The Lewis and Clark Viaduct Concept Study

Project 70-105 KA-2130-02 December 2012

Lewis & Clark VIADUCT CONCEPT STUDY

Acknowledgements

The Lewis and Clark Viaduct Concept Study Report involved input from many team members from the Kansas Department of Transportation, the HNTB Consultant Team and from community leaders throughout the region. This report acknowledges and expresses our appreciation for everyone's efforts.

Kansas Department of Transportation Staff
- Deb Tanking
- Jim Brewer
- Jim Pickett
- Mark Hurt
- Terry Fleck
- Joshua Powers
- Kim Qualls
- David Schwartz

HNTB
- Greg Weatherd
- Sean Gellhaus
- Brenda Foree
- Jesse Kuhlen
- Gretchen Ivy
- Tim Flagler
- Robyn Arthur
- Kip Strauss
- Jared Miller
- Cindy Doran

Wilson & Company
- Michael Falini
- Paul Plotas

BHC Rhodes
- Murray Rhodes
- Wil Anderson

TJ Brown and Associates
- TJ Brown

Dale L. McGregor, P.E.
- Dale McGregor

Federal Highway Administration
- John Knowles

Unified Government of Wyandotte County and Kanas City, Kansas
- Mayor Joe Reardon
- Bill Heatherman
- Bob Roddy
- Rob Richardson

Missouri Department of Transportation Staff
- Warren Zeller
- Jesse Skinner

The Lewis and Clark Viaduct Concept Study

Prepared for

Kansas Department of Transportation

Federal Highway Administration

Mid-America Regional Council

Unified Government of Wyandotte County

Missouri Department of Transportation

Prepared by

HNTB Corporation

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Executive Summary

For the purpose of this study, the Lewis and Clark Viaduct is considered a series of bridges making up an interchange with I-70, Minnesota Avenue, Washington Boulevard, and Fairfax Trafficway in Kansas City, Kansas (KCK). The viaduct provides a vital link for I-70 across the Kansas River and was the first roadway to connect the cities of Kansas City, Kansas and Kansas City, Missouri.

With portions of the viaduct dating back to 1907, annual maintenance and repair costs on the nine aging bridge structures continue to increase. As a result, in the Spring of 2011, the Kansas Department of Transportation established a Study Team consisting of the Federal Highway Administration, Unified Government of Wyandotte County & Kansas City, Kansas, Mid-America Regional Council and the Missouri Department of Transportation to evaluate the condition of each of the nine aging bridges that make up the viaduct and develop a priority phasing plan for rehabilitation and/or replacement of the existing bridges. Additionally, the Study Team used this opportunity to evaluate the feasibility of other roadway improvements in conjunction with the bridge improvements.

Purpose of the Study

The purpose of the Lewis and Clark Viaduct Concept Study was to develop a preferred concept for rehabilitation and/or replacement of the nine Lewis and Clark Viaduct bridges and associated roadway improvements within the study area that facilitates safe and efficient traveler mobility and can be implemented in phases. The study responds to these needs in a manner that:

- ***Improve infrastructure condition*** by rehabilitating or replacing aging and deficient bridge and roadway infrastructure, thereby decreasing maintenance costs.
- ***Enhance traveler safety*** by improving geometric design conditions (including roadway and bridge shoulder widths, horizontal and vertical curves, and lane continuity issues) to address high crash locations and pedestrian conflict points within the study area.
- ***Improve traveler mobility and accessibility*** by incorporating improved study area routing, signage and wayfinding while maintaining multimodal access for transit, bicycles and pedestrians as a part of the roadway and bridge improvements.
- ***Support sustainable design*** by integrating environmental, multimodal and visual design applications into the proposed roadway and bridge improvements, where practical, to enhance the quality of life and aesthetics of the study area.
- ***Support economic development and redevelopment initiatives within the Kansas City, Kansas Downtown Master Plan*** to create a vibrant downtown that is economically, physically and culturally diverse.

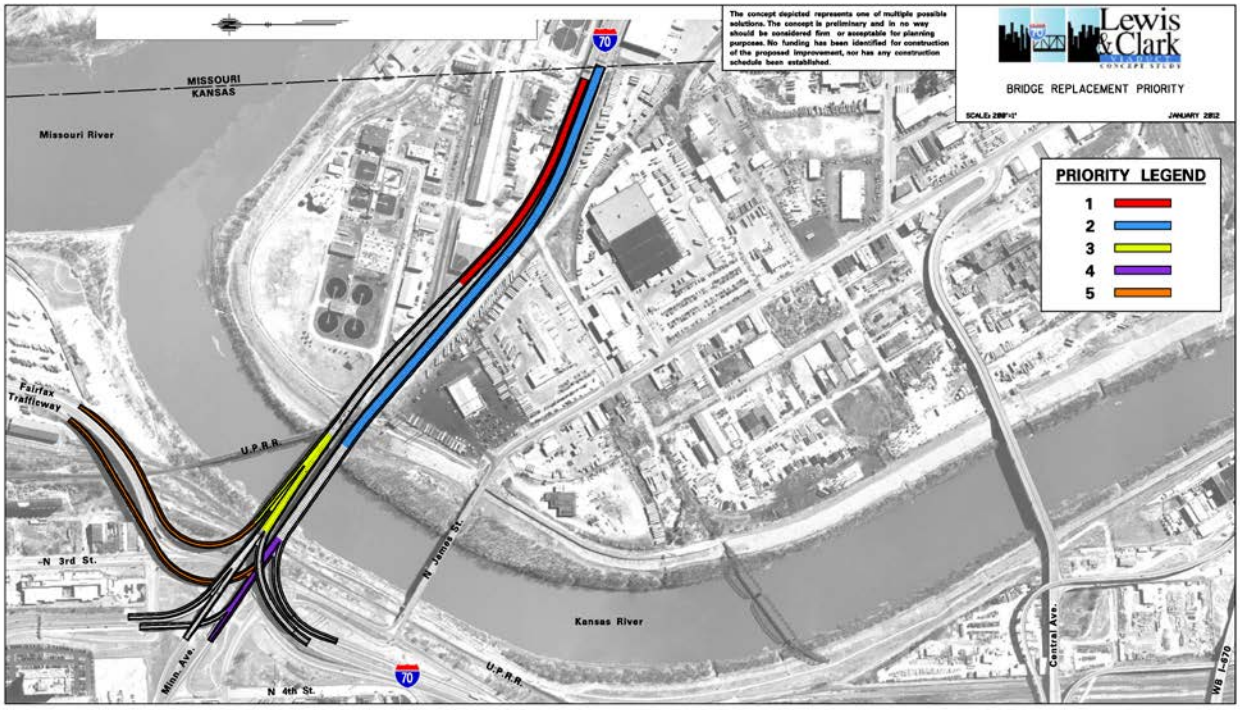
Stakeholder Engagement

To get a full view of the use, issues and opinions within the study area, the Study Team developed a comprehensive public engagement program to provide opportunities at points throughout the study process for stakeholders and member of the public to provide input and help shape the direction of the study. A summary of the activities included:

- Community interviews were conducted with various stakeholders regarding their thoughts on the existing viaduct and interchange. The top issues identified by the interviewees include:
    - Access
    - Safety
    - Economic Development
    - Construction Management and Communication
- A website (http://LCViaductI70.ksdot.org) was launched on June 14, 2011, to provide information and updates about the study including an online survey about user experience with the interchange and improvement recommendations.
- A Listening Session was held to allow participants to express concerns or questions regarding the study. The top issues identified by the meeting attendees include:
    - Quality of Life
    - Economic Development
    - Safety
    - Access
- An Issues Workshop was held to allow area stakeholders to review the proposed concepts in small discussion groups and identify areas of concern that may need more explanation or exploration.
- Briefings were provided to multiple community groups about the study process and to gather additional input on issues and concerns as well as the improvement concepts.
- An initial public meeting was held to present the proposed concepts being considered for the area. A final public meeting presented the final study recommendation and potential phasing plan.
- Various additional outreach measures were taken to provide study related information to the broadest possible spectrum of interested parties. These measures included:
    - Media (TV, Radio and Newspaper) announcements and coverage of study events
    - Lewis and Clark Viaduct Facebook page
    - Electronic newsletters and meeting handouts

Bridge Inspections

HNTB performed the biennial maintenance inspections of the nine bridges that make up the Lewis and Clark Viaduct in April and May 2011. Bridges within the study were prioritized based on need for rehabilitation/replacement.



Screening of Concepts

Numerous potential concepts were developed and subsequently eliminated for various engineering, access, property impact, traffic operation, constructability, and cost issues. Ultimately seven concepts moved forward for more detailed development including:

Concept 1-A: Baseline

This concept essentially replaces the viaduct infrastructure as it is today. Shoulders and lanes are widened where possible and there is no change to the local street system. Total estimated cost (in 2012 dollars) for this concept is in the range of $150 million to $174 million.

Concept 1-B: Baseline w/ Improved I-70

This concept is the same as Concept 1-A except that the tight I-70 curves are improved and I-70 is widened to maintain at least two lanes in the eastbound direction. Total estimated cost (in 2012 dollars) for this concept is in the range of $175 million to $199 million.

Concept 2-A: Box Style

This concept removes the Fairfax Trafficway and Washington Boulevard ramps and leaves the remaining interchange bridges as they are today. Local access and circulation are consolidated into a series of intersections arranged into a "box" configuration. Total estimated cost (in 2012 dollars) for this concept is in the range of $150 million to $174 million.

Concept 2-B: Box Style w/ Improved I-70

This concept is similar to Concept 2-A except that all traffic between I-70 and the local street network is consolidated to a single crossing over the Kansas River, the tight I-70 curves are improved and I-70 is widened to maintain at least two lanes in the eastbound direction. Total estimated cost (in 2012 dollars) for this concept is in the range of $175 million to $199 million.

Concept 3-B: Single Intersection w/ Improved I-70

Similar to Concept 2-B, this concept removes the Fairfax Trafficway and Washington Boulevard ramps and consolidates all traffic into a central signalized intersection or roundabout. Total estimated cost (in 2012 dollars) for this concept is in the range of $175 million to $199 million.

Concept 4-B: New Fairfax Trafficway Ramps w/ Improved I-70

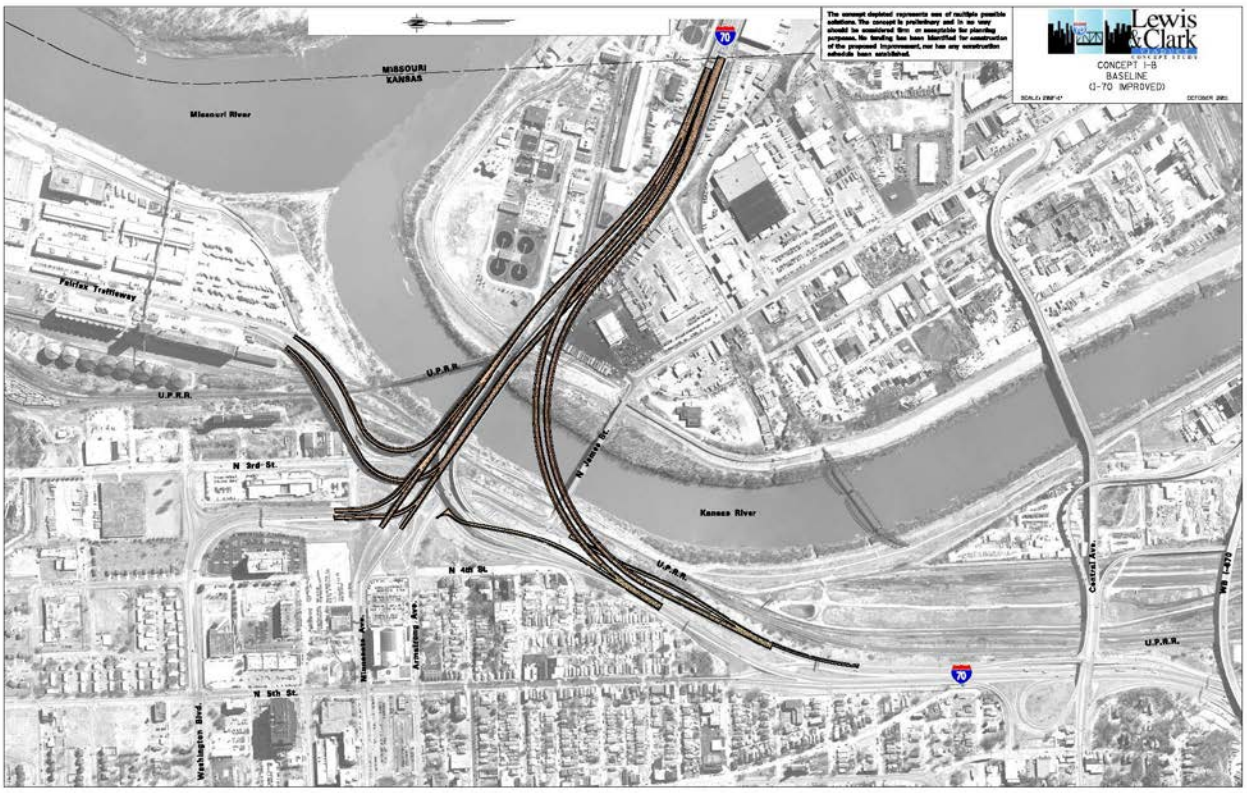
This concept is a variation of Concept 1-B except with the Washington Boulevard ramps removed, the Fairfax Trafficway ramps improved and all traffic between I-70 and downtown KCK consolidated to a single Kansas River crossing. Total estimated cost (in 2012 dollars) for this concept is in excess of $200 million.

KCK Downtown Master Plan: From Concept 2 of Figure II-8 of the 2007 Draft KCK Downtown Master Plan

The core components of the concept mirror those of Concept 1-B. Additional improvements are necessary to accommodate both traffic operations and access to the 5th Street, Central Avenue, Pacific Avenue, and 7th Street interchanges. Total estimated cost (in 2012 dollars) for this concept is near $300 million.

Preferred Concept

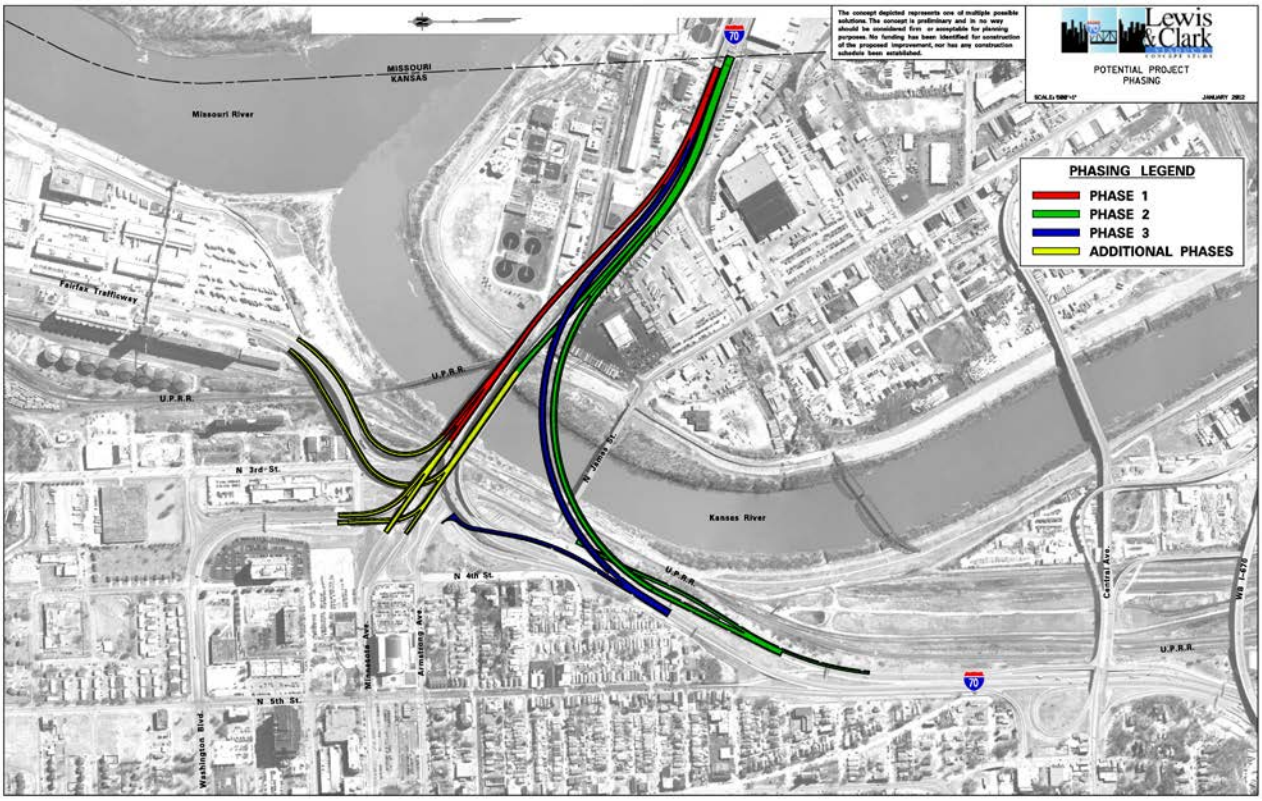
Upon completion of the extensive stakeholder and public engagement activities, the concepts were evaluated relative to their engineering qualities and with regard to the numerous comments received. The evaluation revealed that Concept 1-B not only exhibited good engineering, operational, safety and phased construction qualities; but maintained the level of access the area had become accustomed to, provided the potential for increased park areas overlooking the Kansas River and was widely favored as one of the most desirable concepts by local stakeholders and the public. Therefore, the Study Team determined that further conceptual refinement and detailed comparative analysis with a second concept was unnecessary and selected Concept 1-B as the Preferred Concept.



It is worthy to note that before Concept 1-B was selected as the Preferred Concept, a similar concept derived from the KCK Downtown Master Plan underwent a period of evaluation and collaborative discussion, and the Study Team ultimately eliminated that concept. However, the Unified Government leadership felt strongly that in order for the study to be deemed successful, the Preferred Concept needs to embody the vision and spirit of the Master Plan components. Correspondence from local government leadership related to the elimination of the KCK Downtown Master Plan and the incorporation of core components of that plan into the Preferred Concept can be found in **Appendix F**.

Phasing Plan

Due to the large cost of the overall viaduct and interchange reconstruction, a goal of the study was to select a concept that could be implemented in phases over a period of time as funds become available. One potential phasing plan was developed that identifies replacement in three initial phases. These phases address the top three replacement priority locations as well as provide the improved curves and lane continuity on I-70. The remaining area, identified as "Additional Phases" is largely reconstructed in its existing location. Therefore, these structures can be addressed at any time, either alone or in combination with other construction projects, throughout the overall replacement timeframe.



1.0 Introduction

For the purpose of this study, the Lewis and Clark Viaduct is considered a series of bridges making up an interchange with I-70, Minnesota Avenue, Washington Boulevard, and Fairfax Trafficway in Kansas City, Kansas (KCK). The viaduct provides a vital link for I-70 across the Kansas River and includes what was the first roadway to connect the cities of Kansas City, Kansas and Kansas City, Missouri.

Exhibit 1
Intercity Viaduct - 1908

The original viaduct was built in 1907 as a four-lane two level deck truss bridge to accommodate automobile, rail and pedestrian traffic. It was designed by Waddell and Redrick and became known locally as the Intercity Viaduct. The structure was renamed the Lewis and Clark Viaduct on January 25, 1969, taking the same name of its companion bridge built in 1962 to carry the westbound lanes.

1.1 Study Background

In the Spring of 2011, the Kansas Department of Transportation (KDOT) established a Study Team consisting of the Federal Highway Administration (FHWA), Unified Government of Wyandotte County & Kansas City, Kansas (UG), Mid-America Regional Council (MARC) and Missouri Department of Transportation (MoDOT) to evaluate the condition of each of the nine aging bridges that make up the viaduct and develop a priority phasing plan for rehabilitation and/or replacement of the existing bridges. Additionally, the Study Team used this opportunity to evaluate the feasibility of other roadway improvements in conjunction with the bridge improvements.

It was critical to understand the traffic needs of the highway users as well as the existing and future land use plans for the surrounding area as the viaduct serves as a gateway for Kansas City, Kansas. The Study Team examined a number of elements in the study area including traffic, accident history, access, roadway geometrics, bridge condition and others. This information assisted the Study Team with developing improvement concepts that not only address the aging infrastructure but also modernize other features of the transportation system.

Study Goals:

- Conduct a comprehensive inspection of each bridge to document the existing structure conditions;

- Understand existing and future traffic and safety conditions within the study area and incorporate that information into the recommended solution;
- Engage the community in the study process so that final recommendations consider local priorities;
- Identify potential cost-effective, targeted solutions to address critical existing problems that could be completed prior to any large scale projects;
- Develop a preferred concept for rehabilitation and/or replacement of all bridge structures and corresponding system improvements within the study area;
- Develop a phasing plan that will allow projects to be implemented as funding becomes available.

1.2 Study Area

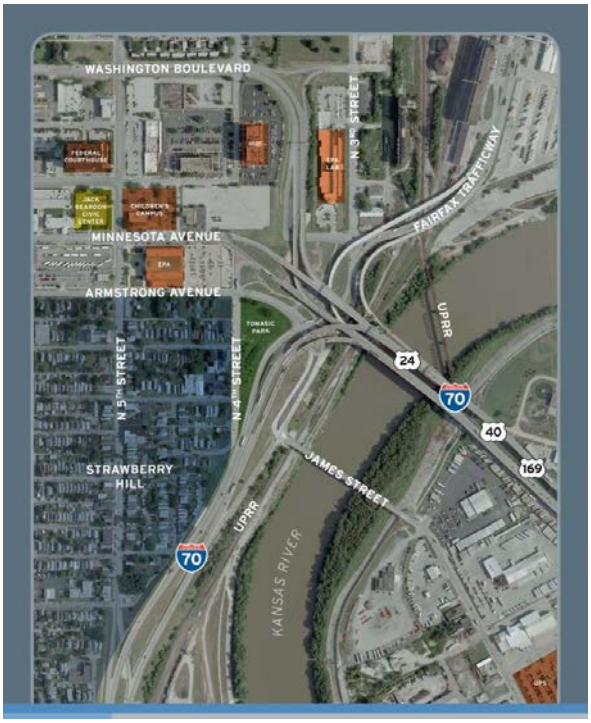
The primary limits of the study area are shown in **Exhibit 2** and are as follows:

- I-70 from the north Central Avenue ramps to the Kansas/Missouri State Line;
- Minnesota Avenue from 5th Street to the I-70 connection;
- Washington Boulevard from 5th Street to the I-70 connection;
- Fairfax Trafficway from River City Drive to the I-70 connection.

Ramp intersections and tie-in points on the following side streets were also part of the study area:

- 5th Street
- James Street
- Armstrong Avenue

Exhibit 2
Study Area



1.3 Purpose and Need for Project

The study was broken into three phases:

Phase 1 - Document Existing Conditions and Develop Alternative Concepts:
Determine existing and future traffic impacts; establish a baseline condition of the bridges, including determining rehabilitation and/or replacement options; and identify potential

improvements for roadway geometrics (horizontal curves and vertical grades). The 2011 Biennial Bridge Inspections were conducted during this phase to support development of the baseline condition for the existing bridges.

Phase 2 - Select Preferred Concept: Evaluate up to two (2) "build" concepts for the viaduct area. Select a preferred concept that would accommodate 2040 traffic volumes.

Phase 3 - Develop Phasing Concept: The Phasing Concept identifies and prioritizes the order of construction projects which will eventually lead to the construction of the Preferred Concept. During this phase, interim projects were also identified. These interim projects are cost-effective, targeted solutions to address critical existing problems and fit within the overall improvement concept.

Clarifying the purpose and confirming the needs of a proposed project are sound practices when developing large-scale projects requiring public funding. A Purpose and Need Statement is a fundamental requirement when evaluating a proposed project that will require National Environmental Policy Act (NEPA) documentation. Although this study was in the concept phase and was not a NEPA study, it was helpful for the Study Team to develop a Purpose and Need to guide the study process and gain stakeholder and public understanding of the purpose for performing the study and the need for transportation improvements within the study area.

The purpose of the Lewis and Clark Viaduct Concept Study was to develop a preferred concept for rehabilitation and/or replacement of the nine Lewis and Clark Viaduct bridges and associated roadway improvements that facilitates safe and efficient traveler mobility and can be implemented in phases. The study addresses these needs in a manner that will:

- ***Improve infrastructure condition*** by rehabilitating or replacing aging and deficient bridge and roadway infrastructure, thereby decreasing maintenance costs.
- ***Enhance traveler safety*** by improving geometric design conditions (including roadway and bridge shoulder widths, horizontal and vertical curves, and lane continuity issues) to address high crash locations and pedestrian conflict points.
- ***Improve traveler mobility and accessibility*** by incorporating improved routing, signage and wayfinding while maintaining multimodal access for transit, bicycles and pedestrians as a part of the roadway and bridge improvements.
- ***Support sustainable design*** by integrating environmental, multimodal and visual design applications into the proposed roadway and bridge improvements, where practical, to enhance the quality of life and aesthetics of the study area.
- ***Support economic development and redevelopment initiatives within the Kansas City, Kansas Downtown Master Plan*** to create a vibrant downtown that is economically, physically and culturally diverse.

During this study, the Purpose and Need for the project was established through a collaborative effort by the Study Team and through public and project stakeholder input received throughout the stakeholder engagement process described in Section 4 of this report. The Study Team also considered the Kansas City region's long range transportation goals when developing the Purpose and Need for the project.

2.0 Study Methodology

This section provides the methodology used for the primary study elements of infrastructure, traffic and safety, transportation enhancements, environmental impacts and hydraulic analysis.

2.1 Stakeholder Engagement

To develop a complete understanding of the use, issues and opinions within the study area, the Study Team developed a comprehensive public engagement program to provide opportunities at strategic points throughout the study process for stakeholders to provide input and help shape the direction of the study. Stakeholders included local business representatives, the local chamber, civic organizations, local elected officials, neighborhood associations and members of the public. A summary of the activities can be found in Section 4.

2.2 Infrastructure

Bridge Inspections

HNTB performed the biennial maintenance inspections of the nine bridges that make up the Lewis and Clark Viaduct in April and May 2011. The inspection team was comprised of two or three individuals utilizing a snooper, boom lift, and other equipment as necessary to perform a "hands-on" visual inspection of the bridge components. Inspectors evaluated the components for compliance with the National Bridge Inspection Standards and as described in the current AASHTO Manual for Maintenance Inspection of Bridges. The condition of each bridge was recorded and photographs were taken to document the observed conditions. An inspection report, including maintenance recommendations, was prepared and submitted for each bridge in November 2011.

Bridge Evaluation

Numerous factors were considered when evaluating the existing bridges to determine their rehabilitation or replacement needs. These factors included the type and importance of the structure as well as its overall configuration, condition and future reparability.

Roadway Evaluation

Various roadway aspects were considered during the selection of a preferred interchange concept including how well the concept would address geometric, safety, mobility, access and constructability issues.

2.3 Traffic & Safety

A comprehensive traffic and safety study was performed and is documented in Appendix C. The appendix covers traffic operations, motorist travel time, bicycle and pedestrian mobility, safety, lane continuity, motorist circulation and wayfinding, transit and ITS. This report summarizes the primary transportation issues related to safety, traffic operation and circulation.

Existing traffic and safety information was utilized to enhance the understanding of the study area and how it functions today. In addition, the information was used to develop forecasts of future traffic demand. KDOT provided crash data and mainline traffic data. Ramp terminal volumes and travel time data were collected for this study by the consultant team. Traffic volumes were forecast to a 2040 design year.

A VISSIM microscopic traffic simulation model was built to analyze the study area transportation network. The VISSIM model was used to extract Highway Capacity Manual equivalent information related to the freeway mainline, merge and diverge conditions and arterial street operations around the interchanges.

Level of Service (LOS) results were determined using the VISSIM model and Highway Capacity Manual 2010 methodology. LOS is a qualitative measure describing operational conditions (how well a roadway operates) in terms of average delay per motorist with regard to intersections and in terms of average passenger cars per mile per lane on the freeway. LOS is described with letter designations A (best) through F (worst). The Highway Capacity Manual provides a description of the qualitative and quantitative meaning of each letter. For this study, LOS D was chosen to be the minimum desirable LOS for this area.

2.4 Environmental

The concept study presents a high level review and screening of environmental resources and issues within the project study area, including identification of any potential environmental “fatal flaws” that could prohibit the construction of the project improvements. The environmental overview has identified key human and natural environmental features within the study area and evaluated those features to determine which may require special attention in future project phases or may prohibit the implementation of project improvements or specific concepts being considered.

The methodology for conducting the environmental screening first included defining the study area for environmental resource review. The study area is shown on **Exhibit 12** (page 25) of this report on the environmental constraints map. The Study Team, in cooperation with KDOT, collected available environmental data including published literature, digital data such as aerial photographs, and existing statewide geographic information system (GIS) data layers. The Study Team also conducted a “windshield survey” review of the project study area to verify GIS

and other published data sources and assess the presence of other potential environmental constraints not available via known published or GIS sources. The environmental constraints review was not conducted at a level of detail required within a National Environmental Policy Act (NEPA) process and will need to be reevaluated once the project moves forward into future design and NEPA phases.

Environmental data collected include:

- Significant community resources (museums, hospital complexes, convention centers, churches, schools);
- Major governmental facilities;
- Listed and eligible National Register of Historic Places (sites and districts);
- Major streams;
- Floodplains and levees;
- Major wetland and/or habitat complexes;
- Public parks (national, state, city);
- Threatened and endangered species;
- Major trail systems;
- Hazardous material sites;
- Designated EPA Environmental Justice areas of concern;
- Railroads;
- Potential sensitive noise receptors (residences, churches);
- Geologically significant areas (terrain); and
- Cemeteries.

KDOT collected the National Register of Historic Places (NRHP) listed and potentially eligible cultural resources (archeology, historical); hazardous materials; wetlands, streams/rivers and other water resources; threatened and endangered species and wildlife habitat; and FEMA 100-year floodplain areas. High level noise information on potential sensitive noise receptors, such as residences and churches, was also collected for the study. However, a more detailed noise analysis will not be performed until subsequent project phases. The consultant environmental team collected information on other social and environmental constraints not collected by KDOT. KDOT documented their environmental review of the project area, including preliminary comments from the State Historical Preservation Officer (SHPO), within a Preliminary Environmental Review Report, dated October 4, 2011. This report can be found in **Appendix D**.

The Study Team used the information collected to identify and map major environmental and community features that may constrain development of the conceptual project improvements. This map established the existing natural and manmade environmental conditions for the project area.

The Study Team then screened the project concepts using the identified environmental constraints in order to evaluate the potential natural and manmade environmental impacts of the proposed improvement concepts. The potential impacts would then be evaluated and refined further within future design and NEPA phases of the project.

2.5 Hydrology & Hydraulics

The Lewis and Clark Viaduct crosses the Kansas River approximately 1,500 feet upstream of its confluence with the Missouri River. Within the study area, the Kansas and Missouri Rivers are bound by levees owned and maintained by levee districts made up of stakeholders that benefit from the levees. The levee units at and immediately upstream of the project area are Central Industrial District (CID) Kansas and Armourdale, both under the jurisdiction of the Kaw Valley Levee District. The Fairfax levee unit is slightly downstream of the project area and should not be impacted by this project. The U.S. Army Corps of Engineers (USACE) provides engineering oversight and review of anything related to the levees and their function. Any impact to flood elevations on the Kansas River must be cleared by the affected levee districts and the Corps of Engineers.

The Kansas River is a FEMA regulatory waterway with a defined floodway. While the FEMA 100-year floodplain is contained within the levees, the existence of a floodway means that any work within it must not cause a rise in the 100-year water surface elevation without submittal of a Conditional Letter of Map Revision (CLOMR) and notifying all impacted property owners. Minor increases can propagate significant distances on major rivers, which could potentially lead to impacts within the Argentine levee unit reach, also under the jurisdiction of the Kaw Valley Levee District. While impacts to the 100-year water surface elevation should be evaluated, the design event for these levee systems is the 500-year flood. The Kaw Valley Levee District's primary concern will be the 500-year rather than the 100-year event.

3.0 Existing and Future No-Build Conditions

This section describes the existing infrastructure, including deficiencies present today.

3.1 Infrastructure

Existing Bridge Conditions

FHWA general condition rating guidelines were used to characterize the condition of the bridge elements. Good condition indicates some minor problems. Satisfactory condition indicates that structural elements show some minor deterioration. Fair condition indicates that all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour. Poor condition indicates advanced section loss, deterioration, spalling, or scour.

