRUCTURE	POTENTIAL TO IMPROVE USEFUL LIFE OF FACILITY	Area of Existing Bridges being Removed	Area (SF)					
				Area of Existing Bridges Left in Place	Area (SF)					
				Maintenance Cost for Existing Bridges Left in Place to 2040	Dollars					
		Area of New Bridge being Built		Area (SF)						
		Maintenance Cost for Existing Roadways Left in Place to 2040		Dollars						
		Area of Existing Pavement Being Removed or Replaced		Area (SF)						
	GEOMETRY	POTENTIAL TO IMPROVE SUB-STANDARD GEOMETRY	Number of Existing Substandard Geometric Features Replaced (Red)	Count						
			Number of Existing Substandard Geometric Features Replaced (Yellow)	Count						
	OPTIMIZE SYSTEM PERFORMANCE	LOCAL/REGIONAL CONNECTIONS	NORTHLAND	Origin: SB MO-9 at HOA Bridge. Destination: SB US-71 at 8th Street.	Travel Time (Min.)					
				Origin: SB MO-9 at HOA Bridge. Destination: WB I-70 at Broadway	Travel Time (Min.)					
			COLUMBUS PARK	Access to/from MO-9	1-4 (Best to Worst)					
			RIVER MARKET	Access to/from MO-9	1-4 (Best to Worst)					
		OAK/LOCUST CONNECTION	Improved intersection at Oak Trafficway and Oak/Locust	1-4 (Best to Worst)						
		IMPLEMENTATION OF APPLICABLE MARC CONGESTION MANAGEMENT TOOLBOX STRATEGIES	ACCESS MANAGEMENT STRATEGIES	Examples: Left Turn Restrictions, Minimum Intersection Spacing, Roundabouts, Frontage Roads, etc.	0-2 (Implementation)					
ACTIVE TRANSPORTATION STRATEGIES			Examples: Designated Bike Lanes, Exclusive Non-Motorized ROW, etc.	0-2 (Implementation)						
HIGHWAY STRATEGIES			Examples: Geometric Improvements, HOV Lanes, Acceleration/Deceleration Lanes, etc.	0-2 (Implementation)						
TRANSIT STRATEGIES			Examples: Dedicated ROW for Transit	0-2 (Implementation)						
TRANSPORTATION OPERATIONS & MGMT STRATEGIES			Examples: Reversible Traffic Lanes, Turn Restrictions, etc.	0-2 (Implementation)						
IMPROVE SAFETY AND SECURITY	DRIVER SAFETY	NUMBER OF CONFLICT POINTS	Number of Conflict Points	Count						
	BIKE/PEDESTRIAN	BICYCLE/PEDESTRIAN SAFETY	Potential for safety improvements to existing Bike/Ped Facilities	1-4 (Best to Worst)						
		IMPROVE EMERGENCY RESPONSE TIMES	Highway Access from KCFD Station 25 (401 E. Missouri Ave)	1-4 (Best to Worst)						
GOALS	IMPROVE TRANSPORTATION CHOICES	CONTRIBUTE TO/COMPLEMENT GREATER KC REGIONAL BIKEWAY PLAN		Potential for expansion of existing Bike/Ped Facilities	1-4 (Best to Worst)					
		ACCOMMODATE EXISTING AND FUTURE TRANSIT		Potential for Bus/Streetcar Integration	1-4 (Best to Worst)					
	IMPROVE ECONOMIC VITALITY AND PLACEMAKING	REVITALIZATION AREAS		Potential to Make Space Available for Commercial/Recreational Development	Area (Acres)					
		PROMOTE QUALITY PLACES		Potential to Make Space Available for Commercial/Recreational Development	Land Value (\$)					
				Visual Character and Aesthetics	1-4 (Best to Worst)					
				Improved external access to River Market	1-4 (Best to Worst)					
	IMPROVE SUSTAINABILITY	COMMUNITY IMPACTS	ROW IMPACTS	Residential	Area (Acres)					
			Commercial	Area (Acres)						
			EI/LEP POPULATIONS DISPLACED	Residential	Number of Residences					
			Commercial	Number of Businesses						
		PROTECT CULTURAL/NATURAL RESOURCES	CULTURAL RESOURCES	NRHP Resources Impacted	Count					
				NRHP Districts Impacted	Count					
				Documented Archeology Sites	Count					
Hazmat Sites Impacted				Count						
NATURAL RESOURCES	Improvement Opportunities Water Quality and Stormwater	1-4 (Best to Worst)								
	Parks Impacted	Area (Acres)								
PUBLIC HEALTH	AIR QUALITY	Wetlands Impacted	Area (Acres)							
		General Conformity Analysis of Required Pollutants	Tons per year							
FEASIBILITY	CONSTRUCTABILITY		Impacts to Heart of America Bridge	1-4 (Best to Worst)						
	ROW ISSUES		Number of tracts with anticipated right-of-way acquisition challenges	Count						
	TOTAL COST		Planning Level Construction Cost Estimate	Dollars						