Due to regular maintenance, most components of the nine existing structures remain in fair to good condition. However some structures are exhibiting poor conditions and maintenance costs continue to increase as the structures age. Note that poor condition does not imply that immediate action is required or that load carrying capacity of the structure is in immediate danger of diminishing to less than safe levels.

See **Exhibit 3** for Existing Bridge Layout. Other than routine maintenance, no significant changes were noted between the 2009 and 2011 inspection periods.

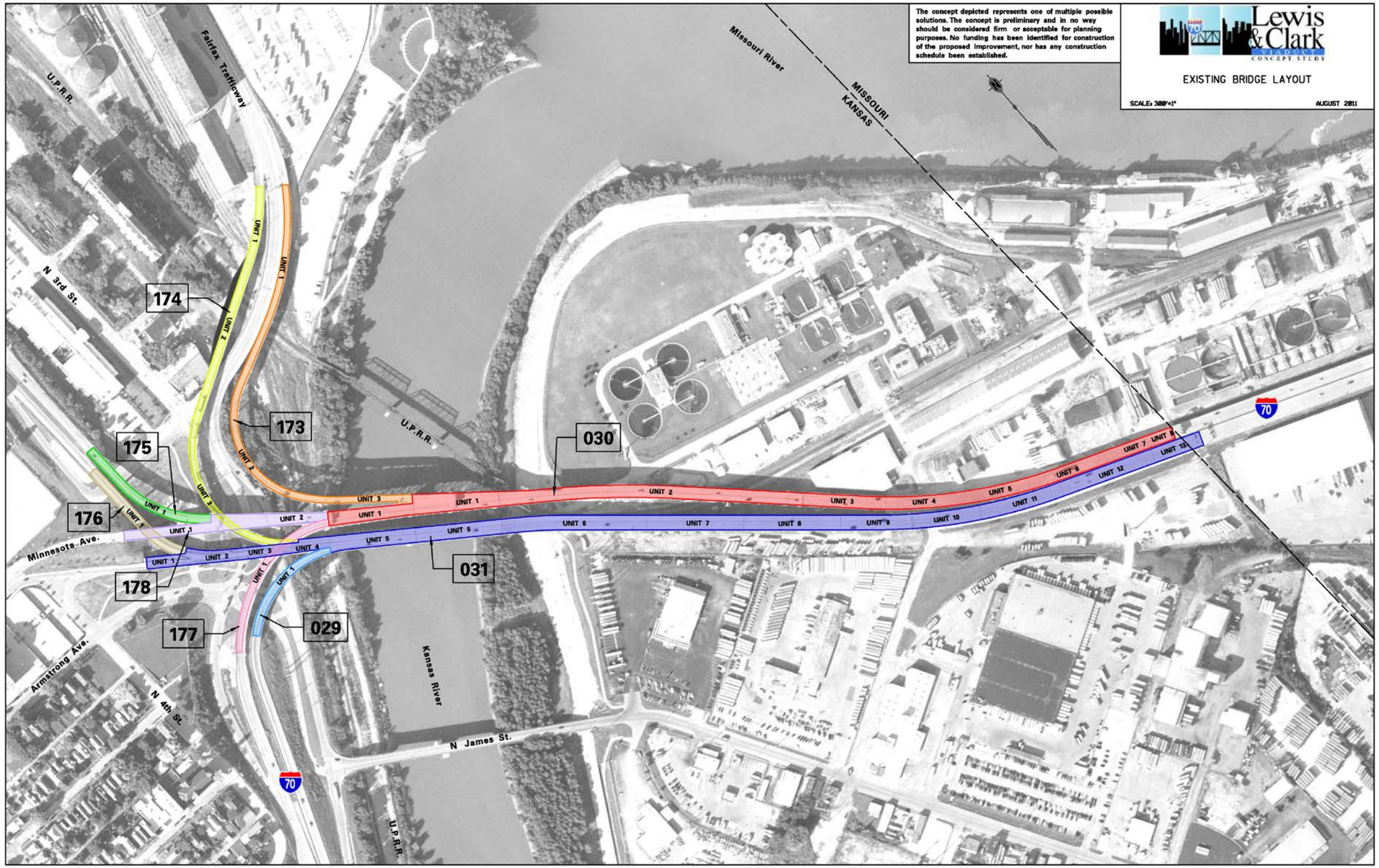
Structures exhibiting poor conditions include the WB viaduct - Units 1 and 3 through 7 (Bridge 030), the EB viaduct - all units (Bridge 031), and the WB Ramp to Fairfax Trafficway – Unit 3 (Bridge 173). The load carrying capacity of these bridges has not currently been reduced to where load posting is necessary. However, if deterioration is not addressed, findings of future inspections could indicate the need for load posting.

The WB viaduct (Unit 1) and WB Ramp to Fairfax Trafficway (Unit 3) consist of non-redundant steel truss spans. Truss lower chords, lower lateral bracing, gusset plates, and diagonal members exhibit severe rust and section loss. If this severe rusting is not addressed, future strengthening of these members will be required in order to avoid load posting of the bridge. This bridge will require significant maintenance until it can be replaced.

The WB viaduct (Units 3 through 7) consists of concrete deck girders which contain locations of concrete spalling, efflorescence, leaching, delamination, map cracking, exposed reinforcement, and vertical cracks in the webs at mid-span. Previous girder repairs and the deck wearing surface have begun to deteriorate. The concrete deck girders require significant maintenance to slow down their deterioration and extend service life until the structure can be replaced.

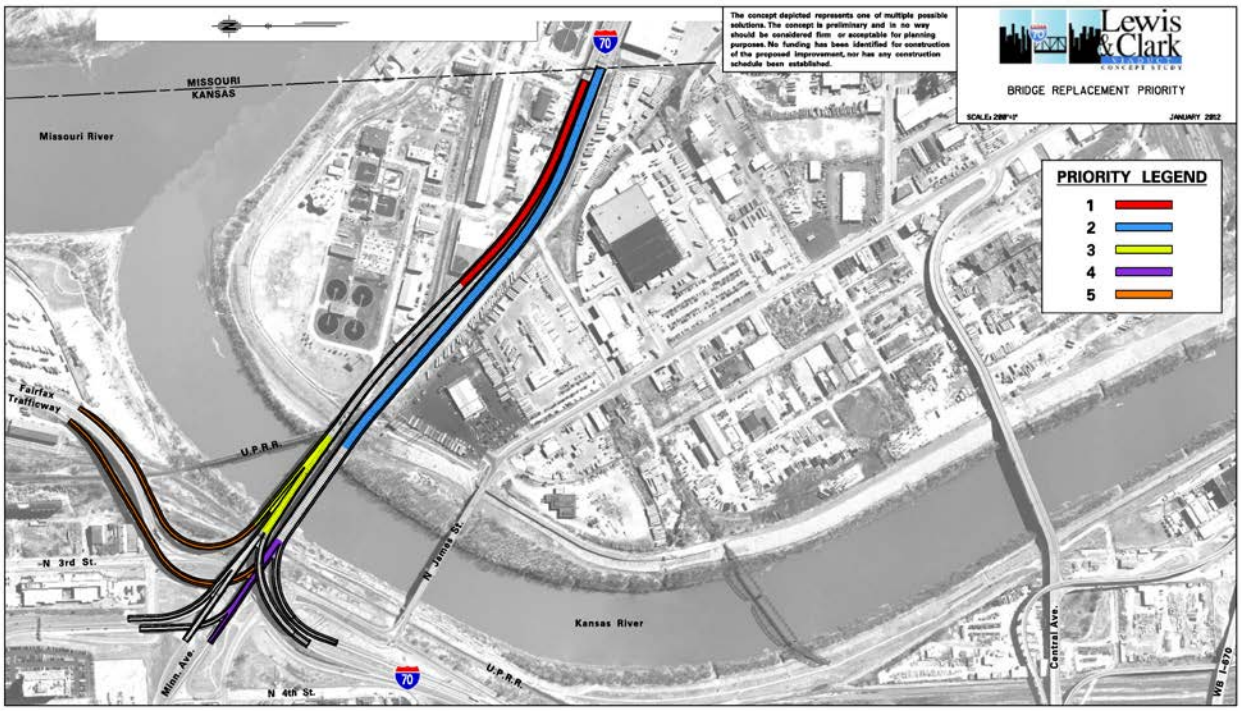
The EB viaduct (Units 1 thru 4 and 6 thru 13) consists of a non-redundant steel girder/floor beam system supported on two non-redundant steel columns. Unit 5 consists of non-redundant steel truss spans. All of these structural elements contain locations of severe rust and section loss. This structure is over 100 years old and the need for major repairs is anticipated to continue until the structure can be replaced.

Exhibit 3
Existing Bridge Layout



See **Exhibit 4** for an illustration of where these structures rank in the bridge replacement priority. For a detailed condition evaluation and recommended maintenance for each existing bridge, see **Appendix A**.

Exhibit 4
Bridge Replacement Priorities



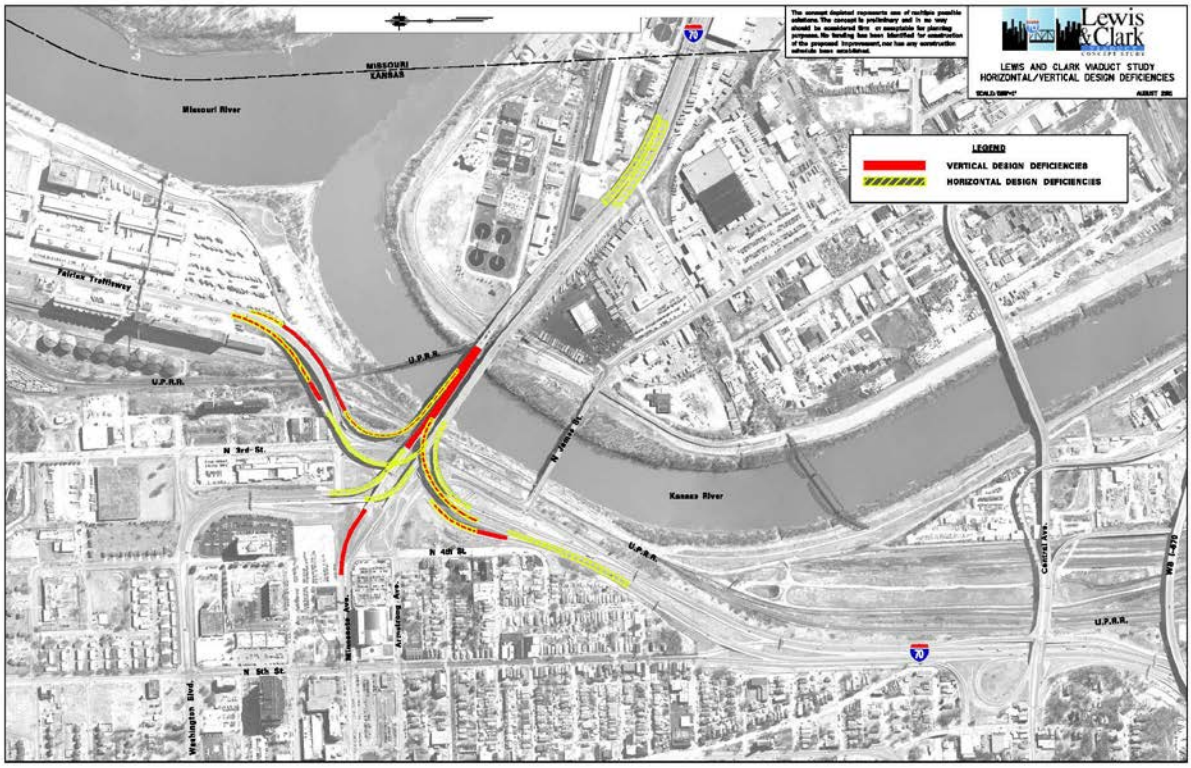
Existing Roadway

The existing roadway elements were evaluated through field observation and historical highway records called as-built plans. Evaluation revealed the following:

- In general, the roadway possesses adequate signing and is well lit;
- Direct access is provided to/from I-70 and Downtown Kansas City, KS, its residential areas and Fairfax Industrial District via Minnesota Avenue, Washington Boulevard, and Fairfax Trafficway ramps; Additional access to/from I-70 and the Central Industrial District and 5th Street is available via partial and full interchanges at 5th Street and Central Avenue, respectively;
- Horizontal and vertical geometric deficiencies exist relative to desired criteria for interstate highways (See **Exhibit 5**);

- Narrow shoulders are the norm within much of the interchange complex. The lack of full width shoulders makes lane blockages unavoidable during vehicle breakdowns, law enforcement traffic stops, and routine bridge maintenance and inspection;
- Eastbound I-70 lane continuity goes against driver expectation. I-70 is a minimum of two lanes in each direction through the entire study area except for a short section of eastbound I-70 after the James Street exit where it drops to a single lane through the tight horizontal curve just west of the Kansas River;
- Spacing of existing guide signs on westbound I-70 is significantly less than desirable and may contribute to wayfinding difficulty;
- A pathway is provided along the bottom deck of the eastbound I-70 river bridge for pedestrian and bicyclist passage across the Kansas River as part of the Riverfront Heritage Trail system;
- Much of the viaduct and overall interchange immediately east and west of the river sit on or over active rail lines.

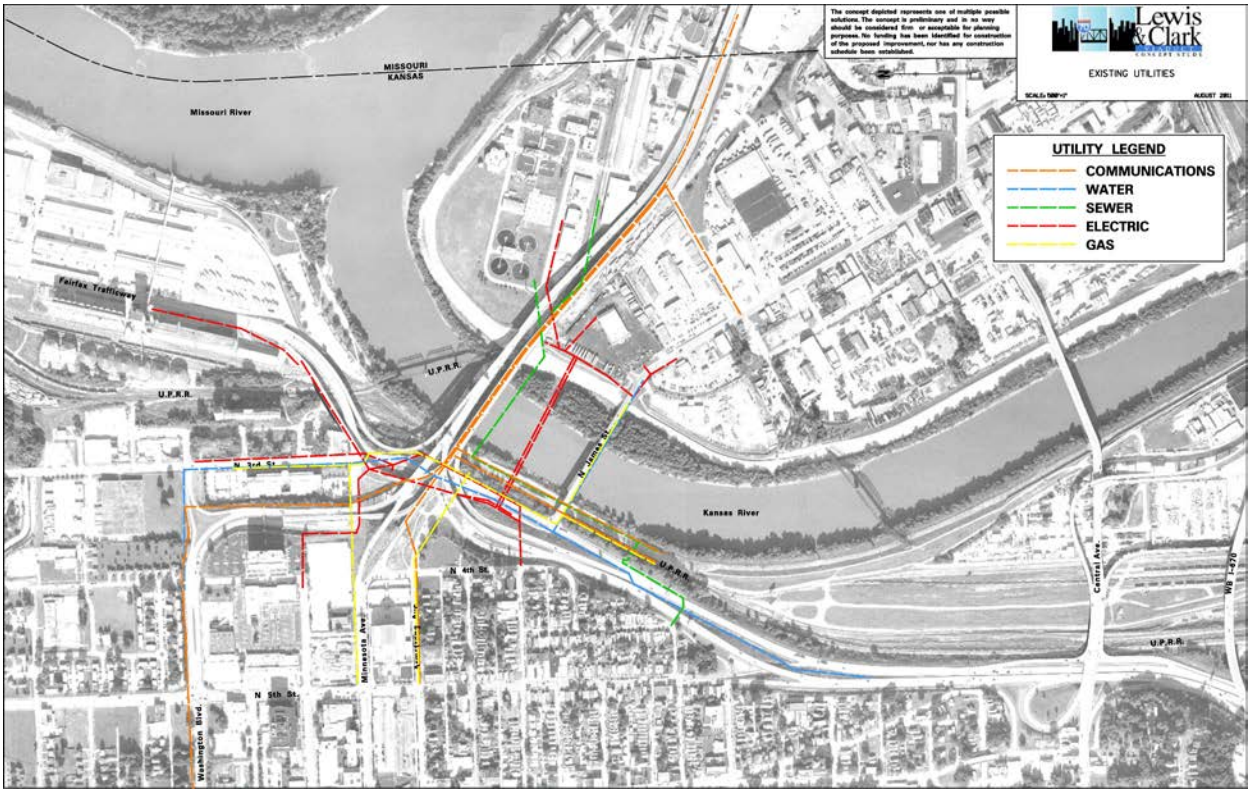
Exhibit 5
Geometric Deficiencies



Existing Utilities

There are numerous utilities located within the viaduct study area including several located on the eastbound I-70 river truss (See **Exhibit 6**). While many of the utilities are the common distribution variety, there are significant water, gas, sewer, and communication lines present. These utilities will be located and accommodation made throughout final design phases of the preferred rehab/reconstruction concept.

Exhibit 6
Existing Utilities



3.2 Traffic & Safety

Traffic

Existing highway mainline traffic volumes were obtained from KDOT, while new traffic volumes were collected at the interchange ramp terminals and surface street intersections. The traffic counts were used to develop a baseline of existing traffic demand and evaluate existing traffic operations. Existing traffic data was also used as the baseline starting point to develop the future 2040 forecasts.

Today, more than 42,000 drivers use this section of I-70 daily. **Table 1** shows the existing average annual daily traffic (AADT) and the existing peak hour traffic at three key points along the I-70 corridor within the study area. The percentage of trucks in the peak hour and corresponding peak hour truck volumes are also given.

Table 1
Existing (2011) Traffic along I-70 within the Study Area

Location	Total Two-Way Traffic Demand (AADT)	Peak Two-Way Traffic Demand (AM/PM)	Truck Percent (AM/PM)	Truck Volume (AM/PM)
I-70 East of the Kansas River	42,626	3,275 / 3,811	11.9% / 8.7%	390 / 332
I-70 Turning South	14,650	1,213 / 1,502	11.4% / 8.7%	138 / 131
I-70 West of Mill St. Overpass	40,872	3,520 / 4,048	10.4% / 8.3%	367 / 334

Source: KDOT Traffic Counts 2011

Table 2 shows the existing peak hour total traffic for each of the study interchanges. Peak hour volumes are derived by adding up the approaches to the interchange.

Table 2
Existing (2011) Total Interchange Peak Hour Traffic

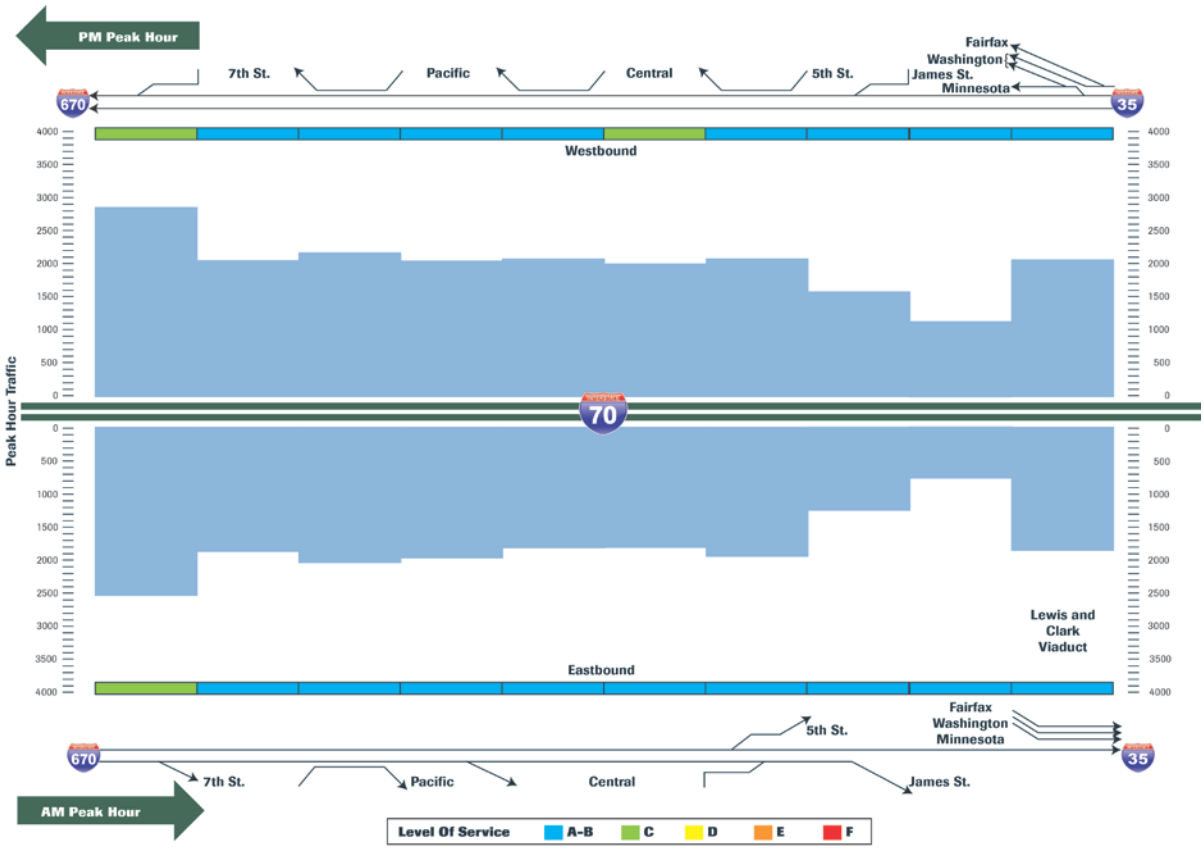
Interchange	Peak Traffic Demand (AM/PM)
7th Street	1,720 / 2,170
Pacific / Central	910 / 1,300
5th Street	830 / 750
Downtown KCK	2,710 / 2,420

Source: KDOT Traffic Counts 2011

KDOT collected traffic data in April 2011 for a 24-hour period. The peak hours were determined based on the four highest consecutive 15 minute periods in the morning and in the afternoon. The morning peak hour was determined to be 7:30 – 8:30 AM and the afternoon peak hour was determined to be 4:45 – 5:45 PM.

The existing conditions operational analysis (as well as Future No-Build and Build conditions) was modeled using these two peak hours. Based on the existing I-70 mainline data collected, and the turning movement count data collected at intersections, an existing AM and PM peak hour traffic volume map was developed. **Exhibit 7** is a summary of the existing peak hour volumes, LOS and lane geometrics.

Exhibit 7
Existing I-70 Traffic during the Peak Hour



As shown in **Exhibit 7**:

- Corridor traffic demand averages 2,000 vehicles in the peak hour in the peak direction with a high of 2,800 vehicles at the west end and a low of 800 vehicles at the I-70 eastbound single lane curve.

- Level of Service is primarily in the range of A to B with a few isolated LOS C, as shown in the colored bands outside of the volume bars. The poorest LOS includes:
    - LOS C at the west end near 7th Street for both directions during both peak hours
    - LOS C westbound under Central Avenue during the PM peak hour

- Each line at the top and bottom of the exhibit represents a physical lane. Existing lane geometric issues include:
    - Eastbound 5th Street off-ramp left exit
    - Eastbound I-70 single lane mainline

Circulation

In order to analyze the traffic and predict the future traffic in the study area it was important to understand how vehicles circulate. **Exhibit 8** shows the circulation of traffic from one starting point to most destinations within the downtown Kansas City, KS interchange and surrounding area. This interchange is complex and it was important to understand the routing of traffic in the area for forecasting future traffic. For example, the yellow line begins on James Street and heads into the interchange area. **Exhibit 8** shows the complexity of the interchange and the circuitousness of some routes.

Exhibit 8
Traffic Circulation Map

Safety

A safety analysis was performed on the existing roadway system to identify vehicle crash patterns and high density crash locations. Other safety statistics, such as crash types and crash severity were also studied. This information was used to assess safety in the study area and help develop mitigation measures such as improved geometrics and access solutions in the future build concepts. Crash data for the five-year period of 2006 through 2010 was received from KDOT for the study area. The study area crash rates were compared to the statewide average highway crash rates. The total highway crashes and highway crash rates for each section of highway are summarized in **Table 3**.

Table 3
I-70 Crash Rate Table (Five Years)

2006-2010	I-70 Crash Rates					
Section	Location	Freeway Section	Statewide Highway Crash Rate	I-70 Crash Rate	Ratio	Total No. of Crashes
A	I-70 – I-670 Split to EB James St. Exit Gore	4 Lane Divided	1.20	**1.30**	1.1	177
B	I-70 – EB James St. Exit Gore to the State Line	6 Lane Divided	1.41	**2.19**	1.6	166

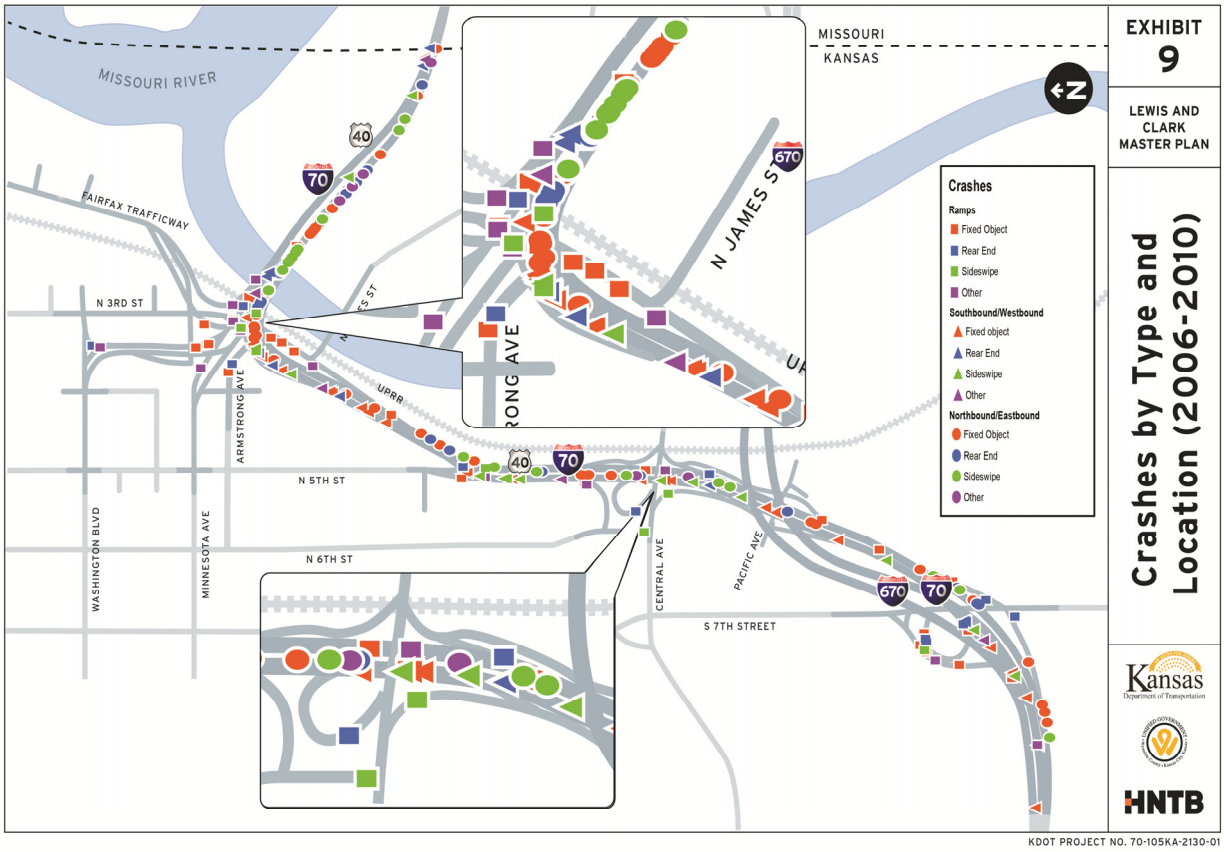
Source: KDOT

Table 3 shows that the highway crash rates on I-70 are higher than the statewide average crash rates for similar facilities by an order-of-magnitude of 10% to 60%.

High Crash Locations

The location of crashes in 2006 to 2010 along the study highway sections are shown in **Exhibit 9**. There are high concentrations of crashes along I-70 near the downtown Kansas City, Kansas interchange, and at the Central Avenue interchange. These high crash concentrations are consistent throughout the five-year period of analysis. Higher concentrations of crashes were observed near ramp merge and diverge areas and tight mainline radii corners.

Exhibit 9
Crash Location Map



Type of Crashes

Table 4 shows the percent of crashes by crash type along I-70 in the study area. As shown in **Exhibit 9** above and in **Table 4**, fixed object crashes were the most frequently occurring type for the corridor. This crash type represents 57 percent of the overall crashes for I-70. The high number of fixed object crashes is attributed to the multiple merging and diverging areas which are closely spaced in the study area with adjacent barriers and the tight geometrics which require a slower speed than is expected for an interstate highway mainline. The crash data shows that the areas with the highest concentrations of collisions on I-70 were near the sharp corner and merge location of Washington/Minnesota in the eastbound direction. This is the same area where the geometric configuration of the roadway was observed to be difficult to navigate. The second and third most frequently occurring crash types for I-70 were sideswipes and rear ends which are prevalent in the same location. Sideswipes may occur due to merging vehicles entering from the Washington/Minnesota ramp.

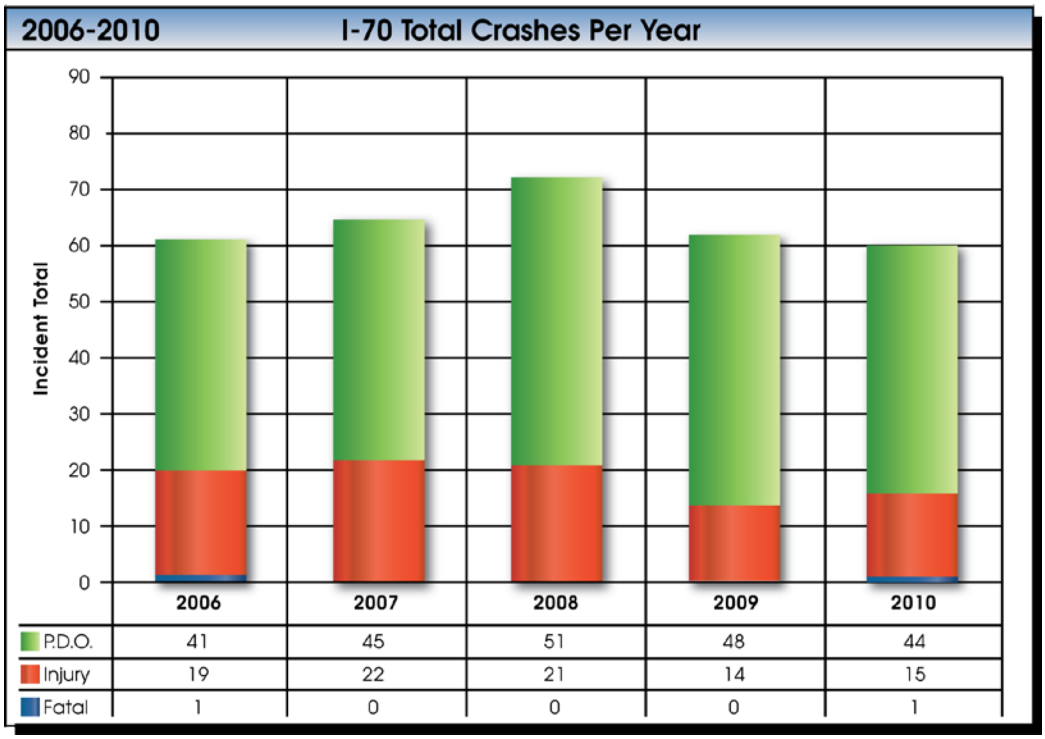
Table 4
Crash Type Table

2006-2010 I-70 Crash Data		
Crash Type	Number	Percentage
Fixed Object	186	57%
Rear End	52	16%
Sideswipe	52	16%
Other	34	10%
Total	**324**	

Crash Severity

Exhibit 10 shows the number of crashes by crash severity along I-70 in the study area. As can be seen in the graph, the majority of the accidents in the study area are property damage only crashes.

Exhibit 10
Crash Type



Summary of Crash Analysis

In summary, the crash data indicate that the study area has a higher total crash rate in comparison with statewide average crash rates for similar types of highways. High concentrations of crashes can be observed within the merging and diverging areas, especially in the downtown Kansas City, KS interchange core. Fixed object crashes are the highest occurring crash type in the study area.

Potential mitigation measures for the types of crashes occurring in the study area would focus on:

1. Adding shoulders to I-70;
2. Geometric changes to allow for consistent speeds;
3. Eliminating/minimizing conflict points with improved weaving, merging and diverging locations; and
4. Relocating fixed objects further from the traveled way when possible.

3.3 Future No-Build Traffic & Safety

Future No-Build conditions assume leaving the transportation network “as is” except for planned or committed projects. This essentially answers the question, “How will this study area function in the future with no changes to the existing roadway configuration?” The following section helps answer this question by gaining an understanding of regional population and employment forecasts, future traffic demand, level of service, future safety and planned or committed transportation enhancements.

Regional influences are those factors which could change or modify the traffic demands on the study area in the future. These regional influences can have a direct impact on future population and economic forecast data. Each of these are discussed in greater detail in **Appendix C**.

- MARC Long Range Transportation Plan (LRTP)
- Unified Government’s Downtown Master Plan
- West Bottoms Plan

The MARC LRTP developed a policy statement to provide guidance for the region's population and growth forecast, and to set a policy agenda to support the region's land-use strategy. The growth and land-use strategy was developed through extensive analysis of local plans, review by local officials and public input. It presents a vision for the future that is rooted in the objectives and strategies contained in local comprehensive plans, and it reflects the concerns and aspirations of the region's citizens.

Table 5 below is the population and employment changes from MARC's LRTP, which are forecast to take place by the year 2040 in Downtown Kansas City, Kansas.

Table 5
Population and Employment Forecast

Downtown Kansas City, Kansas Population and Employment in 2010 and 2040						
	Total Population	Households	Total Employment	Retail	Services	Other Employment
2010	13,900	4,600	23,100	2,200	11,200	9,700
2040	13,700	4,700	22,600	1,900	12,600	8,100
Change	(200)	100	(500)	(300)	1,400	(1,600)

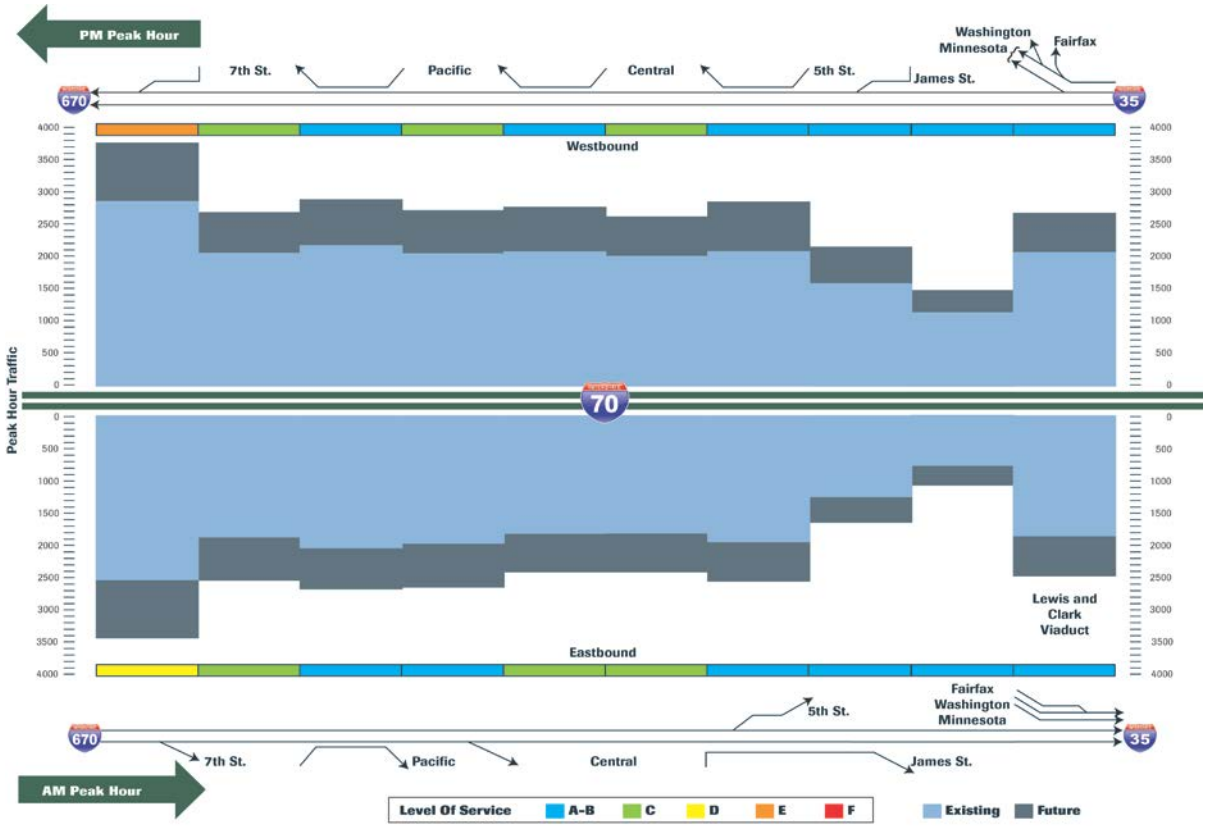
Source: MARC LRTP 2040

MARC's LRTP shows no growth in population and employment in Downtown Kansas City, Kansas. However, redevelopment growth is expected to occur in urban areas surrounding downtown Kansas City, Kansas. Increased traffic on I-70 is experienced by growth in other areas of the metropolitan region that I-70 connects.

When analyzing future no-build conditions, committed projects in the area were taken into consideration. In the case of this study area, there are no committed improvements other than normal maintenance. Consequently, the current roadway is assumed to be the same roadway in the year 2040 for the no-build condition.

Exhibit 11 is a summary of the future no-build peak hour volumes, LOS and lane geometrics.

Exhibit 11
Future 2040 No-Build Traffic and Level of Service



As shown in the exhibit:

- Corridor traffic demand averages 2,800 vehicles in the peak hour in the peak direction with a high of 3,800 vehicles at the west end and a low of 1,100 vehicles at the I-70 eastbound single lane curve. This represents an average increase of 33 percent from existing conditions.

- Level of Service is primarily in the range of A through C with a few isolated LOS D/E segments. The worst LOS areas include:
    - LOS E at the west end near 7th Street in the westbound direction during the PM peak hour;
    - LOS D at the west end near 7th Street in the eastbound direction during the AM peak hour.

- Existing lane geometrics issues (same as existing conditions) include:
    - Eastbound 5th Street off-ramp left exit;
    - Eastbound I-70 single lane mainline.

Safety

Table 6 shows that the crashes per year that are estimated to occur in the future by using the current crash rates with future 2040 No-Build volumes.

Table 6
I-70 Future No-Build Crash Rates (Per Year)

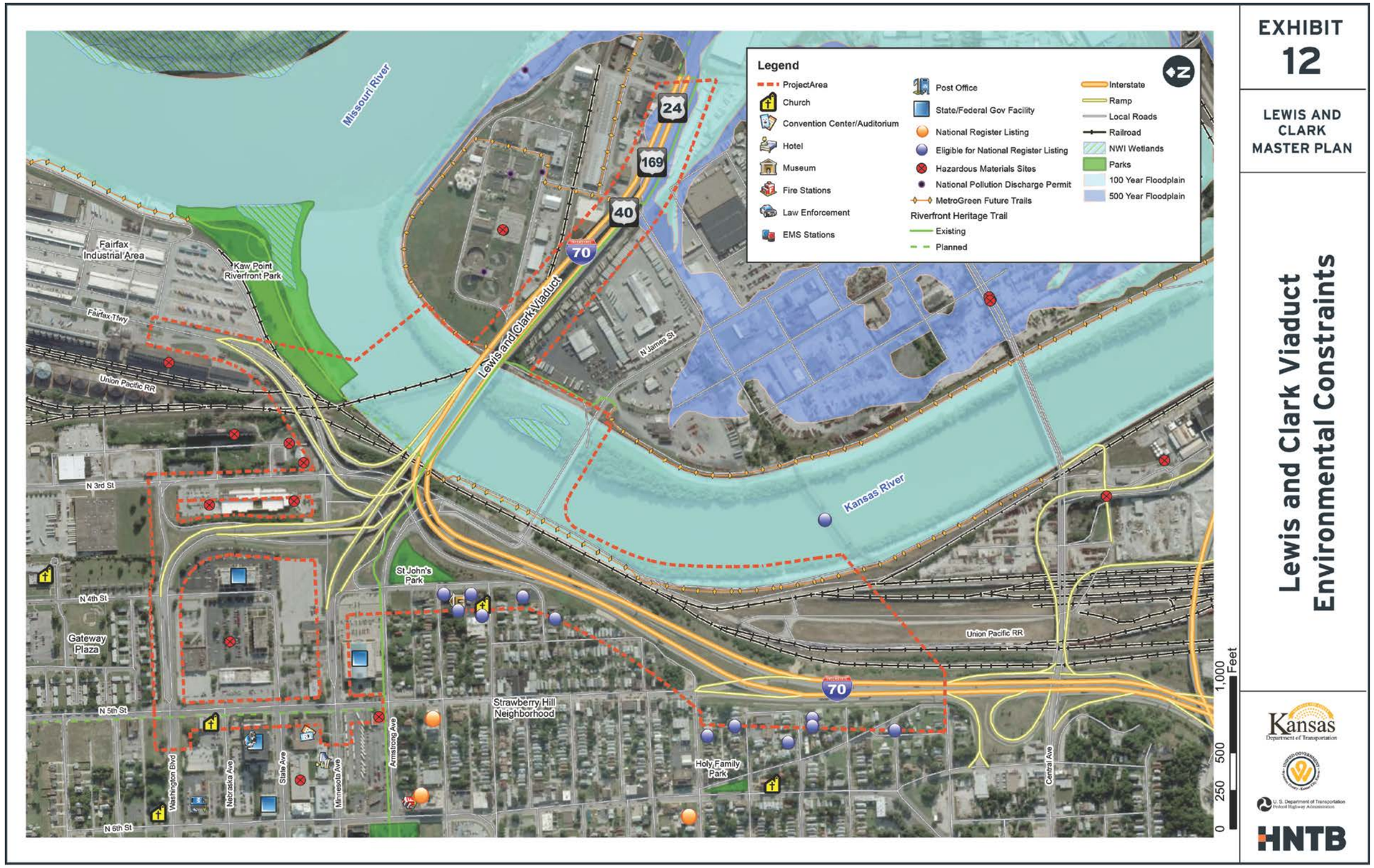
2040	I-70 Crash Rates					
Section	Location	Freeway Section	Statewide Highway Crash Rate	I-70 Crash Rate	Ratio	Total No. of Crashes
A	I-70 – I-670 Split to EB James St. Exit Gore	4 Lane Divided	1.20	**1.30**	1.1	47
B	I-70 – EB James St. Exit Gore to the State Line	6 Lane Divided	1.41	**2.19**	1.6	44

Table 6 shows that the crashes per year are expected to increase from roughly 69 crashes per year over the entire I-70 corridor to 91 crashes per year over the entire corridor. This is due to the increase in vehicle miles traveled (VMT) from 2011 to 2040.

3.4 Environmental

Potential environmental issues and constraints identified by the data collection and “windshield survey” are shown on **Exhibit 12** of this report. This map establishes the existing natural and manmade environmental conditions for the project area. Each of the environmental constraints shown should be considered as a potential “red flag” issue that, if impacted, will require avoidance, minimization or mitigation of impacts. The level of impact to these items will depend on the future alignment and configuration of any proposed project improvements and will need to be reevaluated when the project moves forward into future NEPA or design phases.

Exhibit 12
Environmental Constraints Map



3.5 Hydrology & Hydraulics

In 1998 the Corps of Engineers began a process to evaluate the levee systems in the Kansas City Metropolitan area. This process started with a Reconnaissance Study and proceeded into the Feasibility Study phase. As part of the Corps' process, updated hydraulic models were created. HNTB obtained these models from the Corps of Engineers to use as the base model from which this study would be conducted. HNTB performed a cursory review of the Corps' model and generally found it to be an acceptable existing conditions model. There are a few updates to the Corps' hydraulic model that should be considered as design progresses. More detailed information about these updates is provided in the full hydraulic memo in **Appendix E**.

Design Events: The 500-year flood discharge is the primary design event because of the presence of the levee units, and the Corps models account for tailwater from the Missouri River. The Corps current design standard for levees is risk based rather than freeboard based, and thereby deems the 500-year design event (top of protection elevation) to be one that captures 90% of the 0.2% probability floods (500-year events) that are statistically feasible. The levees were originally designed for a 500-year design event that only captures 50% of the 0.2% probability storms that are statistically feasible, plus 3 feet of freeboard. In addition to the 500-year, impacts to the 100-year profile are also reported in this study for FEMA purposes. However, the Corps 100-year discharges are used instead of the FEMA regulatory discharges because they are more conservative and because they are based upon more recent hydrology than FEMA's discharges. The FEMA regulatory discharges should be modeled during the preliminary design process to determine the need for FEMA submittals. It is possible that FEMA may adopt the new Corps discharges in the near future. The Corps is currently in the process of assessing the level of protection of the levees with respect to the risk based approach discussed above, and therefore adequacy of the existing levees is unknown at this time.

The existing I-70 bridges span the Kansas River and levees and do not have freeboard or capacity issues. A scour analysis was not performed as part of this concept level study to determine whether the substructure of the existing bridges meet current scour standards.

4.0 Stakeholder Engagement

The stakeholder engagement process began by creating an identity around the study area and introducing the goals and objectives of the study through various mechanisms, including launching the website, conducting community interviews, and holding our first listening session to understand the issues and concerns in the study area.

The focus then moved to receiving input on the proposed improvement concepts by conducting an issue workshop and a public meeting. All stakeholder engagement activities conducted for the Concept Study are summarized below and are available on the website: http://LCViaductI70.ksdot.org.

To wrap up the study, a final public meeting was conducted and the summary of the study was emailed to stakeholders and mailed to residents and businesses within the study boundaries.

A comprehensive Public Involvement Activities Log (**PI Log**), summarizing the information and materials presented and the feedback received throughout the various public involvement activities is available through KDOT as a supplement to this report.

4.1 Community Interviews

The community interviews for the Concept Study were conducted over a six week time frame from early May through mid-June 2011. Twenty-five interviews were conducted.

The purpose of the community interviews was to introduce the study to various stakeholders within the study area and ask for thoughts on issues and concerns related to the viaduct. The stakeholders were asked a series of questions to understand their concerns and identify issues that may come up during the study process.

Generally, participants were pleased with the opportunity to provide their input about the study. The overall themes that came out of the meetings included:

- Existing access is cumbersome and confusing;
- Sharp curvature of existing highway infrastructure can feel unsafe;
- Opportunities to enhance development in KCK are important;
- General communication throughout the process is important and communication about changes, detours and construction plans is critical.

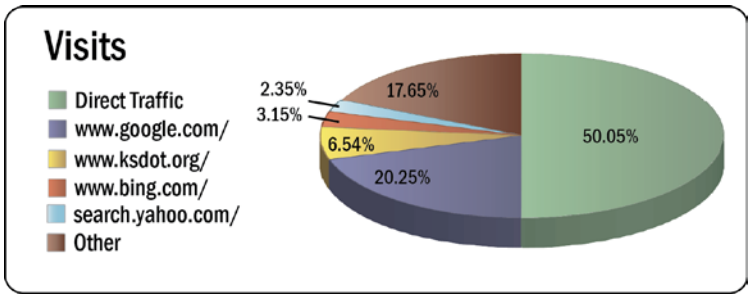
4.2 Website

Since the Lewis and Clark Study area includes stakeholders and users from numerous communities, online outreach was used to provide updates and information in partnership with

other traditional outreach approaches. The website was developed to provide information about the study. The site launched June 14, 2011, is located at http://LCViaductI70.ksdot.org and is maintained by KDOT.

From June 2011 through June 30, 2012, the website has had over 34,000 reoccurring visitors. Half of the visitors are accessing the site directly, as noted by **Exhibit 13**.

Exhibit 13
Visits to Website

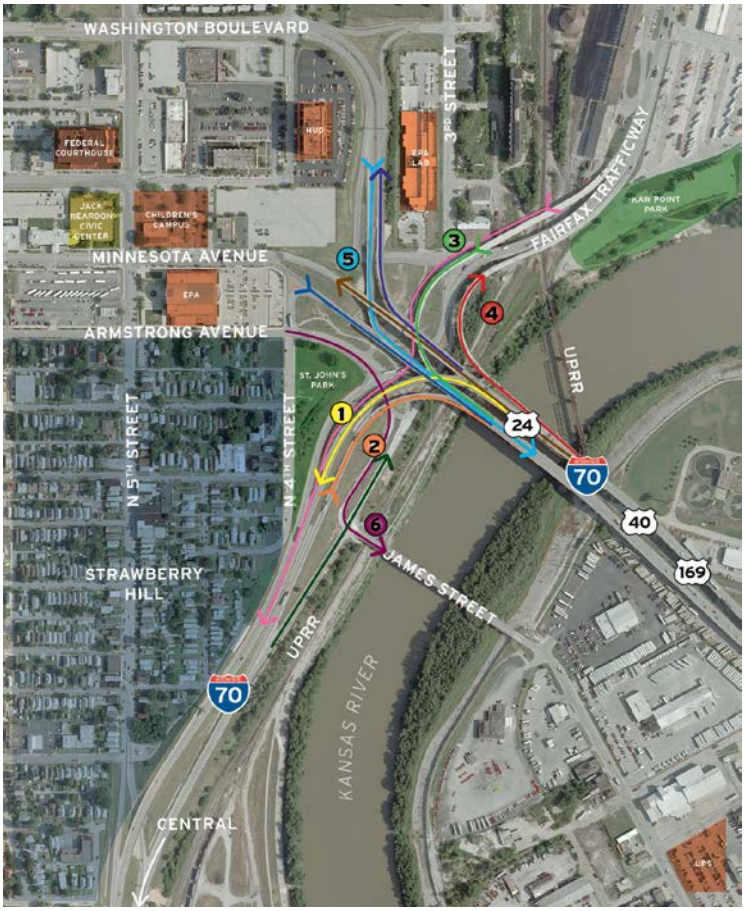


4.3 Online Surveys

The online survey was available June 28, 2011 through August 10, 2011. The purpose of the survey was to gather information from those that use the viaduct and interchange area on a regular basis. The questions were generally focused on user experience, areas of concern and suggestions for improvement. Ninety people responded to the survey. Below are responses to areas of top concern (also illustrated in **Exhibit 14**) and how often people are traveling in the area. Additional survey responses can be found in the **PI Log**.

1. How often do you travel through the area? (Shows percent of through travelers)
   - 22.7% Daily
   - 38.6% Weekly
   - 21.6% Monthly
   - 17.0% Yearly

Exhibit 14
Online Survey Results: Top Concerns Identified



2. What areas are of most concern?
   - Westbound I-70 through traffic 56.4%
   - Eastbound I-70 through traffic 42.3%
   - Southbound Fairfax to eastbound I-70 41.2%
   - Other concerns are more equal with 5 areas between 25-39% including:
     - EB I-70 to downtown KCK, Fairfax/James Street
     - Minnesota to Eastbound I-70
     - Westbound I-70 to Northbound Fairfax
     - Westbound I-70 to Minnesota
     - Armstrong Ave to James Street
   - People identified concerns with sharp curves and traffic down to one lane on the ramps.

3. Suggestions for improving area include:
   - More lanes—widen
   - Reduce curves
   - Make it possible for higher speeds for I-70 through traffic
   - Add aesthetics for bridges/texture to deter graffiti
   - Add shoulders
   - Don't put in a roundabout. Not good for lots of trucks
   - Better lane markings
   - Reduce access (eliminate 5th St., direct traffic to 3rd James)

4.4 Public Meetings

Public meeting events were held as part of the study process in an effort to provide all members of the public the opportunity to engage directly in the study process. These events encouraged attendees to provide their input, opinions and reactions to study related information provided through presentations and exhibits. Comments from the general public were essential to get a full spectrum of input on the study process and products so that the Study Team could understand as many uses, perceptions and expectations of the viaduct and interchange area as possible.

Listening Session

A Listening Session was held on Tuesday, June 28, 2011 from 5:30 to 7:30 p.m. at the Jack Reardon Convention Center in Kansas City, Kansas. Fourteen people attended and provided input on transportation concerns related to the viaduct Concept Study. The purpose of the Listening Session was to provide an overview of the Concept Study and allow participants to express concerns or questions regarding the study. We planned breakout groups to have smaller discussions, but ended up with just one group.

Participants were asked to place dots around the issues of most concern to them in order to help guide discussion. The issues of importance ranked in the following order:

1. Quality of Life
2. Economic Development
3. Safety
4. Access/Mobility

Public Meeting #1

Ninety-six people attended the open house public meeting for the Lewis and Clark Viaduct Concept Study held November 9, 2011 at the Jack Reardon Convention Center in Kansas City, Kansas.

The purpose of the meeting was to present the proposed concepts being considered for the area. Display boards presented background information on traffic, environmental issues, public engagement and comments, and engineering constraints. Twenty-five people provided written comments or responded to our online survey after the meeting. The main concerns noted were:

- Safety—reducing the I-70 curves and making I-70 “easier to drive”
- Access to the river is desired
- Access to the Fairfax Industrial District for trucks
- Community impacts including noise and traffic to the Strawberry Hill area
- Bike and pedestrian access to trail system and parks as well as making KCK more accessible to other modes besides cars and trucks
- Cost of the options needs to be considered
- Roundabout options shown can be difficult for trucks to maneuver
- Should not disturb St. John’s Park

Six concepts were presented and participants were asked to share their preference and comments on the concepts by placing a colored dot alongside the concepts. Not all participants put a dot on each concept. Typically, participants placed dots on the concepts they had a strong opinion about. As shown in **Exhibit 15** below, participants identified positives and negatives for each of the concepts.

Exhibit 15
Concept Concerns from Public Meeting

Please identify what level of concern, if any, you have about each of the concepts by using colored dots.
Green dot — no concerns, I like the concept. Yellow dot — I have some concerns. Red dot — I have major concerns/reservations.
(Please feel free to use the post it notes to elaborate on your concerns)

Interchange Type	Level of Concern: Dot	Level of Concern: Additional Comments	Other
Concept 1A – Baseline - All bridges replaced in kind	🟢🟢🟢 🔴🔴🔴🔴🔴		• Concerned about noise with increased speed • Traffic signal at 5th and Washington has been removed and replaced with a 4-way stop. • One of the positive things about living on Strawberry Hill is the view of the City across the river. We would like to keep the view when you are considering the height of the new ramps.
Concept 1B – Baseline with I-70 Improved	🟢🟢🟢🟢🟢🟢🟢🟢🟢🟢 🟡 🔴🔴	• No bottle neck in access to downtown, Fairfax and I-70, improve safety on I-70 curve. • Westbound I-70 why change access? • Improves the I-70 sharp curve, also does not create a lot of changes for Fairfax district traffic.	
Concept 2A – Box style local access with I-70 not improved	🟢 🟡 🔴🔴		
Concept 2B – Box style local access with I-70 improved	🟢🟢🟢 🟡		
Concept 3B – One intersection with I-70 improved	🟢 🟡🟡 🔴🔴🔴	• Roundabout weather hazard, more lights along the highway and the intersections below.	
Concept 4B – New Fairfax Ramps with I-70 improved	🟢🟢🟢🟢🟢🟢🟢🟢🟢🟢 🟡🟡 🔴	• Heated roads with solar power. • Why change WB I-70 Access? • Building bridges over Kaw Point Park and I am close to the confluence of the Kaw and MO River will detract from the views and quality of Kaw Point. • Too much truck traffic and noise next to Strawberry Hill.	

Public Meeting #2

Fifty-nine people attended the open house public meeting for the Lewis and Clark Viaduct Concept Study held August 15, 2012 at the Jack Reardon Convention Center in Kansas City, Kansas.

The purpose of the meeting was to present the Preferred Concept and conclude the Concept Study. Display boards presented background information on traffic, environmental issues, public engagement comments, and engineering constraints. Seventeen people provided feedback about the project/concept at the event or responded to our online survey after the meeting. Generally, both verbal and written comments were in support of the Preferred Concept.
The general themes of the comments can be classified as follows:

- Support for the Preferred Concept
- Maintain/enhance connections and access to Kaw Point Park from the riverfront and downtown for all forms of transportation
- Keep pedestrians and bicyclists a priority throughout design
- Traffic routing and local circulation is important

- Include comprehensive signage for the entire corridor
- Concern that the Preferred Concept is not in alignment with the KCK Downtown Master Plan

4.5 Issues Workshop

The Study Team held an Issues Workshop on Monday, September 26, 2011 from 11:30 am to 1:30 pm at the Jack Reardon Convention Center in Kansas City, Kansas. The purpose of the workshop was to provide an overview of the study process to area stakeholders and allow them to review the proposed concepts, ask questions and identify concerns that they may have with the concepts.

The team presented an overview of the study goals and approach. They provided updates on what the team has learned so far and then provided an overview of the proposed concepts. The audience then broke out into 3 groups for small group discussion and a more detailed review of each of the concepts. Each of the groups reviewed the concepts and discussed concerns and identified areas that may need more explanation or exploration.

4.6 Media

Since the study began, press releases were sent out to local media at key milestones for the project.

- Announce the kickoff of the study and announce listening session (June 22, 2011)
- Announce the online survey (July 26, 2011)
- Announce public meeting #1 (October 28, 2011)

The local news media published the events and provided follow-up stories. Copies of the media coverage can be found in the **PI Log**.

4.7 Outreach

The Study Team worked closely to keep the stakeholders and the public informed about input opportunities. The Unified Government sent notices through their electronic streams, KDOT tweeted about upcoming events, the downtown shareholders and the chamber of commerce helped provide information about the upcoming events. The Study Team developed a robust database of over 2,500 postal addresses to mail meeting notifications and the final study factsheet.

Electronic Newsletters

E-Newsletters were used to inform area stakeholders and other interested parties about the study progress and upcoming events. Electronic newsletters were sent with the following focus:

- June 2011 — Introduced the study; E-mailed to 78 people
- July 2011 — Announced online survey available; E-mailed to 96 people
- October 2011 — Announced open house public meeting; E-mailed to 150 people

Informational Handouts

Informational handouts were prepared in conjunction with the community interviews and public meetings. A final summary handout was developed and mailed to the study area mailing list of 2,500 people to conclude the study.

Facebook

As part of the public engagement process for this study, a Facebook Page was used to provide information on the study and engage people using social media. It provided links to the website and allowed for a forum for questions and comments about the study. Frequent updates were made to the page to keep people interested and ask questions about their concerns with the study area.

To attract people to the page, a Facebook ad was run which targeted all Facebook users within 50 miles of the Kansas City area over the age of 13. Over 500,000 people were exposed to the ad and just over 70 became interested in the page and 'liked' the page. Through Facebook, Lewis and Clark Viaduct Study was exposed to an audience that is historically difficult to reach through traditional tools. This audience included people who normally don't attend public meetings and are used to receiving information through alternative social media venues.

4.8 Community and Stakeholder Briefings

The Study Team conducted briefings to community groups about the process in order to gather input on issues and concerns as well as the improvement concepts. The team made presentations to the following groups:

- Central Industrial Development District — 03/07/2011
- Fairfax Industrial Association — 03/11/2011 and 11/03/2011
- KCK Chamber of Commerce — 12/07/2011
- UG Public Works & Safety Standing Committee — 12/12/2011
- MARC Total Transportation Policy Committee — 12/20/2011
- MARC Aviation Meeting — 05/10/2012

5.0 Preferred Concept

5.1 Screening of Concepts

Several brainstorming sessions were conducted early in the study that resulted in a myriad of concepts. Many concepts were eliminated due to various combinations of not meeting the established project design criteria, negatively impacting the environment or adjacent properties, constructability concerns, traffic operation concerns, cost, etc. The established project design criteria and examples of eliminated concepts can be found in **Appendix B**. Six acceptable concepts (See **Exhibits 17 – 22**) were further developed and presented at Public Meeting #1 on November 9, 2011.

5.2 Project Concepts

The following were the concepts considered and presented for public comment:

Concept 1-A: Baseline

This concept essentially replaces the viaduct infrastructure as it is today, in the same location with no modifications to curves. Shoulders and lanes are widened where possible and there is no change to the local street system. The redundant access in/out of the Fairfax Industrial District remains. Total estimated cost (in 2012 dollars) for this concept is in the range of $150 million to $174 million.

Concept 1-B: Baseline w/ Improved I-70

This concept is the same as Concept 1-A except that the tight I-70 curves are improved and I-70 is widened to maintain at least two lanes in the eastbound direction. Total estimated cost (in 2012 dollars) for this concept is in the range of $175 million to $199 million.

Concept 2-A: Box Style

This concept removes the Fairfax Trafficway and Washington Boulevard ramps and leaves the remaining interchange bridges as they are today. Local access and circulation is consolidated to a series of intersections arranged into a “box” configuration. This configuration eliminates the redundant access in/out of the Fairfax Industrial District. The tight I-70 curves are rehabilitated as they are today. Total estimated cost (in 2012 dollars) for this concept is in the range of $150 million to $174 million.

Concept 2-B: Box Style w/ Improved I-70

This concept is similar to Concept 2-A except that all traffic between I-70 and the local street network is consolidated to a single crossing over the Kansas River, the tight I-70 curves are

improved and I-70 is widened to maintain at least two lanes in the eastbound direction. Total estimated cost (in 2012 dollars) for this concept is in the range of $175 million to $199 million.

Concept 3-B: Single Intersection w/ Improved I-70

Similar to Concept 2-B, this concept removes the Fairfax Trafficway and Washington Boulevard ramps and consolidates local access and circulation into a central signalized intersection or roundabout. This configuration again eliminates the redundant access in/out of the Fairfax Industrial District and forces all traffic movements within the interchange to pass though the central intersection. Furthermore, traffic between I-70 and the local street network is consolidated to a single crossing over the Kansas River, the tight I-70 curves are improved and I-70 is widened to maintain at least two lanes in the eastbound direction. Total estimated cost (in 2012 dollars) for this concept is in the range of $175 million to $199 million.

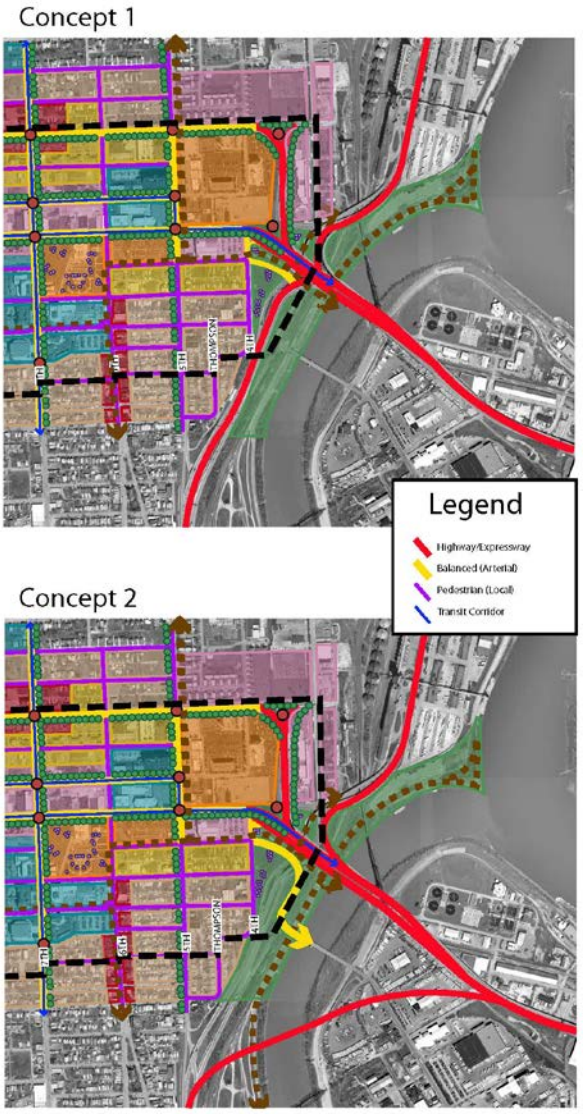
Concept 4-B: New Fairfax Ramps w/ Improved I-70

This concept is a variation of Concept 1-B except with the Washington Boulevard ramps removed, the Fairfax Trafficway ramps improved and all traffic between I-70 and downtown KCK consolidated to a single Kansas River crossing. The redundant access in/out of the Fairfax Industrial District remains, the tight I-70 curves are improved and I-70 is widened to maintain at least two lanes in the eastbound direction. Total estimated cost (in 2012 dollars) for this concept is in excess of $200 million.

KCK Downtown Master Plan

The April 2007 Draft KCK Downtown Master Plan references two potential I-70 concepts in that plan's Figure II-8 (See **Exhibit 16**). Concept 2 illustrates a realignment of I-70 through the Central Industrial District, which was envisioned to open a substantial area of river frontage property west of the Kansas River for recreation and redevelopment. A preliminary concept, based on the Downtown Master Plan, was developed and presented at

Exhibit 16
KCK Downtown Master Plan Figure II-8



Public Meeting #1 as an "eliminated concept" (See **Appendix B**). Feedback from local government leaders received at the November 2011 Public Meeting led to the Study Team further evaluating this I-70 realignment concept (See **Exhibit 23**).

The core components of the concept mirror those of Concept 1-B as well as providing additional potential for open space in alignment with the KCK downtown Master Plan, improves existing weaving locations (5th Street/Pacific Avenue), and improves access from the Central Industrial District to westbound I-70. This concept results in the realigned I-70 curves tying to the existing I-70 corridor in the middle of four closely spaced existing interchanges. The additional improvements illustrated from the 5th Street interchange to the south are necessary to accommodate both traffic operations and access to the 5th Street, Central Avenue, Pacific Avenue, and 7th Street interchanges. Total estimated cost (in 2012 dollars) for this concept is near $300 million.

5.3 Selection of Preferred Concept

Upon completion of the extensive stakeholder and public engagement activities, the concepts were evaluated relative to their engineering qualities and with regard for the numerous comments received. The evaluation revealed that Concept 1-B not only exhibited good engineering, operational, safety and phased construction qualities; but maintained the level of access the area had become accustomed to, provided the potential for increased park areas overlooking the River and was widely favored as one of the most desirable concepts by local stakeholders and the public. Therefore, the Study Team determined that further conceptual refinement and detailed comparative analysis with a second concept was unnecessary and selected Concept 1-B as the Preferred Concept. Correspondence received from local government leadership related to selecting a Preferred Concept can be found in **Appendix F**.

While all the concepts discussed in Section 5.2 are technically acceptable and constructible, the following is a brief synopsis of the aspects that led to elimination of the remaining concepts.

Concept 1-A: Baseline

- Does not address the tight I-70 curves and associated accident history.

Concept 2-A: Box Style

- Does not address the tight I-70 curves and associated accident history;
- Eliminates redundant access to/from I-70 and Fairfax Industrial District;
- Eliminates direct access for trucks into Fairfax Industrial District and forces the traffic to negotiate multiple closely spaced intersections; thereby reducing the attractiveness of the area for potential economic development;
- Slight impact to potential development properties west of the river.

Concept 2-B: Box Style w/ Improved I-70

- Eliminates redundant access to/from I-70 and Fairfax Industrial District that was identified as important during community interviews, stakeholder briefings, and public meetings;
- Eliminates direct access for trucks into Fairfax Industrial District and forces the traffic to negotiate multiple closely spaced intersections; thereby reducing the attractiveness of the area for potential economic development;
- Slight impact to potential development properties west of the river.

Concept 3-B: Single Intersection w/ Improved I-70

- Eliminates redundant access to/from I-70 and Fairfax Industrial District that was identified as important during community interviews, stakeholder briefings, and public meetings;
- Eliminates direct access for trucks into Fairfax Industrial District and forces the traffic to negotiate a central signalized intersection or roundabout; thereby reducing the attractiveness of the area for potential economic development, especially with a roundabout;
- Forces all traffic movements through a central intersection, which results in mixing of passenger car and heavy truck traffic to a greater extent than direct ramps or separated intersections; Concern related to this aspect was the potential of increased accidents involving trucks carrying hazardous or liquid loads;
- Property impact to St. John's Park;
- Impacts potential development properties west of the river.

Concept 4-B: New Fairfax Ramps w/ Improved I-70

- Little flexibility to phase construction over time and address the highest priority segments first without significant use of temporary "throw-away" bridge connections;
- Additional river hydraulic impacts due to more Kansas River bridge crossings;
- Additional railroad conflicts;
- Long inbound grade to Fairfax Industrial District in advance of a large intersection on bridge structure is not desirable;
- Significant impact to Kaw Point Riverfront Park;
- More right-of-way impacts east of the Kansas River than other concepts.

KCK Downtown Master Plan

- Requires nearly 1,000 feet of viaduct reconstruction in Missouri;
- Significant right-of-way impacts through the Central Industrial District (a minimum of 3 affected businesses) and along the north-south oriented portion of I-70 including impacts to the UPRR Regional Track Warehouse and rail yard, businesses, closure of two streets on the west side of I-70;
- Proximity to residences along the west side of I-70;
- Extensive I-70 relocation and reconstruction including reconfiguration of the James, 5th Street, Central, Pacific, and 7th Street interchanges due to I-70 coming across the river south of the existing 5th Street ramps and reducing the space in which to accommodate the movements of multiple interchanges;
- Introduction of new and longer bridge structures with extensive impacts to multiple sets of railroad tracks;
- Introduction of a significant number of new and/or enlarged retaining walls;
- Additional right-of-way and other impacts provide more potential for greater environmental impacts, documentation and/or mitigation;
- Significant reduction in phased construction capability;
- Significant increase in project cost.

It is worthy to note that this concept underwent a period of evaluation and collaborative discussion, and the Study Team ultimately eliminated this concept. However, the Unified Government leadership feels strongly that in order for the study to be deemed successful, the Preferred Concept needs to embody the vision and spirit of the Master Plan components. Correspondence from local government leadership related to the elimination of the KCK Downtown Master Plan and the incorporation of core components of that plan into the Preferred Concept can be found in **Appendix F**.

Exhibit 17
Concept 1-A Baseline

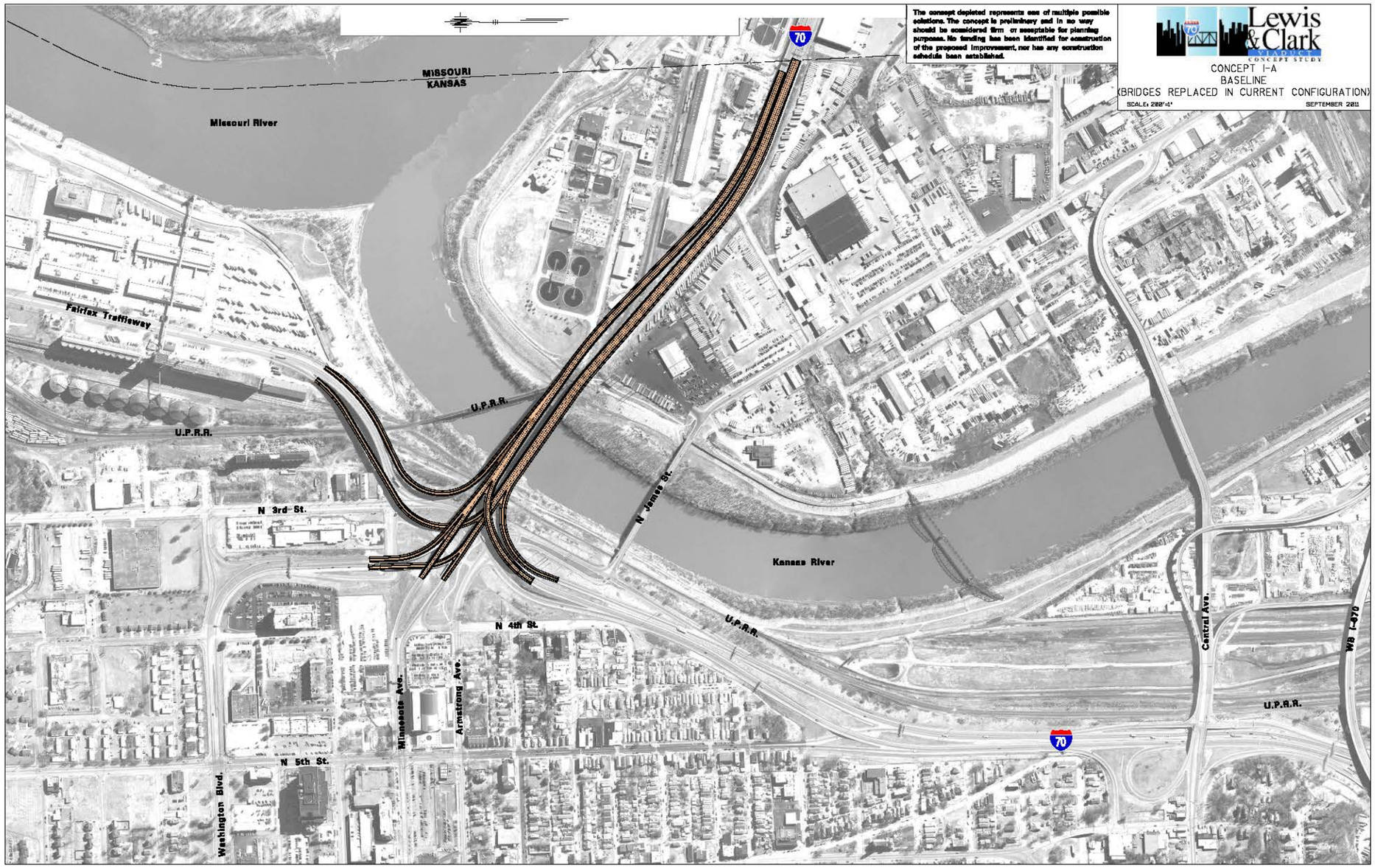


Exhibit 18
Concept 1-B Baseline w/ Improved I-70

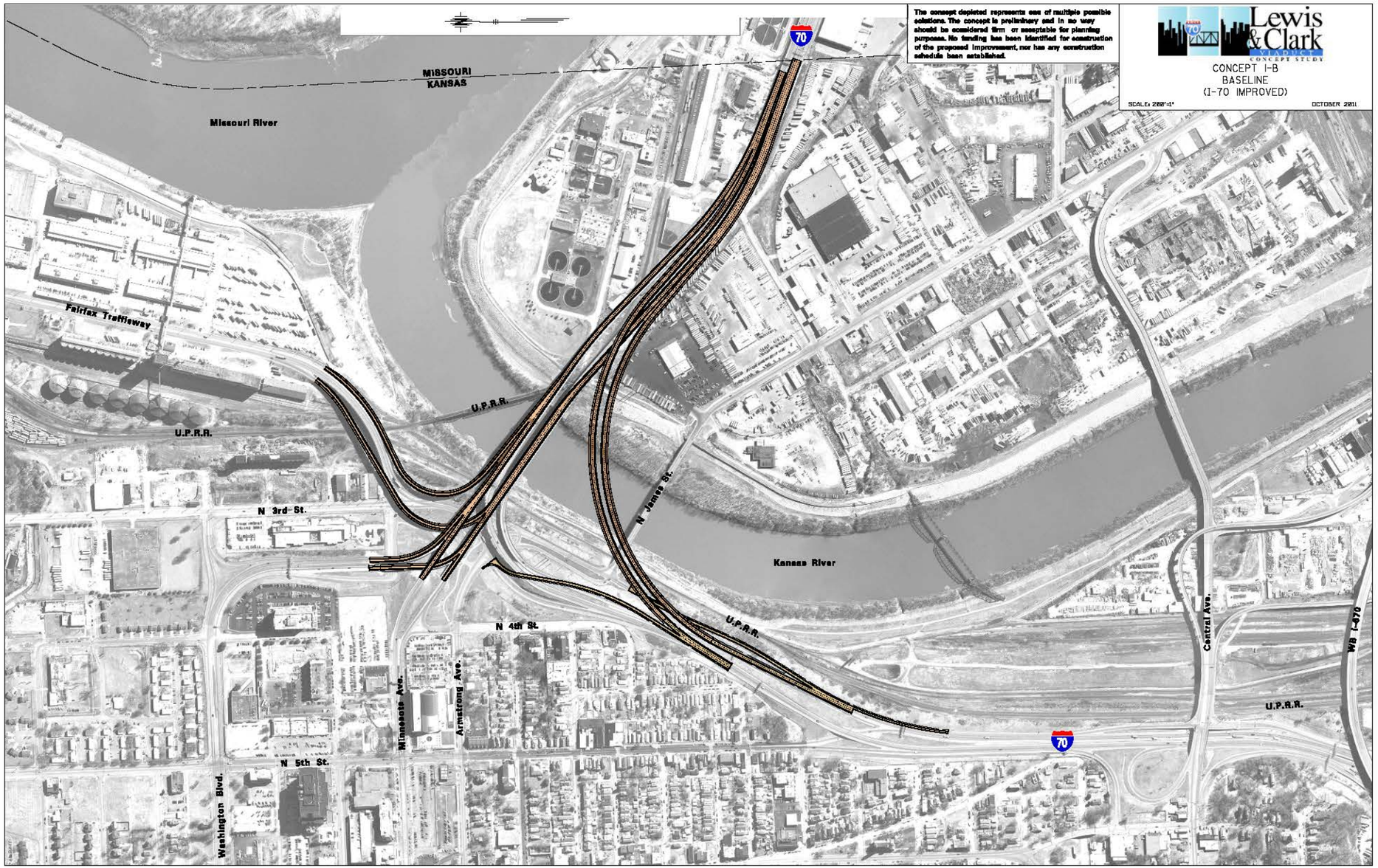


Exhibit 19
Concept 2-A Box Style

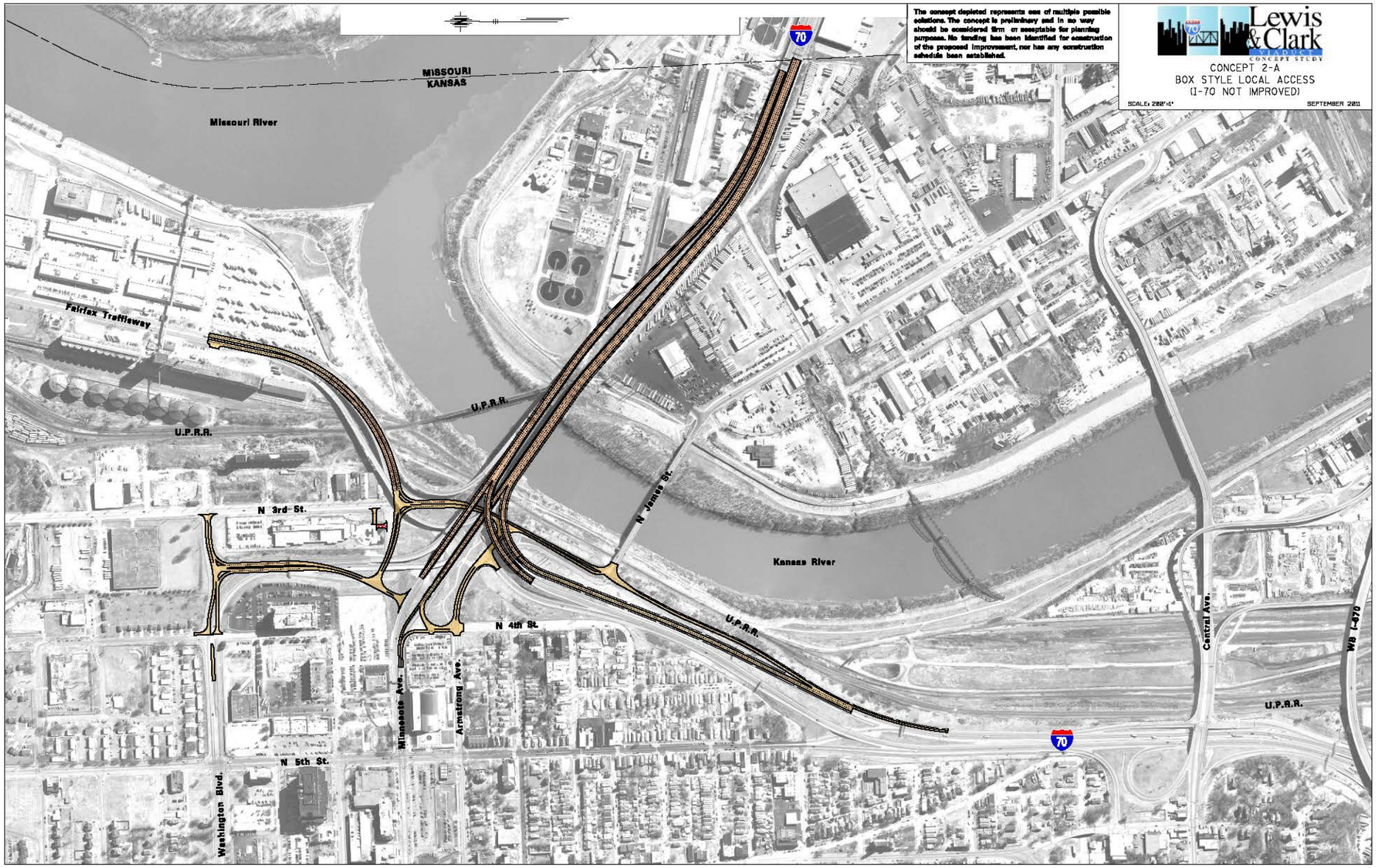


Exhibit 20
Concept 2-B Box Style w/ Improved I-70

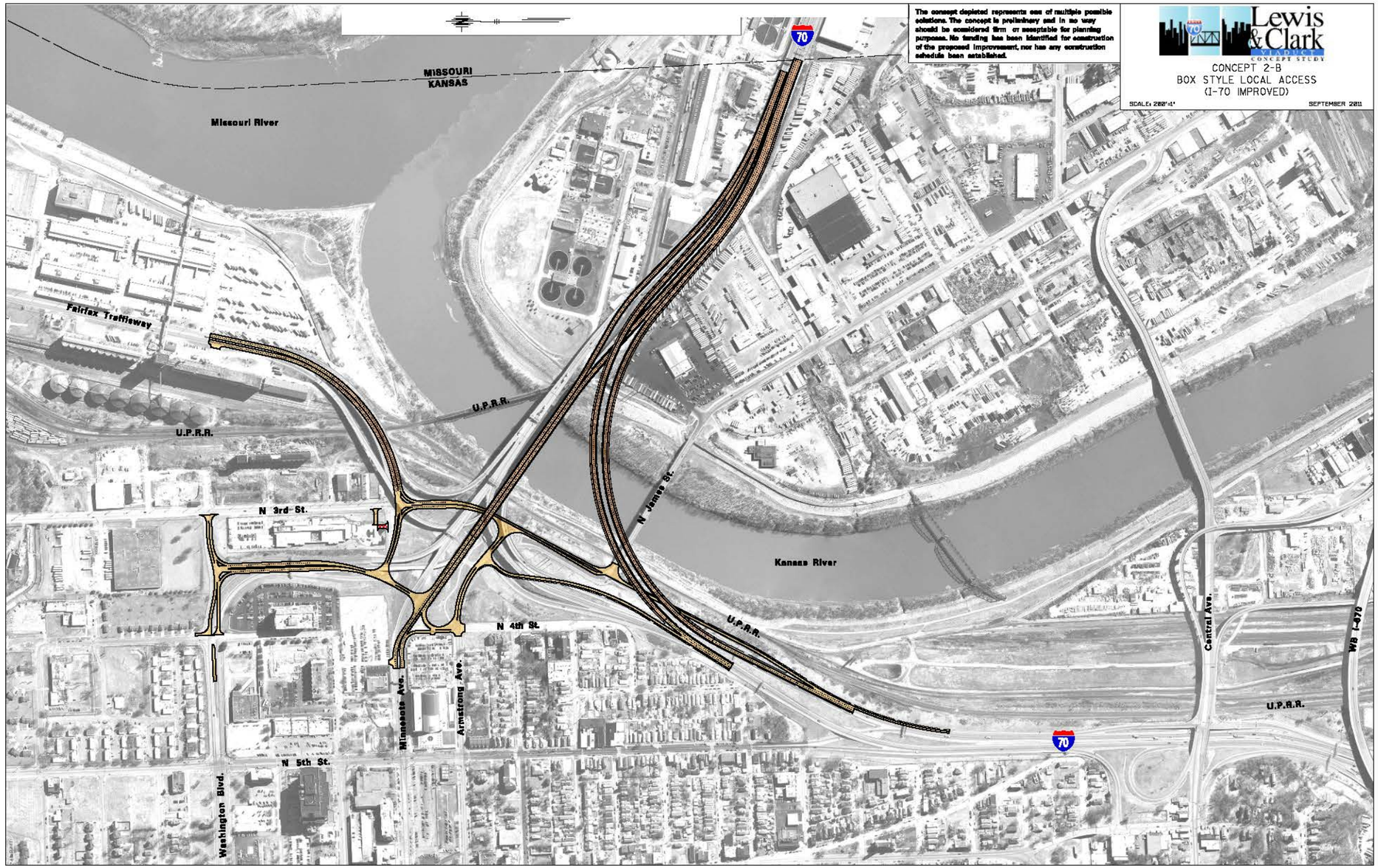


Exhibit 21
Concept 3-B Single Intersection w/ Improved I-70

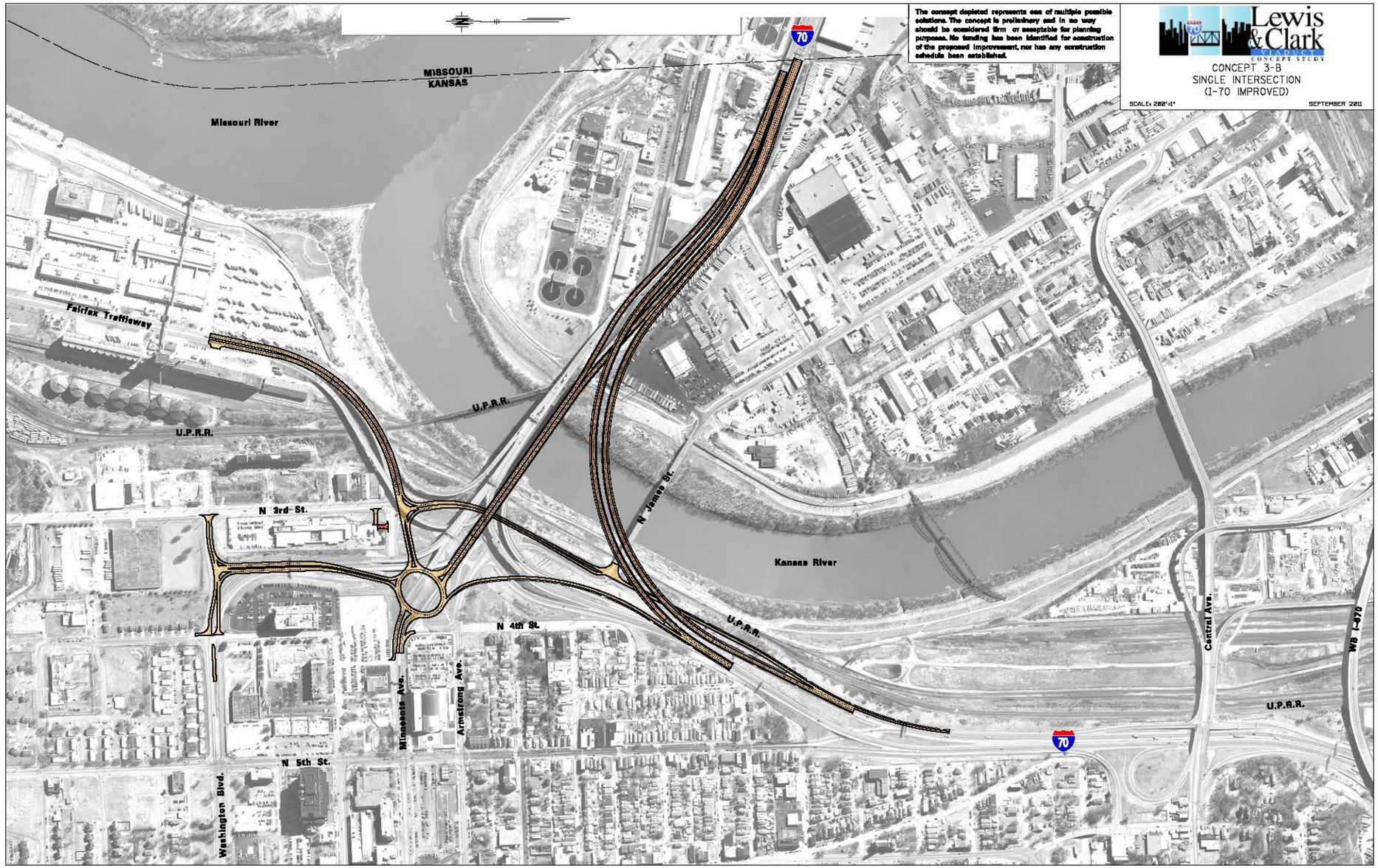


Exhibit 22
Concept 4-B New Fairfax Ramps w/ Improved I-70

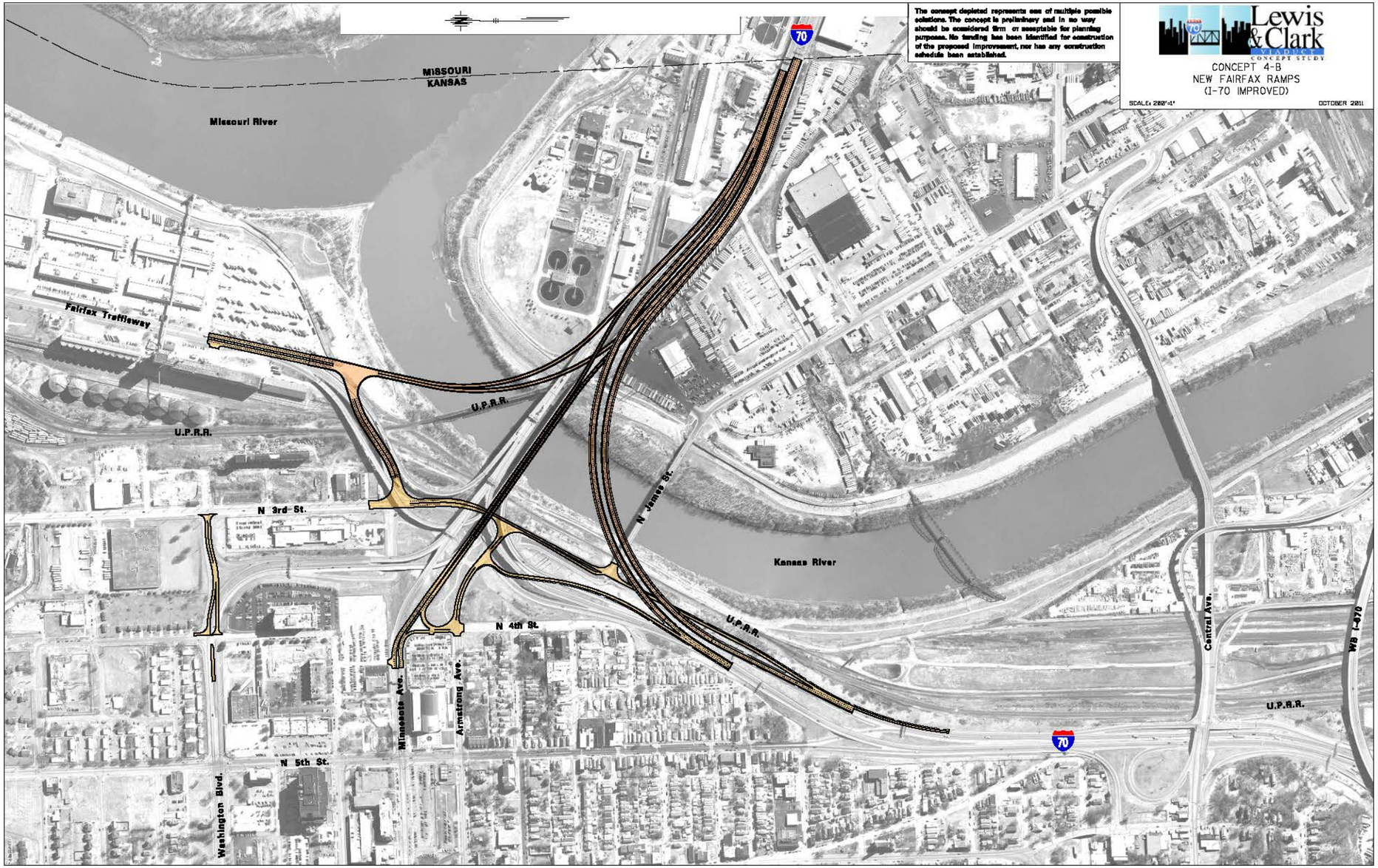
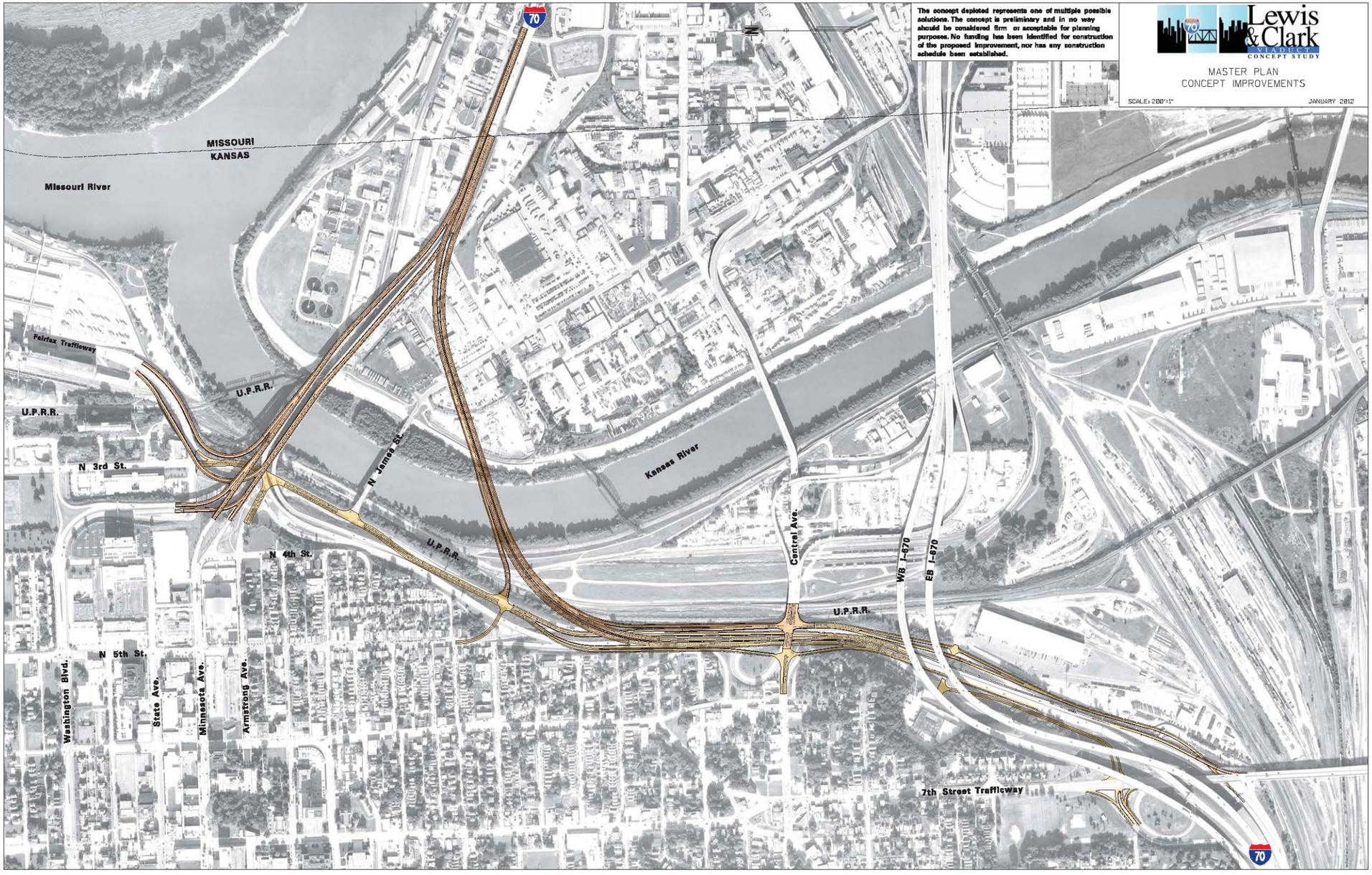


Exhibit 23
KCK Downtown Master Plan



5.4 Preferred Concept

The Preferred Concept 1-B is illustrated in **Exhibit 18** and in more detail in **Appendix B – Pages B-14 through B-17**. Highlights of the Preferred Concept include:

Bridges

The Preferred Concept, Concept 1-B, includes nine new bridges. Seven existing bridges will be replaced, two will be eliminated, and two new bridges will be constructed. See **Appendix A** for additional details regarding the new bridges. There is also the potential need for temporary structures (for interim conditions only), depending on project phasing and funding. The major difference between the Preferred Concept and the existing condition is that the WB and EB I-70 mainline bridges are relocated to the east side of the Kansas River with much larger horizontal curves to allow for higher design speeds. Ultimately, seven existing bridges will be replaced under this concept, but condition evaluations and available funding will play a big role in the selection and timing of the bridge replacements.

Several structures span Union Pacific Railroad (UPRR) tracks. The existing UPRR track that parallels the west side of the Kansas River is referred to as the Kansas City Terminal line. This track intersects the Falls City Subdivision line at the Minnesota Junction underneath the Fairfax bridges. The Falls City line originates near the Broadway Bridge in Kansas City, Missouri and runs through the Fairfax Industrial Area after crossing the Kansas River just north of the WB viaduct.

Typical Section

Improvements are recommended for shoulder widths where possible throughout the viaduct and interchange area. With the project being implemented in phases, shoulder width transitions may be needed at tie-in points between new construction and existing infrastructure. Accommodations should be considered as part of new design and construction to allow for both the interim transitional configuration as well as an ultimate roadway width in accordance with the established project design criteria provided in **Appendix B**.

Access

Concept 1-B maintains all existing access and in much the same configuration.

Right-of-Way

Use of existing right-of-way is maximized as additional right-of-way impacts are limited to south of the eastbound I-70 lanes east of the Kansas River. This area largely avoids the everyday operational areas of the adjacent businesses, but does impact areas being used as equipment

storage. Final design and construction efforts will look to minimize impacts with joint-use agreements and/or strategically located bridge spans and pier placement.

Utilities

Several common utility impacts/relocations are necessary as part of the Viaduct reconstruction. However, the Preferred Concept attempts to minimize these impacts to the extent possible. Known utility impacts of note include the significant communication lines currently located on the existing eastbound bridge, the large force main sewer line just to the south of the existing eastbound I-70 river crossing, and the large sewer lift station just off the right shoulder of the eastbound James/3rd Street exit ramp. Solutions should be explored during the project design phases in order to minimize or eliminate temporary relocation of utilities, particularly those on and under the existing bridges. Such accommodations may need to be provided in one construction phase and utilized in a subsequent phase.

Airport Coordination

At the time of this report, the Charles B. Wheeler Downtown Airport in Kansas City, Missouri, was in the initial stages of an Airport Layout Plan Update. One part of this plan is an evaluation of a potential precision approach to Runway 3. Preliminary coordination indicates that the increased westbound viaduct conceptual elevation will provide the typical 17 feet of clearance relative to the 50:1 Part 77 Precision Approach Surface (See **Appendix B**). It is of note that there are several other obstructions associated with this conceptual approach surface and it is currently unclear as to whether such an approach will ultimately be deemed feasible as the Layout Plan Update progresses. Preliminary indications are that regardless of whether the precision approach is ultimately pursued, implementation of the preferred viaduct replacement concept will not be precluded as any potential obstructions would just need to be documented within the Airport Layout Plan and precision approach design. Given the current conceptual nature of both the viaduct geometrics and potential approach modification, coordination with Charles B. Wheeler Downtown Airport is recommended as part of final design efforts for the viaduct east of the Kansas River. This coordination will keep both parties informed and may allow for the use of design features that minimize potential impacts in the future.

Lighting

Adequate roadway lighting will be provided for safe navigation of the facility at decision points such as ramp entrances or exits. Lighting needs between the Kansas River and KS/MO State Line should be provided with current and future Charles B. Wheeler Downtown Airport approach surfaces in mind.

Signing

Guide sign spacing for westbound I-70 is greatly improved over existing signage due to consolidation of the local road exits to a single exit east of the River. The relocation of this exit will require at least one advance guide sign being placed on the viaduct in Missouri. Furthermore, sign spacing on the westbound ramp from I-70 to the local roads of Fairfax Trafficway, Washington Boulevard and Minnesota Avenue is very near the desirable spacing and final design efforts should look to maximize this spacing. A preliminary signing concept for this area is included in **Appendix B**. Guide signs placed anywhere between the Kansas River and the I-35 interchange ramps should be located with current and future Charles B. Wheeler Downtown Airport approach surfaces in mind.

Pedestrians/Bicyclists

Future expansions/connections to existing pedestrian/bicycle pathways are in various stages of development. These include potential connections to the MetroGreen trail system and Kaw Point Park. The pedestrian/bicyclist pathway, part of the Riverfront Heritage Trail system, present on the bottom deck of the existing eastbound river truss (Bridge 031) must be relocated at the time of, or prior to, replacement of this truss. Local government leadership advocates a relocated pathway as close as possible to the existing crossing location. Final design solutions for the relocation of this pathway will be developed in accordance with available funding as part of future final design phases, however potential solutions identified as part of this study include:

- A trail suspended beneath the replacement eastbound river crossing;
- A separate pedestrian/bicyclist structure across the river;
- Utilize the existing James Street bridge for the addition of a pedestrian/bicycle path;
- Utilize the abandoned Kansas City Southern railroad truss just south of the James Street crossing for a pedestrian/bicyclist trail crossing.

Noise

The need for noise mitigation measures is not anticipated with this concept. However, final determination of noise impacts, documentation and mitigation will take place as part of final design of each construction phase.

Aesthetics

An important part of the 2007 KCK Downtown Master Plan is the incorporation of aesthetic features, gateway elements, landscaping and preservation of green space. In support of the spirit and vision of this plan, an aesthetics plan will be developed as part of preliminary design phases throughout implementation of the Preferred Concept. KDOT will work closely with local government leaders to develop a plan in accordance with available funding that enhances the

area through first-class aesthetics that complement the history of the area and provide enhanced views from multiple locations.

Aesthetic elements could include:

- Gateway elements;
- Landscaping;
- Preservation of green space;
- Enhanced/Aesthetic lighting;
- Concrete enhancements (color, texture, patterns, etc.).

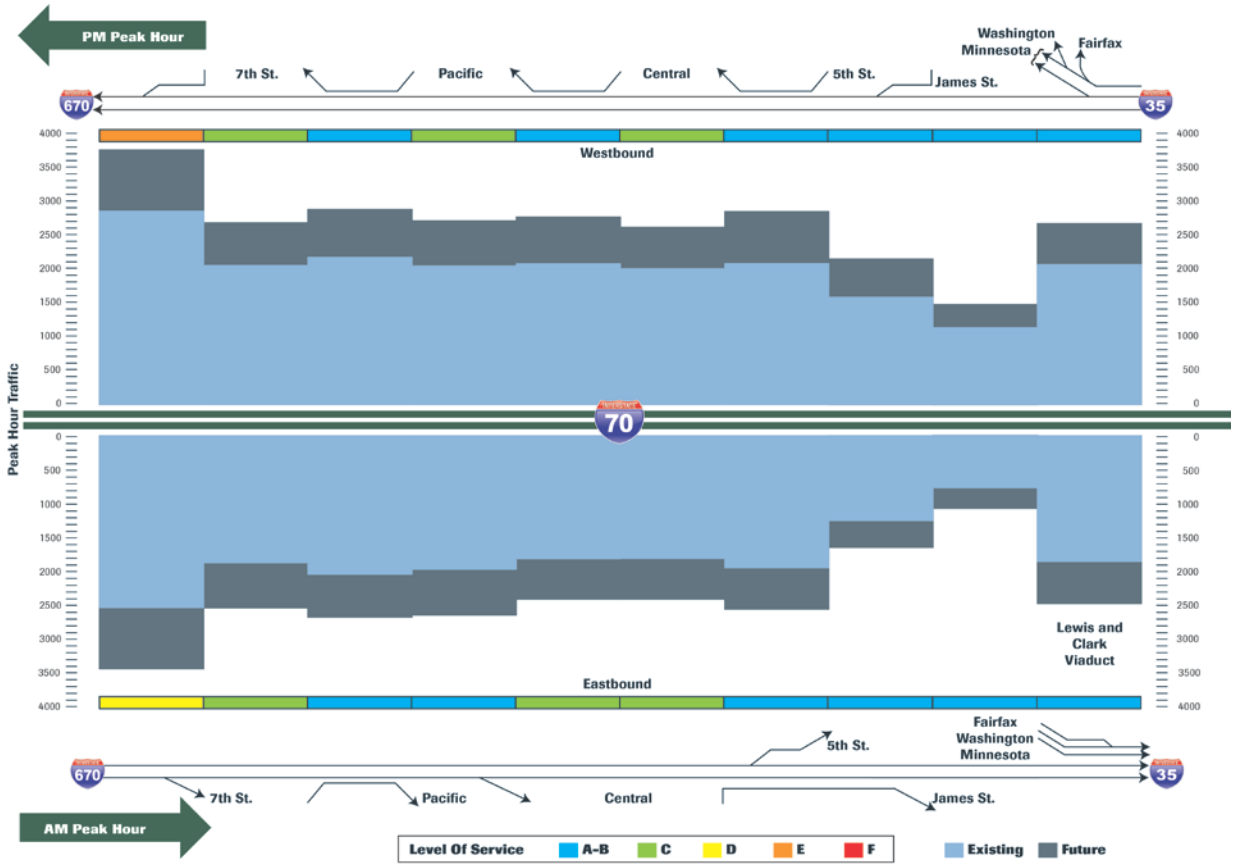
Correspondence received from local government leadership related to the implementation of aesthetic features on the viaduct can be found in **Appendix F**.

Traffic

Traffic and safety analyses were performed for Concept 1-B. This section provides a summary of how the Preferred Concept performs. Other transportation related issues beyond traffic operations and safety are provided in **Appendix C**.

This interchange configuration operates acceptably and similarly to the no-build option from a traffic perspective. This is due to this corridor currently and in the future remaining relatively uncongested. The existence of the parallel I-670 route to the south provides a secondary path through the downtowns of the Kansas Cities. The largest benefits are safety improvements to the I-70 corridor. **Exhibit 24** displays the future build geometrics, traffic, and level of service. The following section details the changes that will occur as part of Concept 1-B.

Exhibit 24
Future 2040 Build Traffic and Level of Service



Since the Concept 1-B configuration changes only slightly from the No-Build Concept, level of service between the Future Build and Future No-Build is almost the same. This is because the Future No-Build Concept operates at a good level of service due to low traffic volumes for the available capacity and the parallel capacity of I-670. Some notable segments include:

- Although the Highway Capacity Manual does not recognize a level of service associated with a one lane freeway, the No-Build I-70 eastbound curve operates at LOS C and the Build operates at an LOS A with two eastbound lanes.
- The westbound I-70 LOS E mainline section west of 7th Street occurs in both the No-Build and Build. This is outside of the study area and any improvement to this would require reconstruction of the I-670 entrance gore to I-70 westbound.
- The 6th Street & Central intersection is the only level of service problem in the Build and that intersection operates at a LOS E in both the Build and No-Build. This is an unsignalized intersection and only the southbound left turn operates at LOS E.
- The James Street and I-70 Eastbound Off-Ramp intersection operates poorly (LOS F) in the No-Build and LOS D in the Build Concept 1-B due to the extended off-ramp from I-70

eastbound. However, the overall intersection only improves by a few seconds due to the threshold 50 seconds of delay per vehicle in an unsignalized intersection. As traffic increases at this location, a traffic signal may be warranted which would improve the intersection level of service.

Reserve Capacity

In 2040, the freeway operates with minimal congestion problems due to the parallel I-670 facility that provides a relief valve. The scope of the project entailed determining how much additional capacity the Preferred Concept could accommodate. The future volumes were determined using the 2040 volumes and growing only the freeway mainline through traffic at a constant 0.5% growth per year. Due to the minimal congestion that exists in 2040 and the low growth rate in the corridor, percentages are referenced for the reserve capacity instead of years. It was determined that the freeway mainline through traffic could increase over 50% and continue to operate at a good LOS through the improved area. However, a 100% increase in traffic volumes result in the westbound mainline breaking down at 7th Street in the PM peak hour due to the short merge lane for the on-ramp. This in turn resulted in the mainline queuing through the study area to the north.

Sensitivity Analysis

The purpose of the sensitivity analysis was to determine how close the improvements could be located to Central on the west end and the downtown loop ramps on the east end. The furthest west the relocated I-70 tie-ins were tested in VISSIM were adjacent to the 5th Street ramps. On the east end, the I-70 tie-ins with the local ramps were tested in VISSIM adjacent to the state line. It was found that as long as the improvements remain in Kansas, the freeway operates acceptably.

New I-70 Access in Missouri

Near the completion of this Concept Study, the City of Kansas City, Missouri made known an interest in improving truck access into and out of the West Bottoms. While improving way-finding signage may provide some level of benefit, the City is also interested in exploring new ramp access on the I-70 Lewis and Clark Viaduct in Missouri to and from the east only. The City of Kansas City, Missouri is currently performing a truck origin and destination study to better understand truck movements in the area. This study is expected to be completed in the Fall of 2012. After the truck origin and destination study is complete, the City will have a more definitive idea of if or how they would like to proceed. KDOT should follow up with Kansas City, Missouri at this time.

Safety

Concept 1-B addressed many of the safety problems identified during Phase 1 of the Concept Study. Improvements to the curvature of the I-70 mainline and an additional eastbound mainline lane will likely reduce the number of accidents at the high accident locations on both of the current I-70 sharp mainline curves. Taking into account future 2040 Build Concept 1-B volumes increasing from 2011 to 2040 and the geometric design standards being improved the total number of crashes per year is expected to be 72 crashes per year (See **Table 7**). This is a reduction compared to the 91 crashes per year in the Future No-Build Concept and roughly the same as the 69 crashes per year in existing conditions.

Table 7
I-70 Future Concept 1-B Crash Rates (Per Year)

2040	I-70 Crash Rates					
Section	Location	Freeway Section	Statewide Highway Crash Rate	I-70 Crash Rate	Ratio	Total No. of Crashes
A	I-70 – I-670 Split to EB James St. Exit Gore	4 Lane Divided	1.20	**1.20**	1.0	44
B	I-70 – EB James St. Exit Gore to the State Line	6 Lane Divided	1.41	**1.41**	1.0	28

Hydraulics

As previously described, the Preferred Concept includes new I-70 bridges with larger radii to facilitate higher speed on the highway. At the location of the current I-70 river spans, new bridges will be constructed to accommodate access into and out of downtown Kansas City, Kansas. The structures modeled are illustrated in **Appendix A, Page A-18**. A more detailed description of the conceptual pier sizes and modeling approaches used to model the Preferred Concept is discussed in **Appendix E**.

Ultimately there will be two more bridges crossing the river than in the existing conditions. However, the existing bridges have more large piers than the proposed structures, and all encroach upon one cross section normal to the flow, therefore having a greater impact on the design water surface elevation. As illustrated in the **Table 8**, the Preferred Concept (in its final

configuration) results in a slight decrease in both 100-year and 500-year water surface elevations.

Table 8 - Backwater Elevations Taken at HEC-RAS River Station 0.504 (Immediately Upstream of the James Street Bridge)

Storm Event	Existing Conditions Water Surface Elevation (feet)	Post-Project Conditions Water Surface Elevation (feet)	Difference Post - Existing (feet)
100-yr	752.64	752.62	-0.02
500-yr	757.92	757.91	-0.01

Environmental

The environmental screening of the Preferred Concept performed as part of this concept study was preliminary in nature and appropriate only to a planning level. A summary of the potential environmental impacts identified for the Concept 1-B include the following:

- No direct impacts to public parks, known hazardous waste sites, designated EPA Environmental Justice areas of concern, NRHP listed or eligible sites, significant community resources, major governmental facilities, or the neighborhoods of Strawberry Hill or Gateway Plaza;
- Several potential impacts to the Kansas River and its 100-year floodplain;
- Additional right-of-way within the 100-year floodplain;
- Bridge construction activities <u>may</u> require one or more of the following permits prior to construction:
  - Kansas Department of Agriculture, Division of Water Resources' Floodplain Fills, Stream Obstructions or Channel Change permit;
  - Corps of Engineers Section 404 or 408 permit;
  - Kansas Department of Wildlife and Parks Action permit;
  - U.S. Coast Guard Section 9 Bridge permit;
- Emergent wetlands and some wooded areas will likely be impacted and require mitigation;
- One federal listed endangered species (Pallid Sturgeon) and several state listed threatened and endangered species could be impacted and require mitigation or avoidance;
- Coordination with the Union Pacific Railroad.

A more detailed summary breakdown of this screening can be found in **Appendix D**. While no environmental "fatal flaws" were found for the Preferred Concept, the potential impacts to the natural and manmade environment as a result of the Preferred Concept, Concept 1-B, will need to be reevaluated when the project moves forward into future design and NEPA phases.

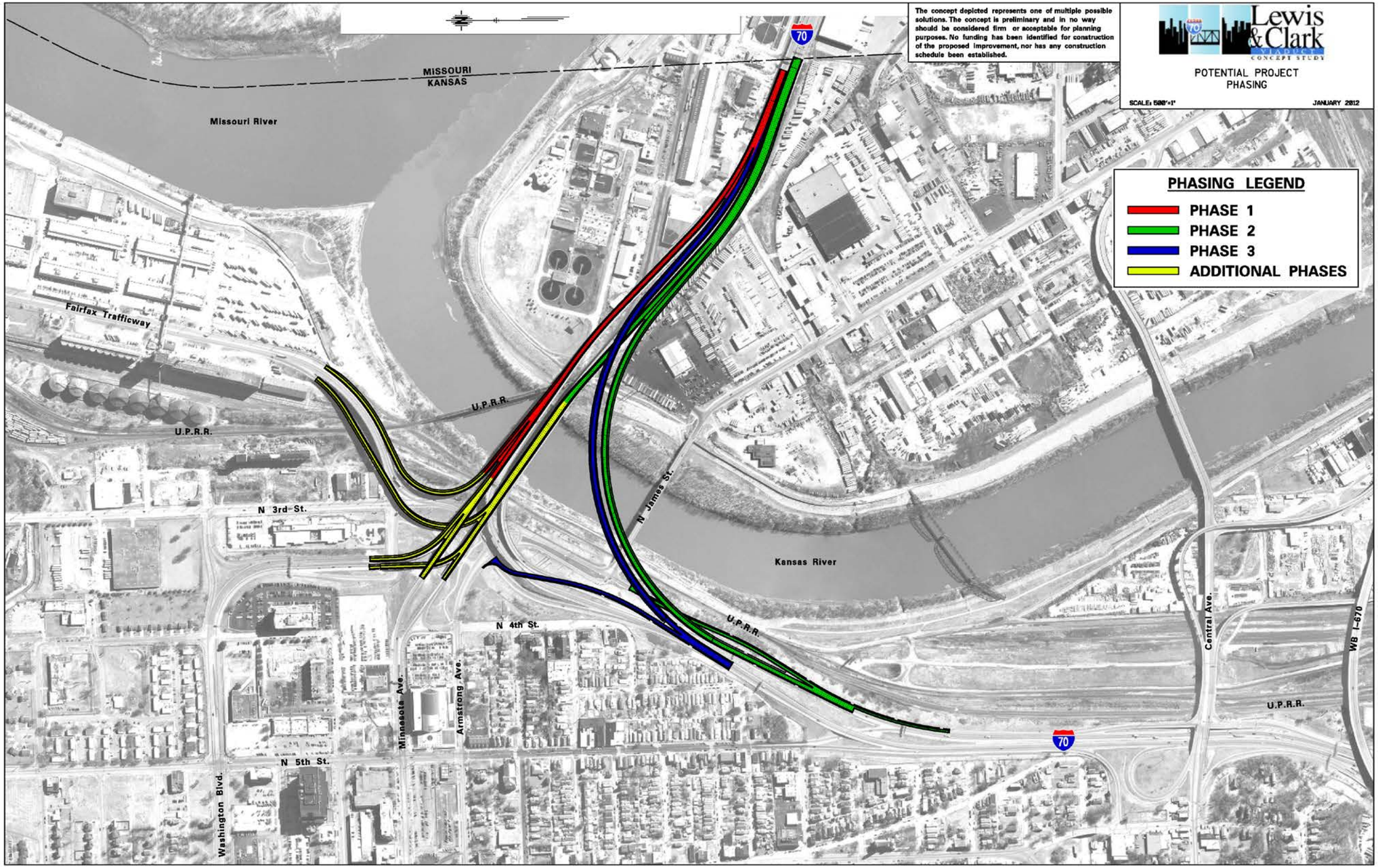
6.0 Phasing Plan

Due to the large cost of the overall viaduct and interchange reconstruction, a goal of the study was to select a concept that could be implemented in phases over a period of time as funds become available. This phasing plan also addresses replacement of the structures identified as most in need (See **Exhibit 4** on page 11) in earlier phases of the reconstruction process. The number and timing of construction phases will ultimately be subject to multiple factors including:

- Availability of funding
- Future bridge inspection findings
- Need for future repair actions

Exhibit 25 illustrates one potential phasing plan. This plan identifies replacement in three initial phases. These phases address the top three replacement priority locations as well as provide the improved geometry and lane continuity on I-70. The remaining area, identified as "Additional Phases" is largely reconstructed in its existing location. Therefore, these structures can be addressed at any time, either alone or in combination with other construction projects, throughout the overall replacement timeframe.

Exhibit 25
Potential Project Phasing



6.1 Phasing Hydraulics

Because the Lewis and Clark improvements will most likely be staged over many years, a phased approach to the hydraulic models was taken in addition to modeling the effects of the ultimate build-out scenario.

The phased hydraulic models described in this section are not to suggest the most appropriate approach to phasing, but rather to determine what could ultimately be the most impacting to design water surface elevations. Also, the descriptions of the phases are not all inclusive of what will be required, and are focused on what is changing between the Kansas River levees. The "phases" referenced are illustrated on **Exhibit 25:**

- Model I includes Phase 1 – Replacement of the westbound I-70 bridge (Bridge 030)
- Model II includes Phases 2 and 3 – Construction of new eastbound and westbound I-70 bridges
- Model III includes Phases 1, 2, 3, and Additional Phases – this is the ultimate build-out scenario previously addressed in Section 5

Table 9
Hydraulic Model Results

Storm Event	Existing Conditions Water Surface Elevation (feet)	Model I Water Surface Elevation (feet)	Model II Water Surface Elevation (feet)	Model III Water Surface Elevation (feet)
100-yr	752.64	752.63	752.70	752.62
500-yr	757.92	757.90	758.03	757.91

- For Model I, the result is a net decrease in both the 100-year and 500-year design events. The new bridge will have fewer and narrower piers encroaching on the waterway between the levees than the existing bridge. The design team did recognize that the piers of this new bridge will not align with the existing eastbound I-70 bridge and took that into account in the proposed model. More information about this model is available in **Appendix E**.
- For Model II, the result of an increase over the existing conditions is expected because two new bridges are being constructed and no existing conditions are changing.
- For Model III, the net change in water surface elevations versus the 2012 pre-project conditions is a slight decrease because the new bridge will have fewer and narrower

piers encroaching on the waterway between the levees than the existing bridge being replaced.

The results of this phased hydraulic study are all reported relative to the 2012 pre-project conditions to illustrate the impacts of the project measured against one consistent starting point. Measuring the results from phase to phase does not accurately portray the impacts of the project on the existing function of the levee systems. This concept was communicated to the Corps of Engineers and the Kaw Valley Drainage District, and they agreed with this approach.

During coordination meetings with the Corps and Drainage District, potential rise mitigation alternatives were discussed. Evaluating "temporary" increases through risk methodology was suggested by the Corps to help indicate whether or not mitigation of the interim rise is necessary. If required, mitigation could include one or more of the following:

- Removal of the abandoned RR Bridge upstream of James Street. This structure is otherwise unaffected by the viaduct study.
- Clearing of trees in the vicinity of the project for hydraulic benefits
- Overbank excavation in the vicinity of the project

COE and Drainage District Coordination

Two coordination meetings were held with the Corps of Engineers and the Kaw Valley Drainage District. More information about these meetings as well as meeting minutes is provided in **Appendix E**. In general, the key discussion points included:

- General overview of the Preferred Concept and potential phasing of projects
- Technical approach to modeling
- Current Corps and Drainage District studies underway to evaluate the adequacy of the existing levees
- Potential mitigation alternatives to offset design water surface impacts associated with the project phases

FEMA Coordination

On September 14, 2012, a phone call with FEMA Region VII was held to discuss FEMA requirements on the project. A detailed record of this call is provided in **Appendix E**, including relevant FEMA requirements to consider as design of the Lewis and Clark Viaduct projects continues.

Appendix A

Lewis & Clark Viaduct
Bridge Condition Evaluations, Recommended Maintenance, and Preferred Concept

1.0 Introduction

This appendix to the Lewis and Clark Viaduct Concept Study Report summarizes the condition evaluations and recommended maintenance actions for each of the existing nine bridges that make up the Lewis and Clark Viaduct, as well as the proposed bridges that make up the Preferred Concept 1-B. For the Existing Bridge Layout see page **A-17**. For the Preliminary Bridge Pier Layout for Proposed Concept 1-B, see page **A-18**.

The condition evaluations and recommended maintenance actions are based on the 2011 inspection reports which document the spring 2011 biennial bridge inspection findings. These in-depth inspections revealed no flaws warranting immediate corrective action, but deficiencies exist that should be addressed. Bridge components should be properly and regularly maintained to delay deterioration and minimize the development of serious defects.

2.0 Bridge Condition Evaluations

FHWA general condition rating guidelines were used to characterize the condition of the bridge elements. Good condition indicates some minor problems. Satisfactory condition indicates that structural elements show some minor deterioration. Fair condition indicates that all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour. Poor condition indicates advanced section loss, deterioration, spalling, or scour. Although some Lewis and Clark bridge components were noted to be in poor condition, this does not imply that immediate action is required or that the load carrying capacity of the structure is in immediate danger of diminishing to less than safe levels.

<u>Bridge 029 – EB Ramp to I-70</u>
This bridge connects EB I-70 traffic from the west side of the Kansas River to the EB Mainline Bridge (031). It consists of 7 welded plate girder spans with an overall bridge length of 445 feet. The horizontal alignment of the bridge has a radius of 390 feet. The roadway is 30 feet wide and is striped for one lane of traffic. The minimum vertical clearance to the local streets is 16'-

4". The original bridge was built in 1962 and was reconstructed with a 3rd girder in 1986, making it a redundant structure.

The continuous welded plate girders, deck slab, bearings, expansion joints, and barrier rails are in good condition. The paint system on the steel girders is in satisfactory condition and contains lead. The reinforced concrete substructure elements are in good condition.

Bridge 030 – WB Viaduct (I-70)

This bridge carries WB I-70 traffic from the State Line over the Union Pacific Railroad (UPRR) and across the Kansas River. It consists of 7 units and a portion of an 8th unit (at the State Line) with an overall bridge length of 3,047 feet.

Unit 1: Two steel deck truss spans with total length of 608 feet.

Unit 2: Nine steel welded plate girder spans with total length of 1,082 feet.

Units 3 thru 7: Twenty four reinforced concrete deck girder spans with total length of 1,295 feet.

Unit 8: One prestressed concrete beam span of length 62 feet.

The roadway is a minimum of 42 feet wide and carries three lanes of traffic. Existing shoulder widths are less than those of modern design standards. The horizontal clearances from edge of pier column to centerline of UPRR track are a minimum of 10'-2". The minimum vertical clearance to the UPRR track is 25'-1". The original bridge was constructed in 1962, with Unit 2 reconstructed in 1984 and Unit 8 replaced in 1994.

Superstructure Condition:

The bearings for all units are in good condition, with the exception of the over-rotated bearings at the truss spans. The expansion joints are in good condition.

Unit 1: The steel truss members are in fair to poor condition with several areas of rust and section loss, especially in locations below deck inlets. Deck downspouts were extended below the lower chord in 2003 to reduce further deterioration due to deck drainage. The deck slab was in good condition and barrier rails are in satisfactory condition with numerous cracks, spalls, and scrapes. The paint system is in good condition and contains lead.

Unit 2: The steel welded plate girders and deck slab are in good condition. The barrier rails are in satisfactory condition with numerous cracks, spalls, and scrapes. The paint system is in satisfactory condition and contains lead.

Units 3 thru 7: The concrete deck girders are in fair to poor condition. There are several locations of spalling, efflorescence, leaching, delaminations, map cracking, exposed reinforcement, and vertical cracks in the webs at midspan. The barrier rails are in satisfactory condition with numerous cracks and spalls.

Unit 8: The prestressed concrete beams, deck slab, and barrier rails are in good condition.

Substructure Condition:

Unit 1: The reinforced concrete tee-piers are in satisfactory condition. They exhibit numerous areas of cracks and spalls and were repaired in 2004.

Unit 2: The reinforced concrete multi-column bents are generally in satisfactory to good condition with minor spalls, cracks, and scrapes. The steel straddle bent is in good condition with minor rusting.

Units 3 thru 7: The reinforced concrete two column bents with integral capbeams are in good condition with minor spalls, cracks, and scrapes.

Unit 8: The reinforced concrete three column bent is in good condition with minor spalls, cracks, and scrapes.

This bridge is considered redundant with the exception of the fracture critical deck truss in Unit 1 and the steel straddle bent pier (Unit 2).

Bridge 031 – EB Viaduct (I-70)

This bridge carries EB I-70 traffic from Minnesota Avenue and Bridge 029 over the UPRR and across the Kansas River to the State Line. It consists of 13 units with an overall bridge length of 3,738 feet.

Units 1 thru 4: Fifteen steel girder/stringer spans with total length of 654 feet.

Unit 5: Two steel deck truss spans with total length of 600 feet

Units 6 thru 13: Fifty five steel girder/stringer spans with total length of 2,484 feet

The roadway for the majority of the bridge is 52’-0” wide to provide for four lanes of traffic. Existing shoulder widths are less than those of modern design standards. The bridge provides a minimum vertical clearance of 16’-3” to the lower streets. The bridge was constructed in 1907 for both vehicles and streetcars and in 1936 was modified to replace the streetcar tracks with pavement. The bridge was modified in 1963 to meet interstate standards at that time.

Superstructure Condition:

The expansion joints are in good condition with the exception of modular joint glands that are weathered and cracked.

Units 1 thru 4 and 6 thru 13: The steel girder/stringer spans are in poor condition with several areas of rust and section loss. The deck slab is in good condition while the barrier rails are in satisfactory condition with several spalls, cracks, and scrapes. The bearings are in good condition. The paint system for Units 1 thru 4 is in satisfactory condition and does not contain lead paint. The paint system for Units 6 thru 13 is in poor condition and contains lead.

Unit 5: The steel deck truss is in fair to poor condition with several areas of rust and section loss. The deck slab is in good condition while the barrier rails are in satisfactory condition with several spalls, cracks, and scrapes. The bearings are in fair condition with pitting and rust laminations. The paint system is in fair condition and does not contain lead.

Substructure Condition:

Units 1 thru 4 and 6 thru 13: The steel two column bents are in fair condition with many areas of rust and section loss. In 2004, at a number of piers, the base of the steel columns was encased in concrete to prevent further section loss.

Unit 5: The reinforced concrete piers are in fair condition with several areas of spalls, cracks, and leaching.

This bridge is considered a non-redundant structure because of the fracture critical steel girder floorbeam spans, steel two column bents in Units 1-4 and 6-13, and the deck trusses.

Bridge 173 – WB Ramp to Fairfax Trafficway

This bridge carries one lane of WB traffic from I-70 to the Fairfax Industrial District across the Kansas River and over the UPRR. It consists of 3 units with an overall bridge length of 1,670 feet. Units 1 and 2 consist of welded plate girders for a total of 16 spans. Unit 3 is a 304 feet long deck truss span. The horizontal alignment of the bridge has curves of 300 feet and 600 feet left and 954 feet right. The roadway width varies from 20 to 22 feet. Existing shoulder widths are less than those of modern design standards. The minimum vertical clearance to the UPRR is 28'-10".

The steel girders and floorbeams for Units 1 and 2 are in fair condition with several areas of retrofitted fatigue cracks, rust, and section loss. The steel truss members for Unit 3 are in fair to poor condition with several areas of rust and section loss, especially in locations below deck inlets. Deck downspouts were extended below the lower chord in 2003 to reduce further deterioration due to deck drainage. The deck slab, bearings, and expansion joints are in good condition. The bridge rails are in fair condition with several spalls, cracks, and scrapes. The substructure consists of steel tee-piers which are in good condition. The paint system for the girders, floorbeams, and steel substructure is in fair condition with several locations exhibiting rust. The paint system contains lead.

This bridge is considered a non-redundant structure because of the fracture critical steel girder floorbeam spans, steel substructure, and steel deck truss.

Bridge 174 – EB Ramp from Fairfax Trafficway

This bridge carries one lane of EB traffic from the Fairfax Industrial District to EB I-70 over the UPRR and local streets. It consists of 3 units of steel girder/floorbeam spans with an overall bridge length of 1,443 feet. The horizontal alignment of the bridge has curves of 300 feet and 352 feet left and 730 feet right. The roadway width varies from 22 feet to 26 feet. Existing shoulder widths are less than those of modern design standards. The minimum vertical clearance to the local streets is 16'-1".

The steel girders and floorbeams are in satisfactory condition with many areas of retrofitted fatigue cracks. The deck slab, bearings, and expansion joints are in good condition. The bridge

rails are in satisfactory condition with several spalls, cracks, and scrapes. The substructure consists of steel tee-piers and one reinforced concrete tee-pier which are in good condition. The paint system for the steel girders, floorbeams, and steel substructure is in satisfactory condition with several locations with peeling paint and rust. The paint system contains lead.

This bridge is considered a non-redundant structure because of the fracture critical steel girder floorbeam spans and steel substructure.

Bridge 175 – WB Ramp to Washington Boulevard

This bridge carries two lanes of WB traffic from I-70 into downtown Kansas City, KS via Washington Boulevard. It consists of 8 steel girder/floorbeam spans with an overall bridge length of 719 feet. The horizontal alignment of the bridge has a radius of 400 feet. The roadway width is 30 feet for spans 1 thru 5 and tapers down for Spans 6 thru 8 where it connects to Bridge 178. The minimum vertical clearance to the local streets is 25'-0".

The steel girders, floorbeams, and bearings are in good condition. The deck slab is in satisfactory condition with areas of delamination, efflorescence, and exposed reinforcing. The expansion joints and bridge rails are in fair condition with damaged glands and rust in the joints and spalls, cracks, and scrapes in the rails. The paint system is in satisfactory condition with slight peeling and rust. The paint system contains lead. The reinforced concrete tee-piers are in good condition.

The bridge superstructure is considered non-redundant because of the fracture critical steel girder floorbeam spans.

Bridge 176 – EB Ramp from Washington Boulevard

This bridge carries two lanes of EB traffic from downtown Kansas City, KS via Washington Boulevard to EB I-70. It consists of 8 steel girder/floorbeam spans with an overall bridge length of 457 feet. The horizontal alignment of the bridge has a radius of 300 feet. The roadway width is 30 feet. The minimum vertical clearance to the local streets is 15'-3".

The steel girders and floorbeams are in fair condition with several areas of retrofitted fatigue cracks. The deck slab is in satisfactory condition with delamination and minor cracking. The expansion joints and bearings are in good condition. The bridge rails are in fair condition with several spalls, cracks and scrapes. The paint system is in satisfactory condition with slight peeling and rust. The paint system contains lead. The reinforced concrete tee-piers are in good condition.

The bridge superstructure is considered non-redundant because of the fracture critical steel girder floorbeam spans.

Bridge 177 – WB I-70 Ramp

This bridge connects WB I-70 traffic from WB Mainline Bridge (030) to WB I-70 on the West side of the Kansas River. It consists of 7 welded plate girder spans with an overall bridge length of 619 feet. The horizontal alignment of the bridge has a radius of 390 feet. The roadway is 30 feet wide and is striped for two lanes of traffic. The minimum vertical clearance to the local streets is 16'-9". The original bridge was built in 1962 and was reconstructed with a 3rd girder in 1982, making it a redundant structure.

The continuous welded plate girders, deck slab, bearings, expansion joints, and barrier rails are in good condition. The paint system on the steel girders is in good condition and contains lead. The reinforced concrete substructure elements are in good condition with the exception of the abutment which is in fair condition with areas of leaching, flaking, delamination, and spalling.

Bridge 178 – WB Ramp to Minnesota Avenue

This bridge connects WB I-70 traffic from WB Mainline Bridge (030) to downtown Kansas City, KS via Minnesota Avenue. It consists of 2 units with an overall bridge length of 725 feet. The roadway is 30 feet wide for Unit 1 and tapers out for Unit 2 where it connects to Bridges 030 and 175. It is striped for 2 lanes of traffic. The minimum vertical clearance to the local streets is 16'-5".

The steel girder/floorbeam spans are in satisfactory condition with some fatigue cracking and rust. The paint system is generally in fair condition and contains lead. The deck slab is in satisfactory condition with several areas of spalls, cracks and delamination with efflorescence. The expansion joints and bearings are in good condition. The bridge rails are in fair condition with spalls and cracks. The reinforced concrete substructure elements are in good condition.

The bridge superstructure is considered non-redundant because of the fracture critical steel girder floorbeam spans.

Cross-Over Structure – Between WB & EB I-70 near State Line

This structure has been used as a cross over for EB or WB traffic for previous I-70 closures due to maintenance and rehabilitation on the Lewis and Clark Viaduct. This structure is mainly comprised of steel H piles and is located in the median between the WB Viaduct (030) and EB Viaduct (031) near the State Line. This structure is in poor condition.

3.0 Recommended Bridge Maintenance

The condition of the nine bridges is such that adequate maintenance can continue to extend their service life, but ultimately they need to be replaced. However, certain bridge units currently require significant maintenance and should be considered for replacement in the near future.

Maintenance recommendations and estimated repair costs, anticipated for the next 5 years of service life, from the 2011 Bridge Inspection Report are summarized for each bridge. These maintenance actions are intended to maintain the bridges in their current condition until their decks reach the end of their service life. Most bridge decks are at least 30 years old and are estimated to have at most 15 years of service life remaining. It is anticipated that repainting of some structural steel bridge components will also be needed during this timeframe.

Minor Cost ≤ $100,000 $100,000 < Moderate Cost ≤ $1,000,000 Major Cost ≥ $1,000,000

<u>Bridge 029 – EB I-70 Ramp</u>
The bridge was constructed in 1962 and modified in 1986, 2002, and 2005. Future repair costs are considered minor to keep the bridge in service. This bridge can continue to be maintained as issues arise and is low in priority for replacement because it remains in good condition. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $48,000.

<u>Bridge 030 – WB Viaduct (I-70)</u>
The bridge was constructed in 1962 and modified in 1984, 1994, 2003, and 2004. Future repair costs are considered major to keep the bridge in service.

Unit 1 (steel truss spans) can continue to be maintained, but at a significant cost that might better lend itself to full replacement of the unit. Long term repairs would include strengthening of several of the truss members with significant section loss. Additional painting, deck work, and barrier repair may also be needed. This unit is #3 in priority for replacement.

Units 3 thru 7 require replacement in the near future because previous beam repairs and the wearing surface have begun to deteriorate. The structure type is not conducive to further rehabilitation and it is anticipated that future repairs would slow down deterioration for a short time only. Long term repairs would require a complete superstructure replacement that would be almost as costly as a full bridge replacement. These units are #1 in priority for replacement.

Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $405,000.

Bridge 031 – EB Viaduct (I-70)
The bridge was constructed in 1907 and was modified in 1930, 1936, 1963, 1987, 2002, 2003, 2004, and 2006. A deck patching and polymer overlay project (KA-2707-01) was let in April 2012 for this bridge, with work scheduled to be completed in the fall of 2012.

Future repair costs are considered major to keep the bridge in service. This bridge can continue to be maintained but at a significant cost that might lend itself better to full replacement. Major unanticipated repairs have occurred in recent years. This bridge is #2 in priority for replacement, with emphasis on the units east of the river truss spans. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $129,000.

Bridge 173 – WB Ramp to Fairfax Trafficway
The bridge was constructed in 1962 and was modified in 1982, 2002, and 2007. Future repair costs are considered moderate to keep the bridge in service. This bridge can continue to be maintained as issues arise but due to the fracture critical elements, should be considered for replacement. Unit 3 (truss span) can continue to be maintained but at a significant cost that might lend itself better to full replacement of the unit. Long term repairs would include strengthening of several of the truss members with significant section loss. This bridge is moderate to high in priority for replacement. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $103,000.

Bridge 174 – EB Ramp from Fairfax Trafficway
The bridge was constructed in 1962 and was modified in 1982, 1987, 1989, 2002, and 2007. Future repair costs are considered moderate to keep the bridge in service. This bridge can continue to be maintained as issues arise, but due to the fracture critical elements should be considered for future replacement. This bridge is moderate to high in priority for replacement. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $73,000.

Bridge 175 – WB Ramp to Washington Boulevard
The bridge was constructed in 1962 and was modified in 1982, 1986, 1989, 2002, and 2004. Future repair costs are considered minor to keep the bridge in service. This bridge can continue to be maintained as issues arise, but due to the fracture critical elements, should be considered for future replacement. This bridge is low in priority for replacement because it is in good condition. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $13,000.

Bridge 176 – EB Ramp from Washington Boulevard
The bridge was constructed in 1962 and was modified in 1986, 1987, and 2002. Future repair costs are considered minor to keep the bridge in service. This bridge can continue to be maintained as issues arise, but due to the fracture critical elements should be considered for future replacement. This bridge is low in priority for replacement because it remains in good

condition. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $14,000.

Bridge 177 – WB I-70 Ramp

The bridge was constructed in 1962 and was modified in 1984 and 2002. Future repair costs are considered minor to keep the bridge in service. This bridge can continue to be maintained as issues arise. It is low in priority for replacement because it remains in good condition. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $20,000.

Bridge 178 – WB Ramp to Minnesota Avenue

The bridge was constructed in 1962 and was modified in 1982, 1987, and 2002. Future repair costs are considered minor to keep the bridge in service. This bridge can continue to be maintained as issues arise, but due to the fracture critical elements should be considered for future replacement. This bridge is low in priority for replacement because it remains in good condition. Estimated maintenance cost to address current deficiencies and extend the service life of the bridge is $20,000.

Cross-Over Structure – Between WB & EB I-70 near State Line

This structure may need to be removed for construction of the WB Bridge (030). If a traffic shift for WB or EB I-70 is required during future rehabilitation and/or replacement of Lewis and Clark Viaduct bridges, the existing structure shall be removed and a cross-over structure shall be constructed on the Missouri side of the State Line.

4.0 Preferred Concept

Bridge 029 – EB I-70 Ramp

This bridge will be removed after the future EB I-70 ramp is constructed. Although the existing bridge is currently in good structural condition, its horizontal curve is sharper than those of modern design standards, resulting in a low design speed and a higher number of crashes than the statewide average for similar facilities. The bridge's sharp horizontal curve is a main factor in selecting Concept 1-B as the Preferred Concept.

Bridge 030 – WB Viaduct (I-70)

Portions of this bridge are #1 (concrete deck girder spans) and #3 (truss spans) in priority for replacement based on their current condition. KDOT has programmed the replacement of this entire bridge for an August 2016 bid letting.

The horizontal geometry of the new bridge roadway will match that of the existing. It will tie into the existing Missouri bridge at the state line and Bridges 173, 177, and 178 at the west end. The roadway width will accommodate a minimum of 3 lanes of traffic with shoulder widths that meet current design code requirements. The ultimate condition requires 2 lanes of traffic, but 3 lanes are necessary for the interim condition. The geometry of the future WB I-70 ramp must be considered when determining the framing plan for this bridge.

The vertical profile of the bridge will match existing at the tie-ins at state line and at Bridges 173, 177, and 178. However, the profile will be raised elsewhere to accommodate the future WB I-70 ramp. This will also provide adequate vertical clearances to the local streets and the UPRR tracks below.

Substructure location will be a key factor in selecting the superstructure type. Constraints include the UPRR tracks (future and existing), the UPRR truss bridge, existing viaduct substructure, and the future WB I-70 ramp tie-in. A concept level economic span study was performed for the bridge spans east of the Kansas River. K4 and K6 beams, with a maximum span of 120 feet, were determined to be the most economical. However, steel girders may better accommodate the constraints listed above and should also be considered during final design.

Development of a "signature" bridge structure over the Kansas River was neither the intent nor a goal of this study, and therefore was not considered. Concept studies assumed that river spans will consist of welded steel plate girders. Constant depth and parabolic webs were considered. The difference in the amount of structural steel required for the two web options was determined to be negligible; however the constant web depth option better accommodates the complex framing required for the flared roadway over the Kansas River.

Preliminary substructure types identified for the spans east of the Kansas River are reinforced concrete tee or multi-column piers. Adequate horizontal clearances will need to be maintained

and pier protection provided where required. At the Falls City railroad line (east of the Kansas River), the UPRR has requested that future substructure be located to provide adequate horizontal clearance to 2 tracks at 20 foot centers with a minimum 18 feet side clearance. The UPRR also requested that the designer consider placing piers parallel to the railroad tracks. Since bedrock is approximately 100 feet deep, utilizing existing pier pile foundations should be considered. The re-use of the existing pier at the state line should also be investigated. The spans over the Kansas River were assumed to be supported by reinforced concrete tee-piers.

In the interim condition, after Bridge 030 is replaced and existing Bridges 177 and 178 remain, the proposed westernmost river span pier was assumed to be offset (towards the river) from the existing truss pier. A temporary structure would span approximately 30 feet from the existing pier supporting the east end span of Bridges 177 and 178 to the proposed pier.

Further investigation by the final designer will be needed to determine if the existing truss pier is structurally and hydraulically feasible to support the proposed river span, or if the temporary span is necessary. If the existing truss pier is re-used, temporary falsework bents adjacent to the UPRR Kansas City Terminal line will likely be needed. In addition to the ultimate configuration, the hydraulics of all interim configurations must be considered, including effects of existing and proposed EB Viaduct (031) bridge piers.

Bridge 031 – EB Viaduct (I-70)

This bridge will be replaced. The existing bridge is #2 in priority for replacement based on the condition of the truss spans, steel girder floorbeams, and steel column bent spans.

The horizontal alignment of the new bridge will be shifted to the south for the spans east of the river, but will tie into the existing bridge at the state line and at approximately the same location as the existing bridge at Minnesota Avenue. The roadway width will accommodate 1 traffic lane at the west end and 4 traffic lanes east of the river, with shoulder widths that meet current design code requirements.

The vertical profile of the bridge will match existing at tie-ins at the state line and Minnesota Avenue. The location of the remaining profile will be dependent on project phasing, which will be dictated by the amount and timing of available funding. If the truss spans can be replaced at the same time as the remainder of the bridge, then the profile could potentially be lowered while maintaining vertical clearances to local streets and the UPRR.

Substructure location will be a key factor in selecting the superstructure type. Constraints include the UPRR tracks, local streets, and existing substructure. A concept level economic span study was performed for the bridge spans east of the Kansas River. K4 and K6 prestressed beams, with a maximum span of 120 feet, were determined to be the most economical. However, during final design steel girder options should also be considered.

Development of a “signature” bridge structure over the Kansas River was neither the intent nor a goal of this study, and therefore was not considered. Concept studies assumed that river spans will consist of welded steel plate girders. Constant depth and parabolic webs were

considered. The difference in the amount of structural steel required for the two web options was determined to be negligible.

Preliminary substructure types identified for the spans east and west of the Kansas River are reinforced concrete tee or multi-column piers. Adequate horizontal clearances will need to be maintained and pier protection provided where required. At the Falls City line (east of the river), the UPRR has requested that substructure be located to provide adequate horizontal clearance to 2 tracks spaced at 20 foot centers with a minimum 18 feet side clearance. The spans over the Kansas River were assumed to consist of reinforced concrete tee-piers. At the Kansas City Terminal line (west of the Kansas River), the UPRR has requested that substructure be located to provide adequate horizontal clearance to 2 tracks spaced at 20 foot centers with a minimum 18 feet side clearance, and to consider placing piers parallel to the tracks.

If the entire EB bridge is replaced at the same time, no temporary structures are necessary. However, if the existing truss spans remain for an interim condition, Concept 1-B proposes to utilize a temporary structure to span from the eastern existing truss pier to the adjacent proposed pier which will eventually support the future river span superstructure.

Bridge 173 – WB Ramp to Fairfax Trafficway

This bridge will be replaced. The existing bridge is moderate to high in priority for replacement based on the condition of the truss spans, the steel girder floorbeam spans, and the steel substructure.

The horizontal alignment of the bridge will match that of the existing. It will tie into the river span at the south and Fairfax Trafficway at the north. The roadway will consist of 1 traffic lane with shoulder widths that meet current design code requirements.

The vertical profile of the bridge will match the existing elevations at the tie-in locations at the river span and at Fairfax Trafficway. The profile grade will need to be set to provide adequate vertical clearances to the UPRR tracks below.

Welded structural steel plate girders are most suited to the horizontal alignment of the bridge. Substructure (reinforced concrete tee piers) shall be positioned to provide adequate horizontal clearances to the UPRR tracks and maintain efficient span configuration, as well as avoid conflicts with existing substructure. Maximum spans of 140 feet are recommended. It may be beneficial to utilize existing substructure foundations where feasible.

Existing Unit 3 of Bridge 173 is the river truss span, and will be replaced with the Bridge 030 replacement project programmed for an August 2016 bid letting. In the interim condition, after Bridge 030 and Bridge 173 Unit 3 are replaced and Bridge 173 Units 1 and 2 remain, it was assumed that the proposed westernmost river span pier will be offset (towards the river) from the existing truss pier. A temporary structure would span approximately 30 feet from the existing pier supporting the east end span of Bridge 173 to the proposed pier.

Further investigation by the final designer will be needed to determine if the existing truss pier is structurally and hydraulically feasible to support the proposed river span, or if the temporary span is necessary. If the existing truss pier is re-used, the use of temporary falsework bents adjacent to the UPRR track will likely be needed. In addition to the ultimate configuration, the hydraulics of all interim configurations must be considered, including effects of existing and proposed EB Viaduct (031) bridge piers.

Bridge 174 – EB Ramp from Fairfax Trafficway

This bridge will be replaced. The existing bridge is moderate to high in priority for replacement based on the condition of the steel girder/floorbeam spans and the steel substructure.

The horizontal alignment of the bridge will match that of the existing. It will tie into Bridge 031 at the south and Fairfax Trafficway at the north. The roadway will consist of 1 traffic lane with shoulder widths that meet current design code requirements.

The vertical profile of the bridge will match the elevations at the tie-in locations at Bridge 031 and at Fairfax Trafficway. The profile will need to be set to provide adequate vertical clearances to the UPRR tracks and local streets below.

Welded structural steel plate girders are most suited to the horizontal alignment of the bridge. Substructure (reinforced concrete tee piers) shall be positioned to provide adequate horizontal clearances to the UPRR tracks and maintain efficient span configuration, as well as avoid conflicts with existing substructure and the local street network. Maximum spans of 140 feet are recommended. It may be beneficial to reuse existing foundations where feasible.

Bridge 175 – WB Ramp to Washington Boulevard

This bridge will be replaced. The existing bridge is low in priority for replacement based on the overall good condition of the bridge.

The horizontal alignment of the bridge will match that of the existing. It will tie into Bridge 178 at the south and Washington Boulevard at the north. The roadway will consist of 1 traffic lane with shoulder widths that meet current design code requirements.

The vertical profile of the bridge will match the elevations at the tie-in locations at Bridge 178 and at Washington Boulevard. The profile will need to be set to provide adequate vertical clearances to the local streets below.

Welded steel plate girders are most suited to the horizontal alignment of the bridge, Substructure (reinforced concrete tee piers or multi-column bents) shall be positioned to provide adequate horizontal clearances to the local streets and maintain efficient span configuration, as well as avoid conflicts with existing substructure. Maximum spans of 140 feet are recommended. It may be beneficial to reuse existing foundations where feasible.

Bridge 176 – EB Ramp from Washington Boulevard

This bridge will be replaced. The existing bridge is low in priority for replacement based on the overall good condition of the bridge.

The horizontal alignment of the bridge will match that of the existing. It will tie into Bridge 031 at the south and Washington Boulevard at the north. The roadway will consist of 1 traffic lane with shoulder widths that meet current design code requirements.

The vertical profile of the bridge will match the elevations at the tie in locations at Bridge 031 and at Washington Boulevard. The profile will need to be set to provide adequate vertical clearances to the local streets below.

Welded steel plate girders are most suited to the horizontal alignment of the bridge, Substructure (reinforced concrete tee piers or multi-column bents) shall be positioned to provide adequate horizontal clearances to the local streets and maintain efficient span configuration, as well as avoid conflicts with existing substructure. Maximum spans of 140 feet are recommended. It may be beneficial to reuse existing foundations where feasible.

Bridge 177 – WB I-70 Ramp

This bridge will be removed after the future WB I-70 ramp is constructed. Although the existing bridge is currently in good structural condition, its horizontal curve is sharper than those of modern design standards, resulting in a low design speed and a higher number of crashes than the statewide average for similar facilities. The bridge's sharp horizontal curve is a main factor in selecting Concept 1-B as the Preferred Concept.

Bridge 178 – WB Ramp to Minnesota Avenue

This bridge will be replaced. The existing bridge is low in priority for replacement based on the overall good condition of the bridge.

The horizontal alignment of the bridge will match that of the existing. It will tie into Bridge 030 at the east and Minnesota Avenue at the west. The roadway will consist of 2 traffic lanes with increased shoulder widths that meet current design code requirements.

The vertical profile of the bridge will match the elevations at the tie in locations at Bridge 030 and at Minnesota Avenue. The profile will need to be set to provide adequate vertical clearances to the local streets and the UPRR below.

The superstructure may consist of prestressed beam or welded plate girder spans. Substructure (reinforced concrete tee piers or multi-column bents) shall be positioned to provide adequate horizontal clearances to the local streets and the UPRR and maintain efficient span configuration, as well as avoid conflicts with existing substructure. At the Kansas City Terminal line (west of the river), the UPRR has requested that substructure be located to provide adequate horizontal clearance to 2 tracks spaced at 20 foot centers with minimum 18 feet side

clearances, and to consider placing piers parallel to the tracks. It may be beneficial to utilize existing substructure where feasible.

Future WB I-70 Ramp

This bridge is the replacement for Bridge 177. It will carry WB I-70 over the following; the Kansas River, the EB Minnesota to EB I-70 bridge, UPRR tracks, James Street bridge, and local streets.

The horizontal alignment of the bridge will include a much larger radius than existing Bridge 177 to accommodate an increased design speed. It will tie into Bridge 030 at the east end and WB I-70 at the west end. The roadway will consist of two 12 foot traffic lanes with a 12 foot and 4 foot shoulder.

The vertical profile of the bridge has been set to provide adequate vertical clearances to the EB Minnesota to EB I-70 bridge, James Street bridge, and James Street / 3rd Street exit ramp. This will also provide adequate clearances to the local streets, UPRR, and Kansas River. The vertical geometry of this bridge dictates the profile of the Bridge 030 replacement bridge.

The superstructure may consist of prestressed beam or welded plate girder spans. Prestressed beam spans may provide an economic benefit if utilized for the spans east of the river. The span configuration is controlled by UPRR clearances, existing substructure locations, proposed substructure locations for other bridges, local streets, levees, and pier placement within the Kansas River flood plain. Pier locations will need to be coordinated with the Corps of Engineers and the surrounding levee districts.

Conceptual span layouts have been made structurally efficient, but consideration must be given to unique situations when determining substructure locations during final design. Structure depths assumed for vertical clearances were as follows:

Crossing Location	Structure Depth
James Street / 3rd Street Ramp	7’-3”
UPRR & James Street Bridge	17’-6”
EB Minnesota to EB I-70 ramp	12’-0”

The substructure was assumed to consist of reinforced concrete tee-piers at most locations. However, framed-in capbeam or straddle bent piers may be necessary where the future WB I-70 bridge spans the James Street / 3rd Street exit ramp and spans the EB Minnesota to EB I-70 bridge.

Future EB I-70 Ramp

This bridge is the replacement for Bridge 029. It will carry EB I-70 over the following; the Kansas River, the James Street bridge, UPRR tracks, and local streets.

The horizontal alignment of the bridge will include a much larger radius than existing Bridge 029 to accommodate an increased design speed. It will tie into Bridge 031 at the east end and EB I-70 at the west end. The roadway will consist of two 12 foot traffic lanes with a 12 foot and 4 foot shoulder.

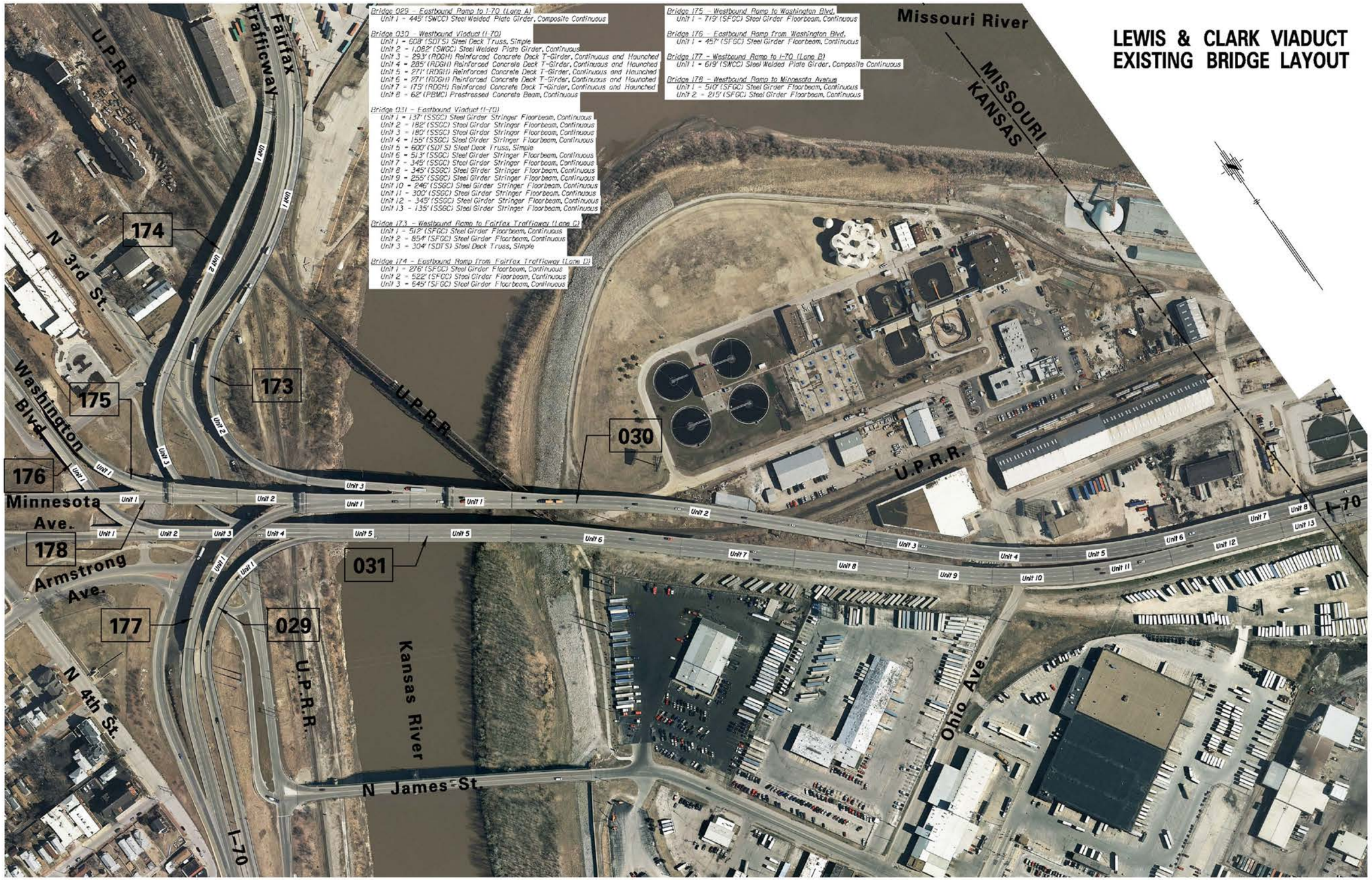
The vertical profile of the bridge will need to match the elevations at the tie in locations at Bridge 031 and at EB I-70. The profile has been set to provide adequate vertical clearance to the James Street / 3rd Street exit ramp and James Street bridge. This will also provide adequate clearances to the local streets, UPRR, and Kansas River.

The superstructure may consist of prestressed beam or welded plate girder spans. Prestressed beam spans may provide an economic benefit if utilized for the spans east of the river. The span configuration is controlled by UPRR horizontal clearances, existing substructure locations, proposed substructure locations for other bridges, local streets, levees, and pier placement within the Kansas River flood plain. Pier locations will need to be coordinated with the Corps of Engineers and the surrounding levee districts.

Conceptual span layouts have been made structurally efficient, but consideration must be given to unique situations when determining substructure locations during final design. Structure depths assumed for vertical clearances were as follows:

Crossing Location	Structure Depth
James Street / 3rd Street Ramp	6’-0”
UPRR & James Street Bridge	17’-6

The substructure was assumed to consist of reinforced concrete tee-piers at most locations. However, framed-in capbeam or straddle bent piers may be necessary where the future EB I-70 bridge spans the James Street / 3rd Street exit ramp.


LEWIS & CLARK VIADUCT
EXISTING BRIDGE LAYOUT
Bridge 029 – Eastbound Ramp to I-70 (Lane A)
Unit 1 - 445' (SWCC) Steel Welded Plate Girder, Composite Continuous
Bridge 030 – Westbound Viaduct (I-70)
Unit 1 - 608' (SDTS) Steel Deck Truss, Simple
Unit 2 - 1,082' (SWGC) Steel Welded Plate Girder, Continuous
Unit 3 - 293' (RDGH) Reinforced Concrete Deck T-Girder, Continuous and Haunched
Unit 4 - 285' (RDGH) Reinforced Concrete Deck T-Girder, Continuous and Haunched
Unit 5 - 271' (RDGH) Reinforced Concrete Deck T-Girder, Continuous and Haunched
Unit 6 - 271' (RDGH) Reinforced Concrete Deck T-Girder, Continuous and Haunched
Unit 7 - 175' (RDGH) Reinforced Concrete Deck T-Girder, Continuous and Haunched
Unit 8 - 62' (PBMC) Prestressed Concrete Beam, Continuous
Bridge 031 – Eastbound Viaduct (I-70)
Unit 1 - 137' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 2 - 182' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 3 - 180' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 4 - 156' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 5 - 600' (SDTS) Steel Deck Truss, Simple
Unit 6 - 513' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 7 - 345' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 8 - 345' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 9 - 255' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 10 - 246' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 11 - 300' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 12 - 345' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Unit 13 - 135' (SSGC) Steel Girder Stringer Floorbeam, Continuous
Bridge 173 – Westbound Ramp to Fairfax Trafficway (Lane C)
Unit 1 - 512' (SFGC) Steel Girder Floorbeam, Continuous
Unit 2 - 854' (SFGC) Steel Girder Floorbeam, Continuous
Unit 3 - 304' (SDTS) Steel Deck Truss, Simple
Bridge 174 – Eastbound Ramp from Fairfax Trafficway (Lane D)
Unit 1 - 276' (SFGC) Steel Girder Floorbeam, Continuous
Unit 2 - 522' (SFGC) Steel Girder Floorbeam, Continuous
Unit 3 - 545' (SFGC) Steel Girder Floorbeam, Continuous
Bridge 175 – Westbound Ramp to Washington Blvd.
Unit 1 - 719' (SFGC) Steel Girder Floorbeam, Continuous
Bridge 176 – Eastbound Ramp from Washington Blvd.
Unit 1 - 457' (SFGC) Steel Girder Floorbeam, Continuous
Bridge 177 – Westbound Ramp to I-70 (Lane B)
Unit 1 - 619' (SWCC) Steel Welded Plate Girder, Composite Continuous
Bridge 178 – Westbound Ramp to Minnesota Avenue
Unit 1 - 510' (SFGC) Steel Girder Floorbeam, Continuous
Unit 2 - 215' (SFGC) Steel Girder Floorbeam, Continuous
Missouri River
MISSOURI
KANSAS
U.P.R.R.
Fairfax Trafficway
N 3rd St.
Washington Blvd.
Minnesota Ave.
Armstrong Ave.
N 4th St.
Kansas River
N James St.
Ohio Ave.
I-70
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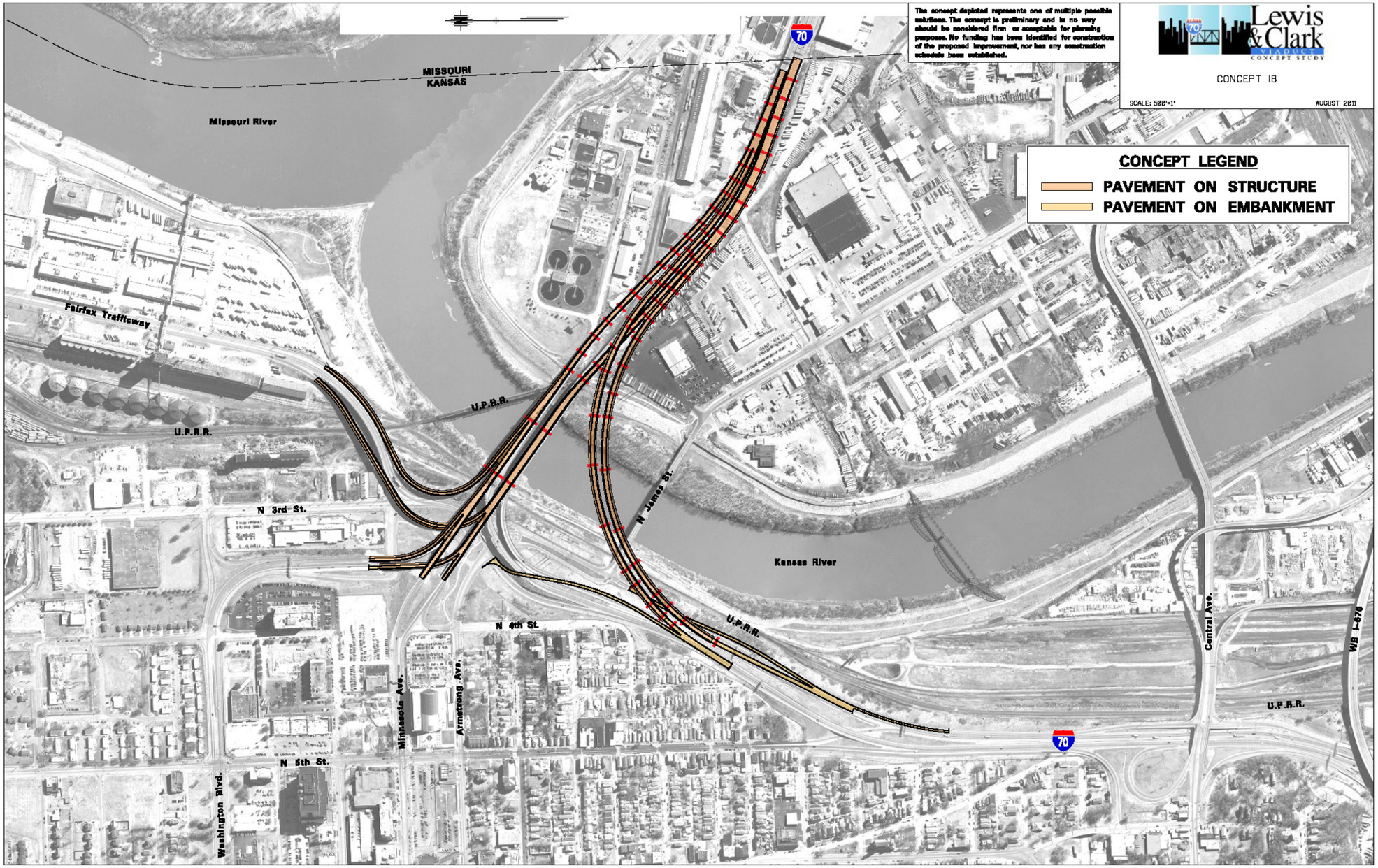
173
175
176
178
177
029
031
030

Preliminary Bridge Pier Layout
Preferred Concept



Appendix B

Lewis & Clark Viaduct
Supplementary Roadway Information

1.0 Introduction

This appendix contains miscellaneous roadway information to supplement the Lewis & Clark Viaduct Concept Study. This information includes:

- Eliminated Concepts (Pages **B-1 to B-11**)
- Design Criteria (Page **B-12**)
- Conceptual Cost Estimate (Page **B-13**)
- Preferred Concept Plates (Pages **B-14 to B-17**)
- Charles B. Wheeler Downtown Airport Part 77 Precision Approach Surface (Page **B-18**)
- Preliminary Signing Concept for Preferred Concept Westbound I-70 (Page **B-19**)

2.0 Eliminated Concepts

The following concepts were eliminated early in the study process and were presented as eliminated concepts at Public Meeting #1 on November 9, 2011. The concepts are illustrated on pages **B-5 to B-11** and include highlighted problem areas.

Concept A – Box Style Interchange w/ State Avenue Connection; I-70 Not Improved

Eliminated Because:

- State Avenue connection is impactful to existing established properties, does not exist today and is contrary to the proposed East Bluff Place development detailed in the Downtown KCK Master Plan.
- A variation of this concept moved forward as Concept 2-A.

Concept B – Single Roundabout on Upper Tier w/ James Street Connector; I-70 Not Improved

Eliminated Because:

- Connection from roundabout to 3rd Street requires unacceptable grades.
- Armstrong/4th Street connection to WB I-70 ramp is not geometrically desirable.

Concept C – Single Roundabout on Lower Tier; Maintain Fairfax Direct Ramps; I-70 Improved

Eliminated Because:

- Connection from Armstrong/4th Street to roundabout requires unacceptable grades.
- Relocation of James Street provides little to no benefit relative to the cost of a new bridge.

Concept D – Single Roundabout on Upper Tier; I-70 Improved

Eliminated Because:

- Connection from roundabout to 3rd Street requires unacceptable grades.
- Connection from James Street to WB I-70 requires unacceptable grades.
- Forcing all traffic movements through a single roundabout is not desirable.

Concept E – Single Roundabout on Upper Tier w/ James Street Connector; I-70 Improved

Eliminated Because:

- Connection from roundabout to 3rd Street requires unacceptable grades.
- Armstrong/4th Street connection to WB I-70 ramp is not geometrically desirable.
- A variation of this concept moved forward as Concept 3-B.

Concept F – Dual Roundabouts on Upper and Lower Tiers; I-70 Improved

Eliminated Because:

- Connection between roundabouts requires unacceptable grades.
- Traffic to/from the Fairfax and Central Industrial Districts is unnecessarily circuitous.

Concept G – Dual At-Grade Intersections; I-70 Improved

Eliminated Because:

- Connection from James Street to WB I-70 requires unacceptable grades.
- Forcing multiple traffic movements through closely spaced intersections can cause operational problems, especially with truck traffic.
- The Fairfax/James Street intersection would result in an undesirable Minnesota Avenue profile and approaches to the Washington Blvd./4th Street intersection.

Concept H – Dual Roundabouts on the Same Tier; I-70 Improved

Eliminated Because:

- Connection between roundabouts requires unacceptable grades.
- Connection from James Street to WB I-70 requires unacceptable grades.

Concept I – Diamond Interchange (Traditional, Tight, Single-Point, etc.); I-70 Improved

Eliminated Because:

- Ramps cause significant impact to adjacent properties, structures and railroad.
- Connection from James Street to WB I-70 requires unacceptable grades.
- Requires numerous bridge piers in the river requiring additional hydraulic mitigation.

Concept J – Single Roundabout on Upper Tier w/ James Street to WB I-70 Connection; I-70 Improved

Eliminated Because:

- Connection from roundabout to 3rd Street requires unacceptable grades.
- Connection from James Street Connector to WB I-70 ramp requires unacceptable grades.
- A variation of this concept moved forward as Concept 3-B.

Concept K – Signalized Intersection on Upper Tier w/ James Street to WB I-70 Connection; I-70 Improved

Eliminated Because:

- Connection from intersection on Minnesota to 3rd Street requires unacceptable grades.
- Connection from James Street Connector to WB I-70 ramp requires unacceptable grades.

Concept L – Modified Local Roads w/ I-70 Improved Using a Right-Hand Exit & Right-Hand Entrance East of River

Eliminated Because:

- Right-hand entrance requires the EB I-70 bridge to pass over EB traffic from Minnesota. This provides no operational benefit, increases bridge cost and limits phased construction potential.

Concept M – Modified Local Roads w/ I-70 Improved Using a Left-Hand Exit & Left-Hand Entrance East of River

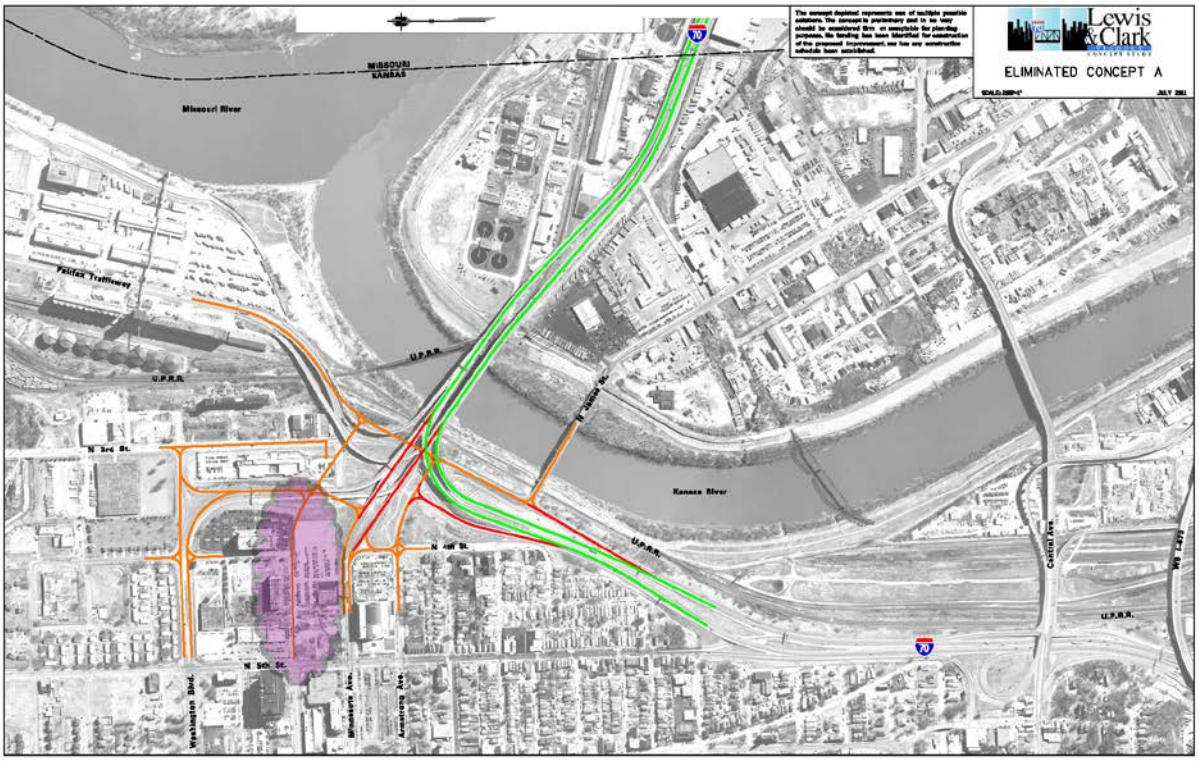
Eliminated Because:

- Left-hand exit requires the WB I-70 bridge to pass over both EB and WB traffic to/from Minnesota. This provides no operational benefit, is typically avoided as it is contrary to driver expectation and could complicate interaction with the railroad.

Concept N – KCK Downtown Master Plan Interstate Realignment Concept #2

Eliminated Because:

- WB I-70 would, at a minimum, need to pass over the local traffic movement to EB I-70 east of the river. This would necessitate extensive viaduct reconstruction in Missouri to accommodate the vertical requirements associated with such a crossing.
- Realignment of I-70 through the Central Industrial District would significantly impact established businesses.
- The interaction of relocated I-70 with the existing interchanges west of the river would necessitate closure and/or extensive reconfiguration of each. These interchanges include those with James Street, 5th Street, Central, Pacific, and 7th Street. Reconfiguration of the interchanges would result in development of a Collector-Distributor road system where possible and would need to overcome significant horizontal and vertical challenges in order to do so (i.e. railroad and available R/W constraints; braided ramp vertical clearances; limited weave distances; etc.).
- Realignment of I-70 to this extent would result in significant additional costs due to R/W purchase and the still present need for extended ramps to/from downtown KCK, Central Industrial District and Fairfax Industrial District. These ramps would be needed both east and west of the river and would be substantial infrastructure given the traffic volumes and heavy truck usage.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Minnesota Ave.
Armstrong Ave.
Central Ave.
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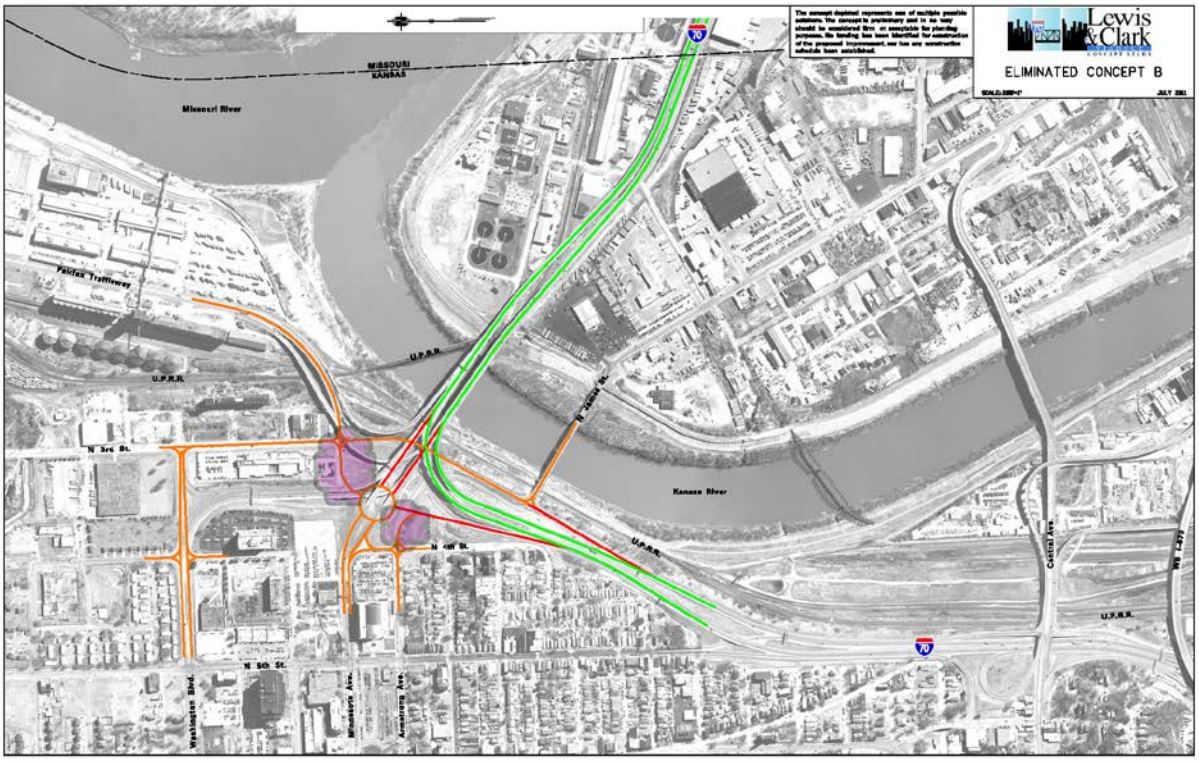
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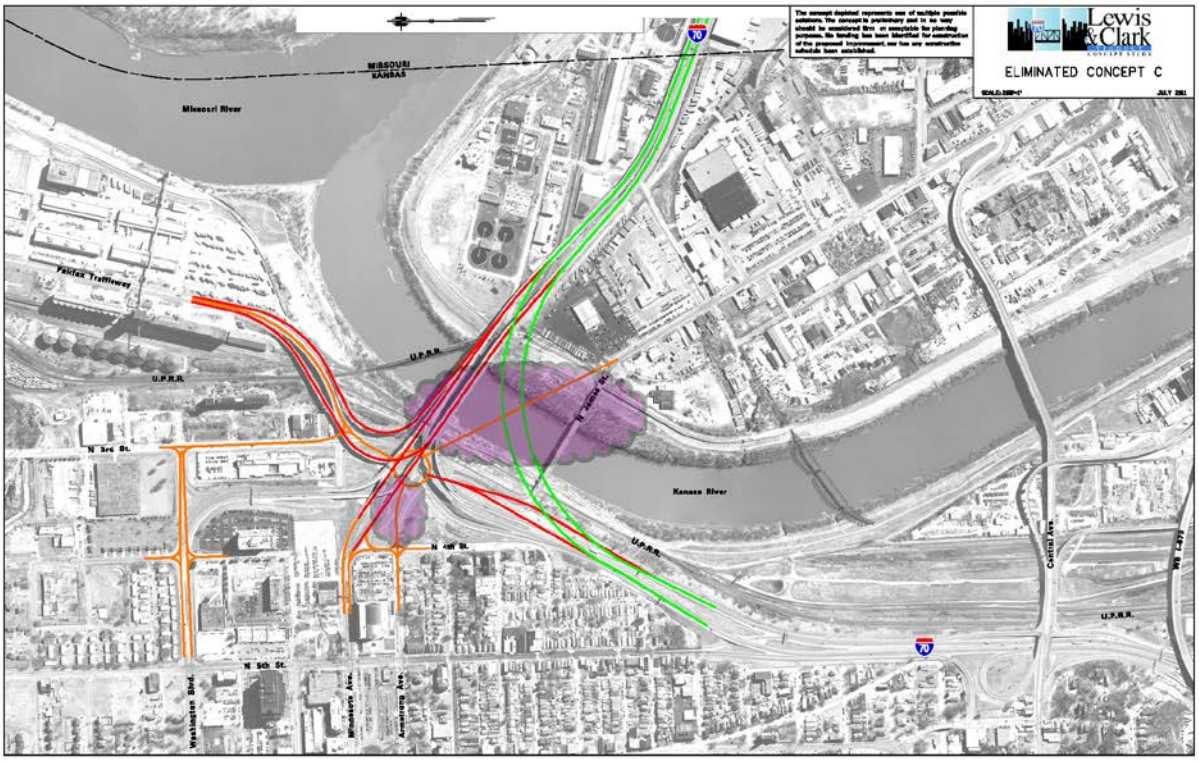
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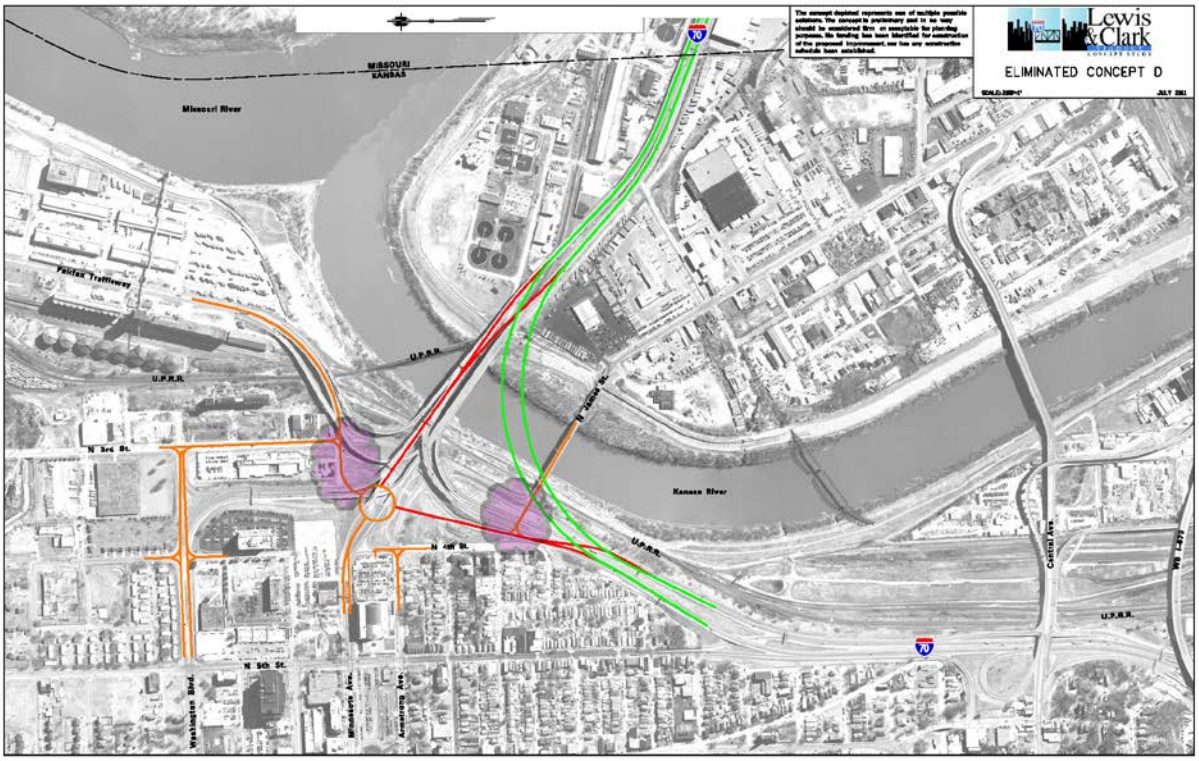
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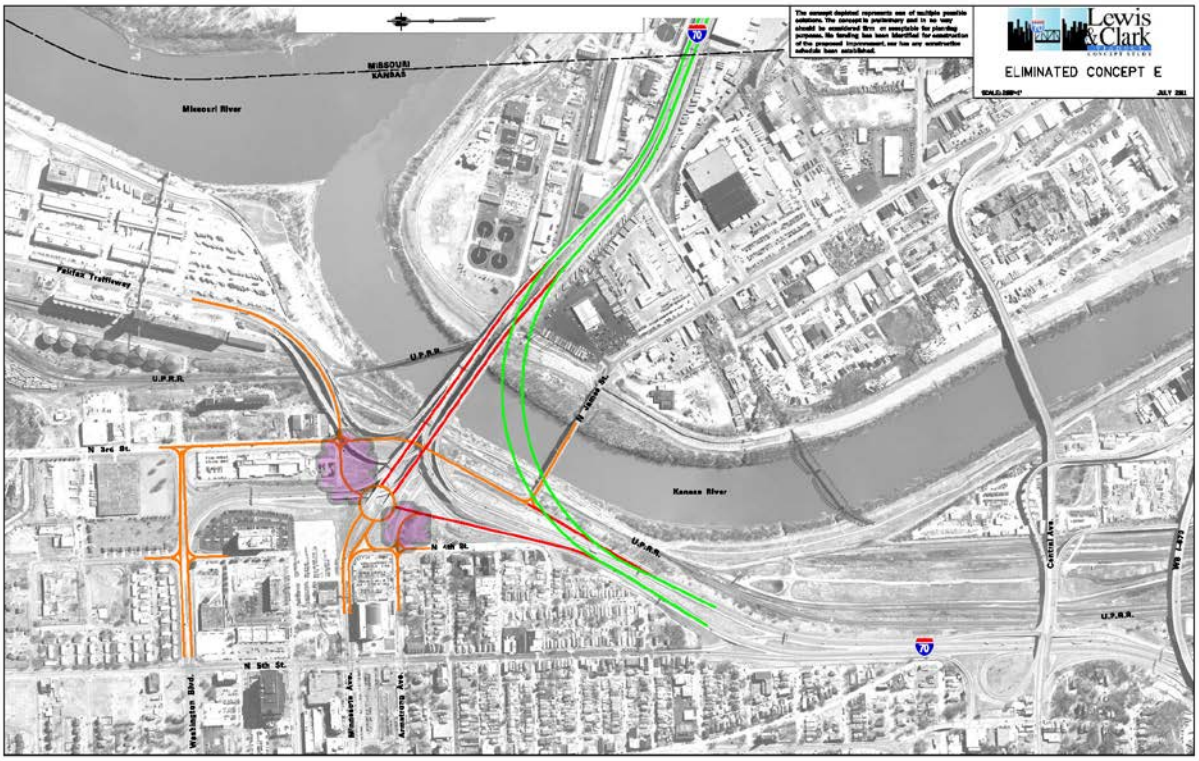
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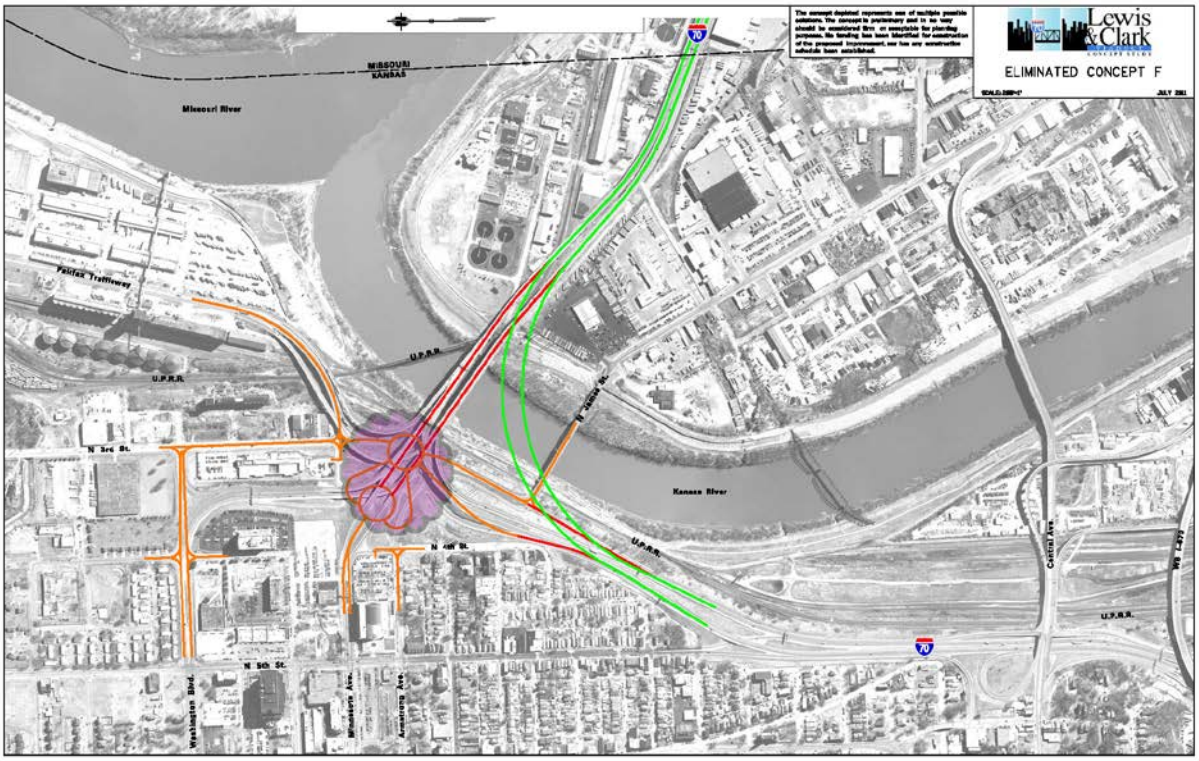
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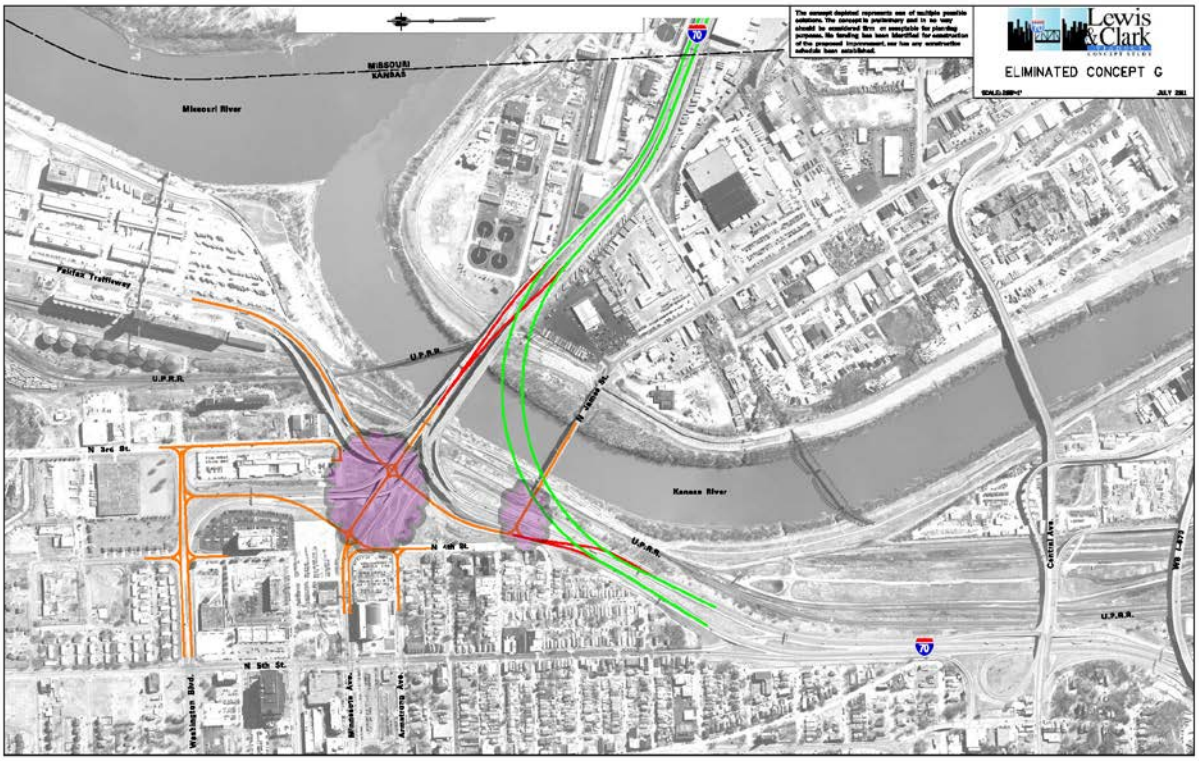
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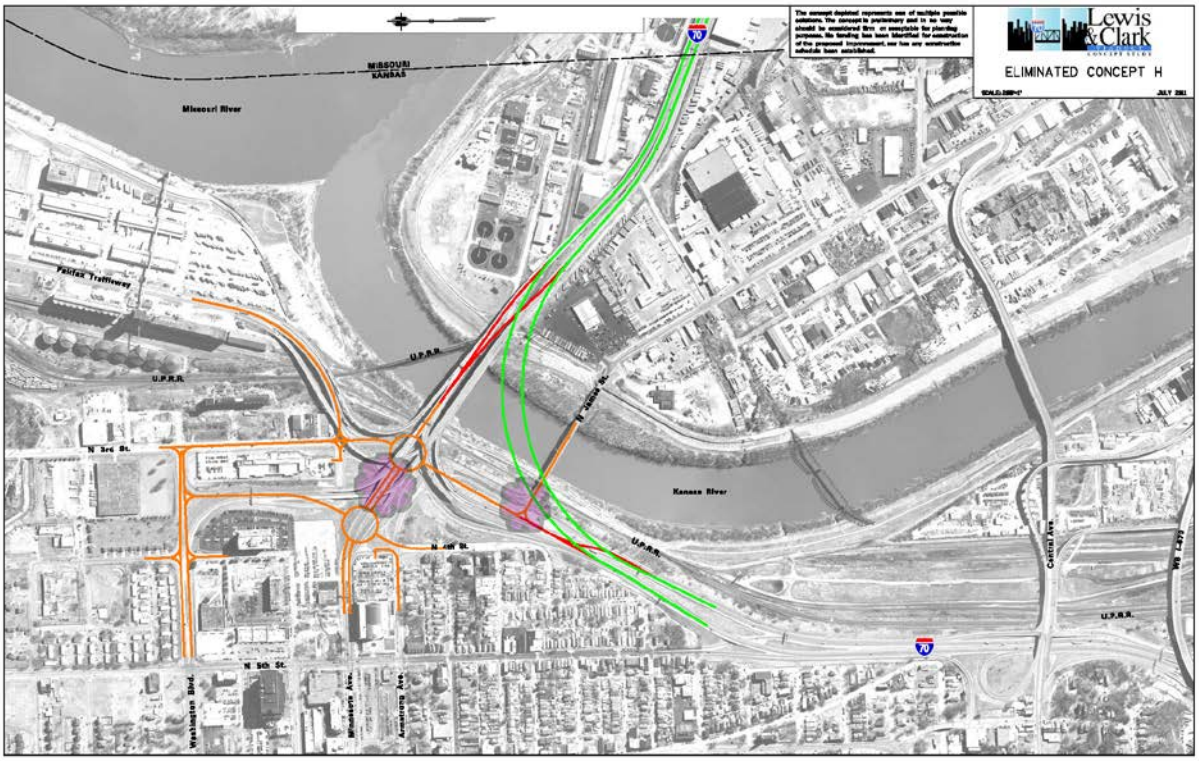
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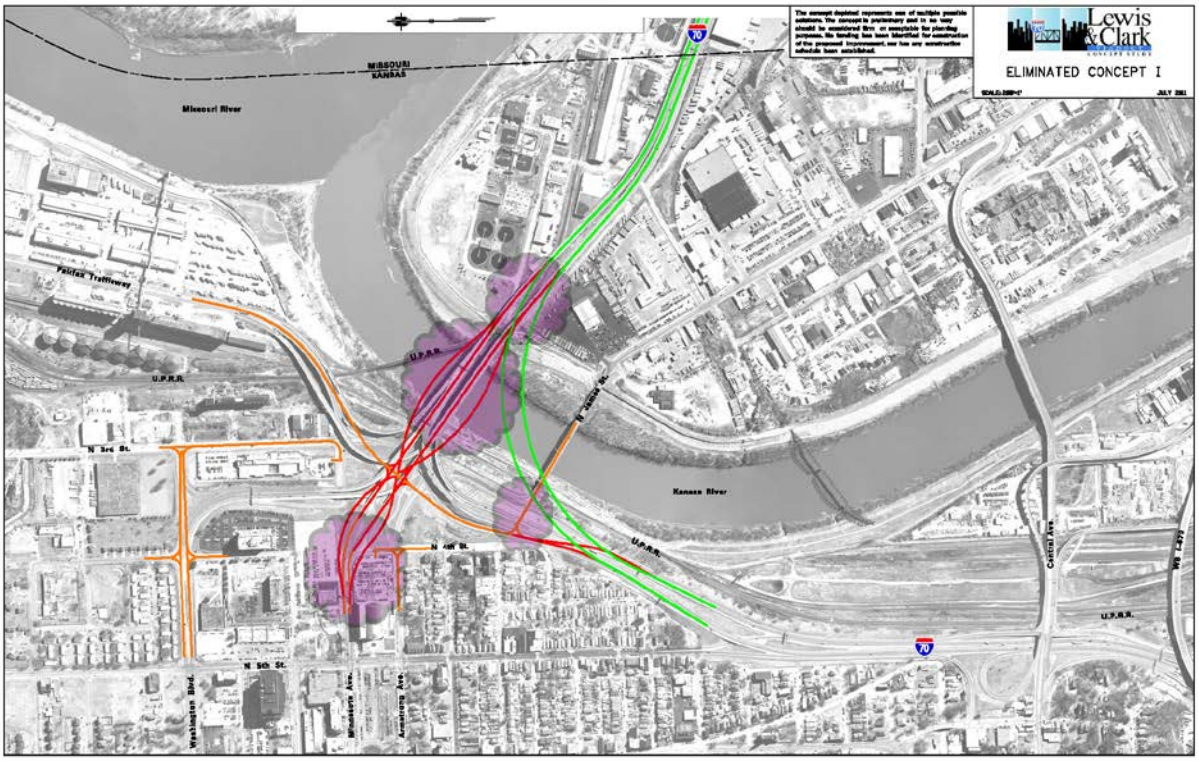
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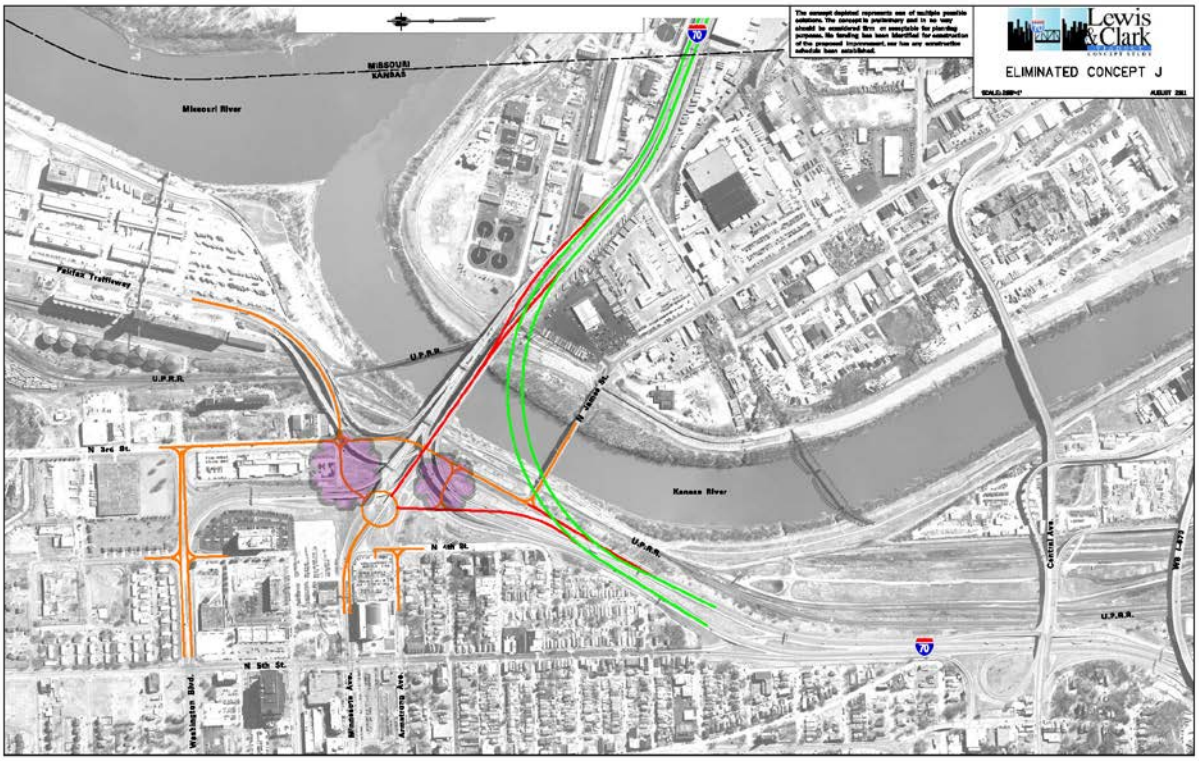
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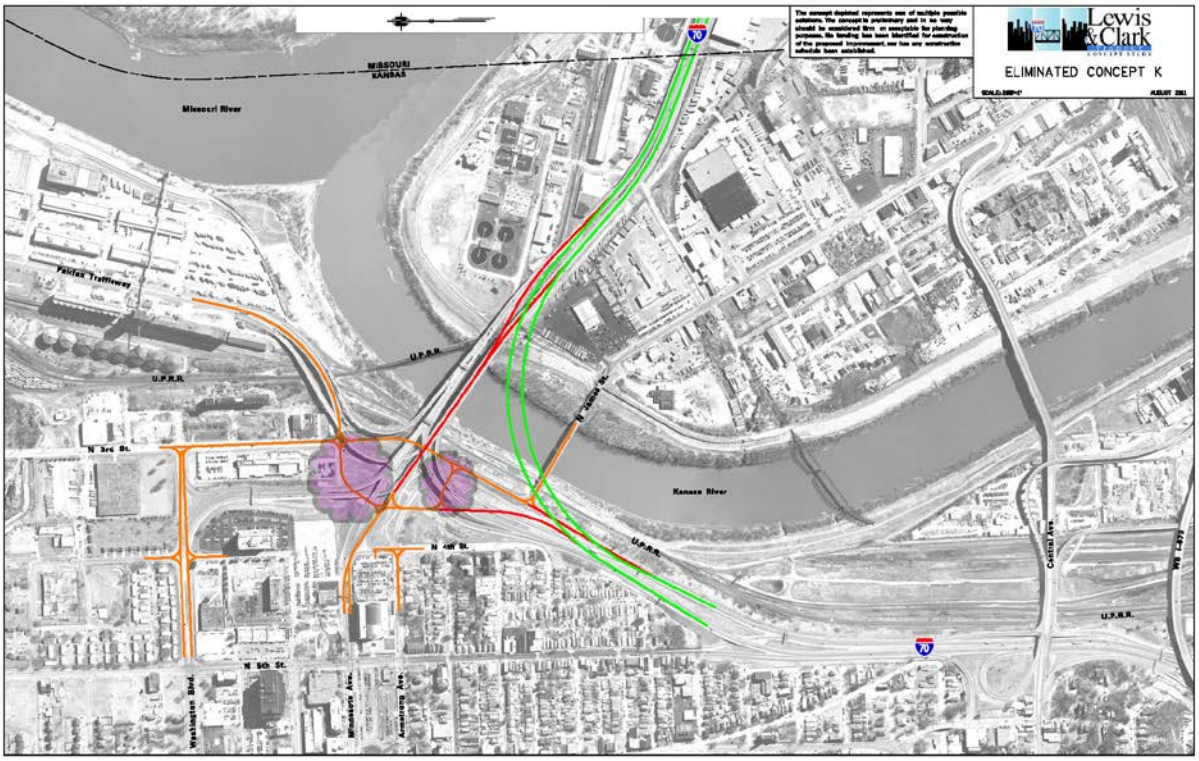
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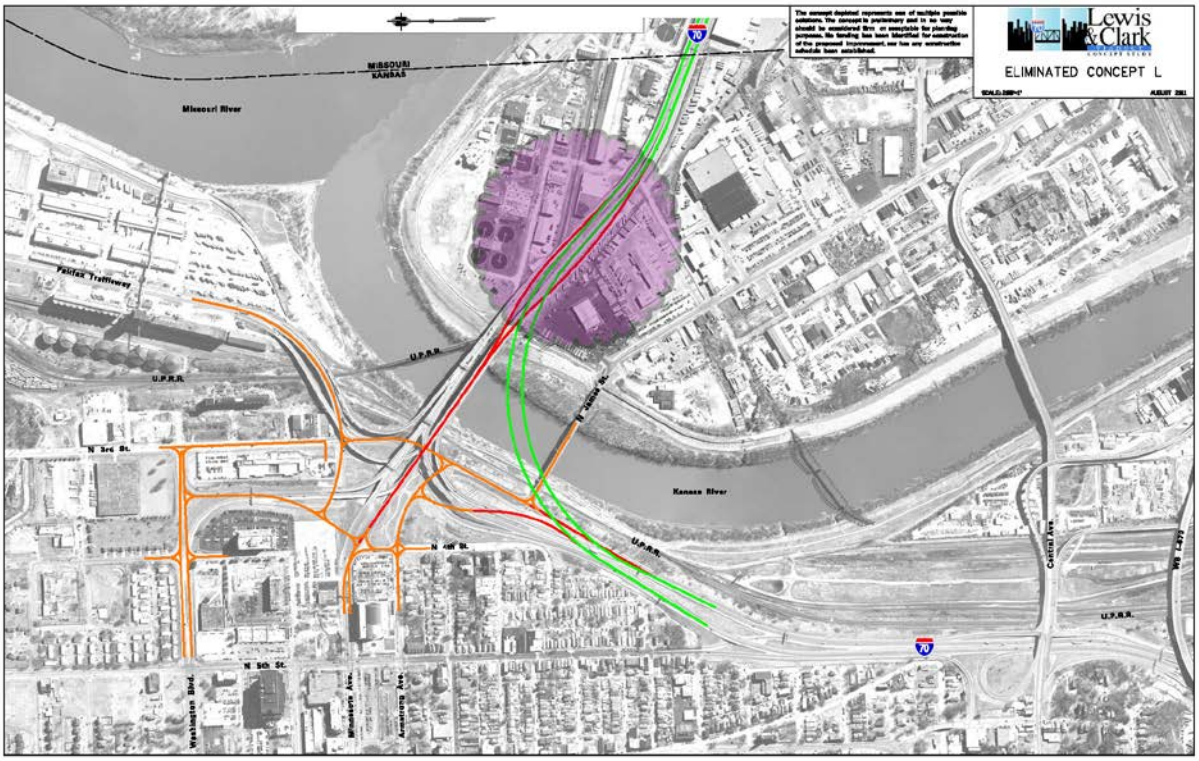
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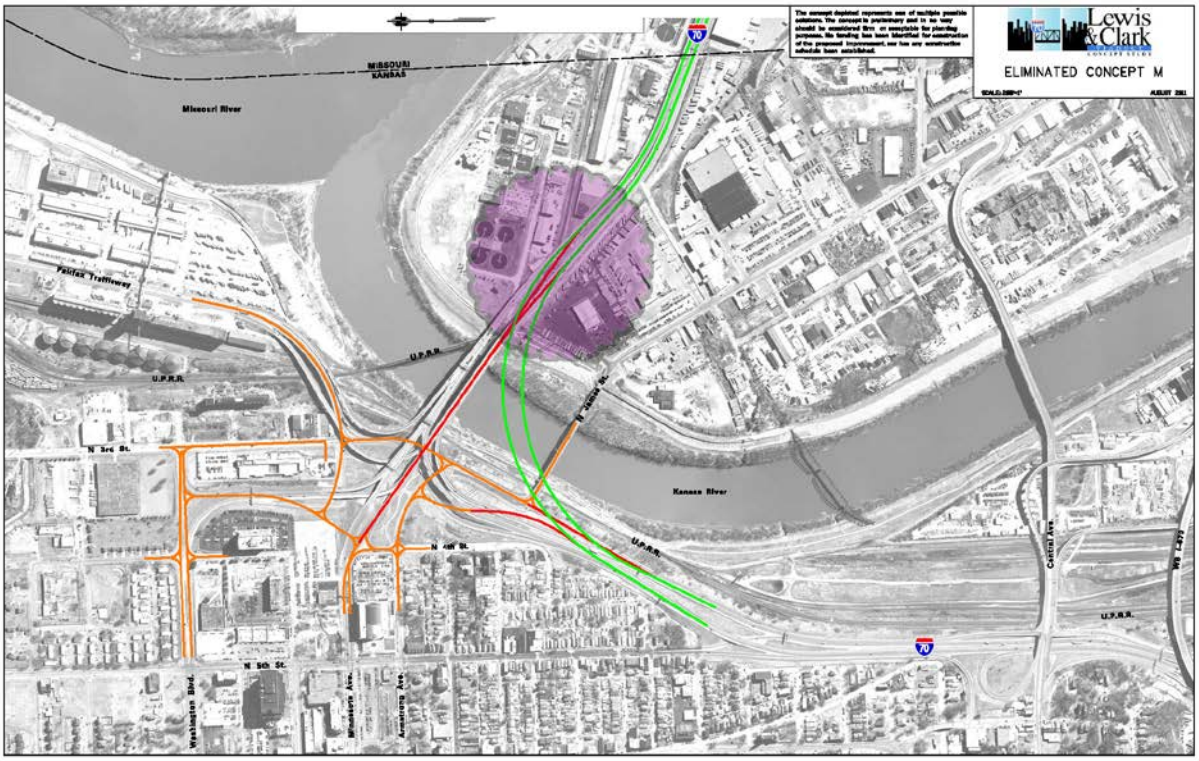
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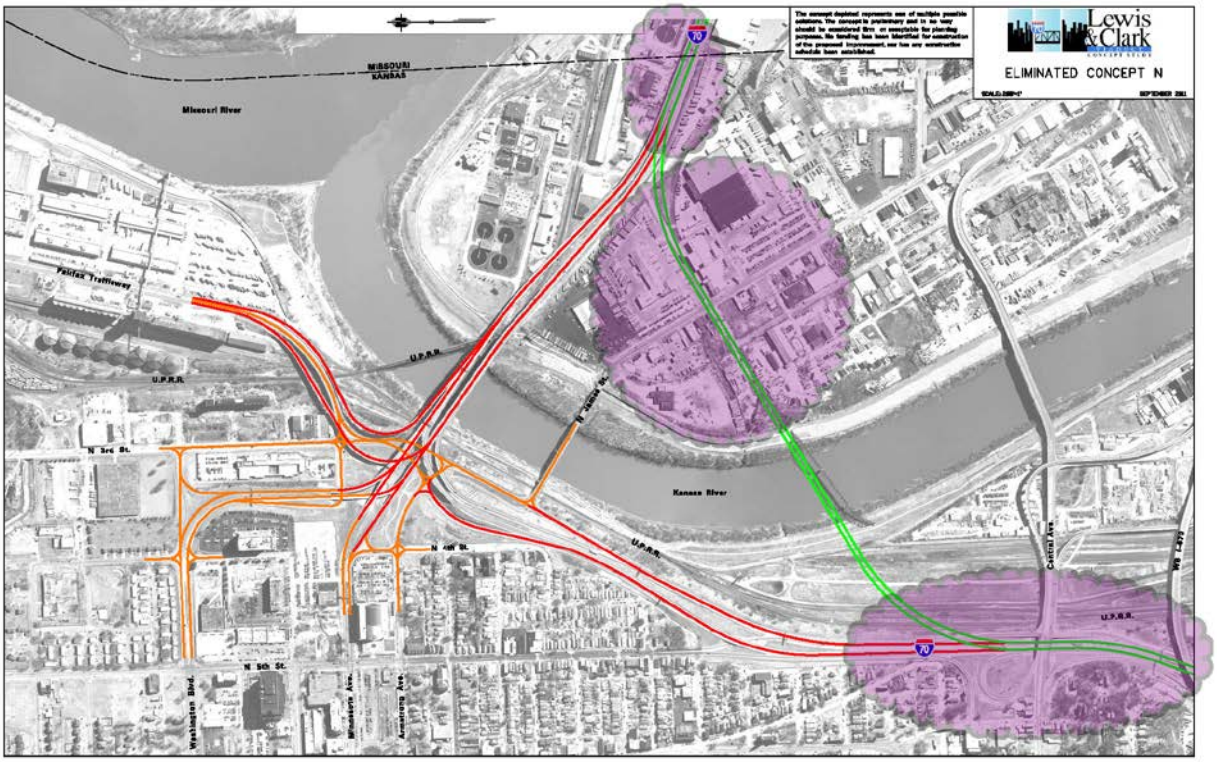
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Minnesota Ave.
Armstrong Ave.
Central Ave.
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3.0 Design Criteria

Preliminary Design Criteria
Lewis & Clark Viaduct
I-70 Mainline & Ramps

Design Feature	I-70		Ramps			
			At Gores		Intermediate	Depart/Approach Side Rd.
	Desirable	Minimum	Entrance	Exit		
Access Control	Full		Full		Full	Full
Design Speed (mph)	60	50	40	† 40	40	30
Design Vehicle	WB-67		WB-67		WB-67	WB-67
Typical Section						
-Lane Width (ft)	12		16 (1 lane), 12 each (2 or more lanes)			
-Shoulders (ft)						
-Outside (Rt.)*,‡	10 (4' min. on Bridge)		8 (4' min. on Bridge)		8 (4' min. on Bridge)	8 (4' min. on Bridge)
-Median (Lt.)*,‡	6 (4' min. on Bridge)		2 (4' min. on Bridge)		2 (4' min. on Bridge)	2 (4' min. on Bridge)
-Percent Grade						
-Minimum	0.50%	0.30%	0.50% (0.30% min.)	0.50% (0.30% min.)	0.50% (0.30% min.)	0.50% (0.30% min.)
-Maximum	3%	3%	5%	5%	5%	5%
-Min. Stopping Sight Dist. (ft)	570	425	305	305	305	200
-Min. K Values						
-Sag Vertical	136	96	64	64	64	37
-Crest Vertical	151	84	44	44	44	19
-Horizontal Curvature						
-Minimum Radius (ft)	1200	758	444	444	444	214
-Max. Superelevation**	6% (8.0% max.)		6% (8.0% max.)		6% (8.0% max.)	6% (8.0% max.)
Vertical Clearance						
-Over highways & local roads w/ I/C	16'-4"		16'-4"		16'-4"	16'-4"
-Over local roads	16'-4"		16'-4"		16'-4"	16'-4"
-Over RR	23'-6"		23'-6"		23'-6"	23'-6"
Curb Return Radii (ft)	N/A		N/A		N/A	75' min
Clear Zone (ft)	32		16	16	16	16

Notes:

Design Criteria based on 2011 AASHTO Green Book (6th Edition), 2005 AASHTO Policy on Design Standards Interstate System, and 2011 AASHTO Roadside Design Guide (4th Edition)

* Rt. & Lt. is referenced looking in the direction of traffic.

** Use e_{max} = 8% AASHTO table

† Use Mainline Design Speed for exits with optional 2 lane exits.

‡ New WB I-70 river structure transitions to a wide (12') shoulder on the median side and narrow (4') shoulder on the outside

4.0 Conceptual Cost Estimate – Preferred Concept (Concept 1-B)

The total estimated cost of the Preferred Concept, including nominal costs associated with separate construction phases, is as follows:

Item Description	Phase 1	Phase 2	Phase 3	Phase 4	Total Price (2012 Dollars)
CONSTRUCTION	$30,989,000	$43,176,000	$28,974,000	$37,055,000	$140,194,000
CONSTRUCTION CONTINGENCY	$6,198,000	$8,636,000	$5,795,000	$7,411,000	$28,040,000
UTILITIES	$744,000	$1,037,000	$696,000	$890,000	$3,367,000
RIGHT-OF-WAY	$-	$2,000,000	$-	$-	$2,000,000
DESIGN	$2,975,000	$4,145,000	$2,782,000	$3,558,000	$13,460,000
CONSTRUCTION ENGINEERING	$2,604,000	$3,627,000	$2,434,000	$3,113,000	$11,778,000
TOTAL	**$43,510,000**	**$62,621,000**	**$40,681,000**	**$52,027,000**	**$198,839,000**

5.0 Preferred Concept Plates

Plate - 1

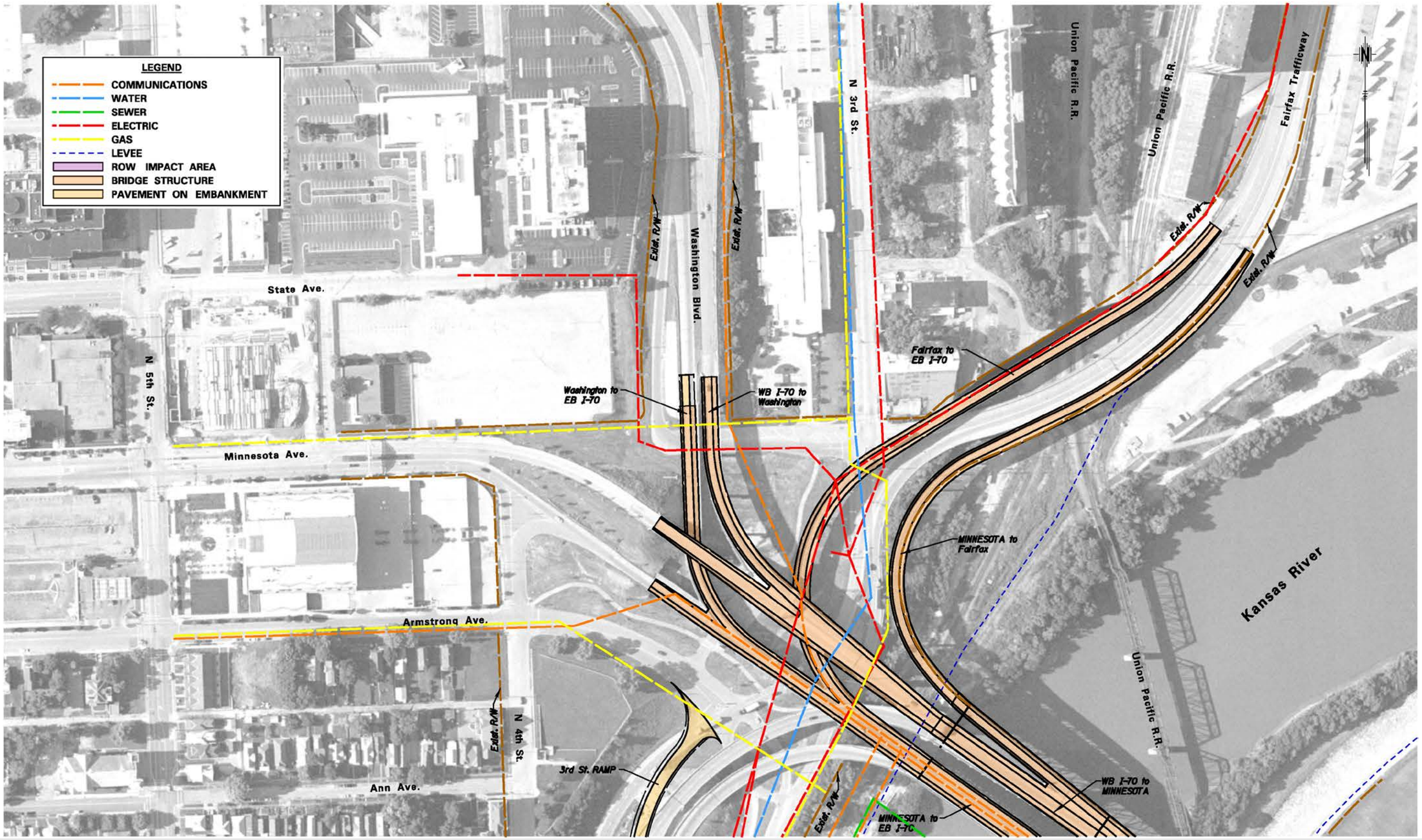
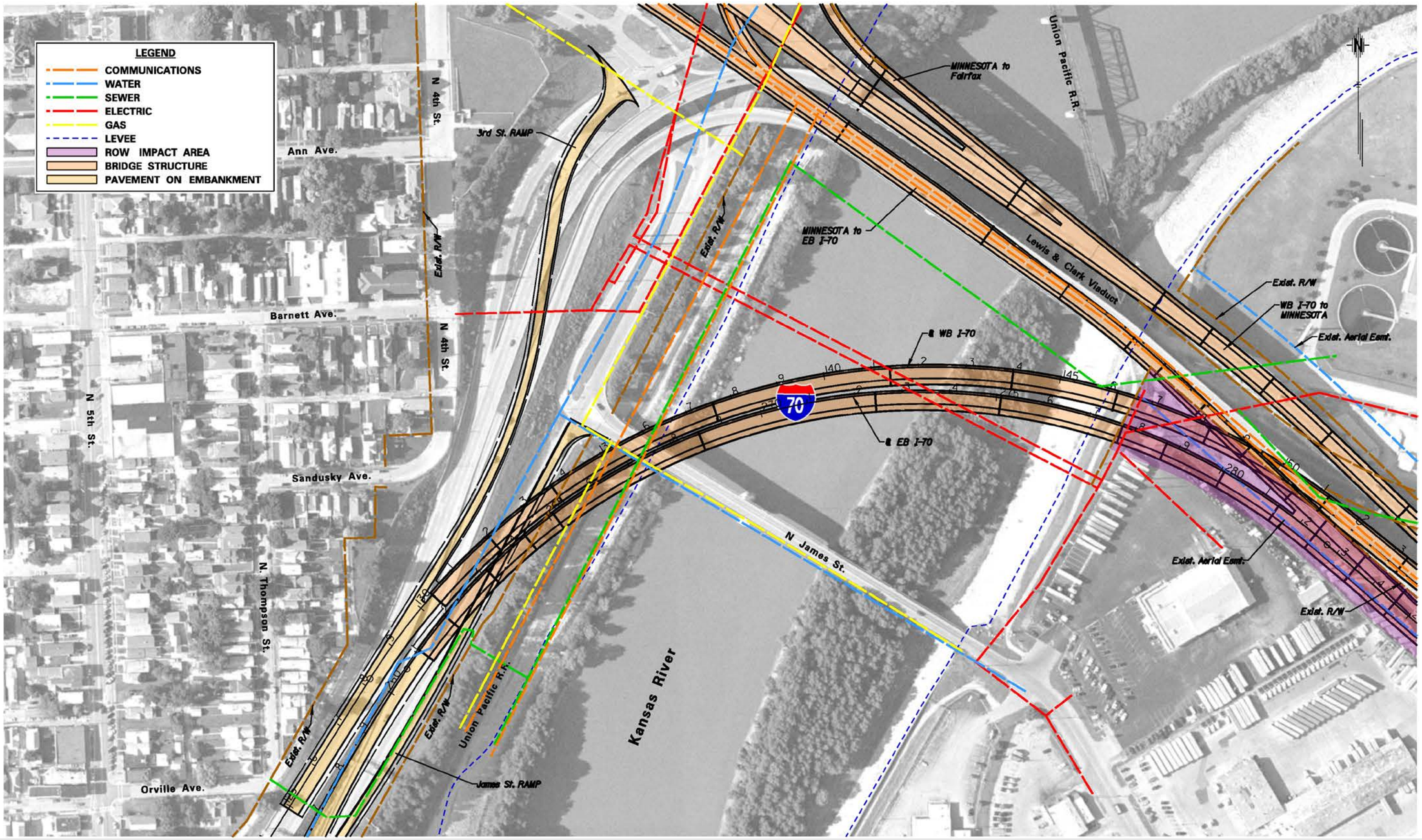


Plate - 2


LEGEND
COMMUNICATIONS
WATER
SEWER
ELECTRIC
GAS
LEVEE
ROW IMPACT AREA
BRIDGE STRUCTURE
PAVEMENT ON EMBANKMENT
N
Ann Ave.
N 4th St.
3rd St. RAMP
Exist. R/W
Barnett Ave.
N 5th St.
Sandusky Ave.
N. Thompson St.
Orville Ave.
Union Pacific R.R.
James St. RAMP
Kansas River
N James St.
MINNESOTA to Fairfax
MINNESOTA to EB I-70
Lewis & Clark Viaduct
WB I-70 to MINNESOTA
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℄ EB I-70
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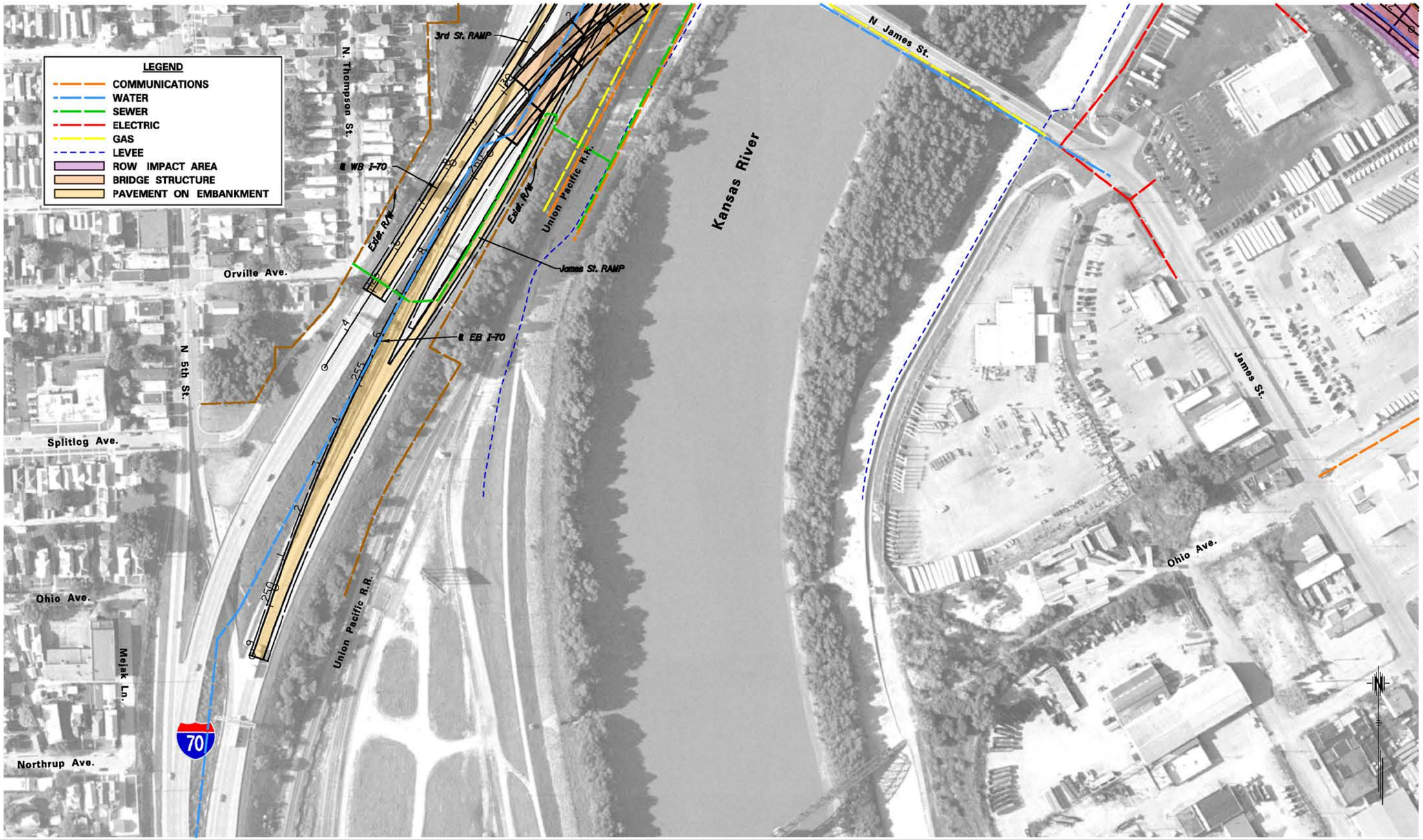
Plate - 3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PAVEMENT ON EMBANKMENT
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N. Thompson St.
℄ WB I-70
Exist. R/W
Exist. R/W
Union Pacific R.R.
James St. RAMP
Kansas River
N James St.
Orville Ave.
℄ EB I-70
N 5th St.
Splitlog Ave.
James St.
Ohio Ave.
Ohio Ave.
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Union Pacific R.R.
70
Northrup Ave.
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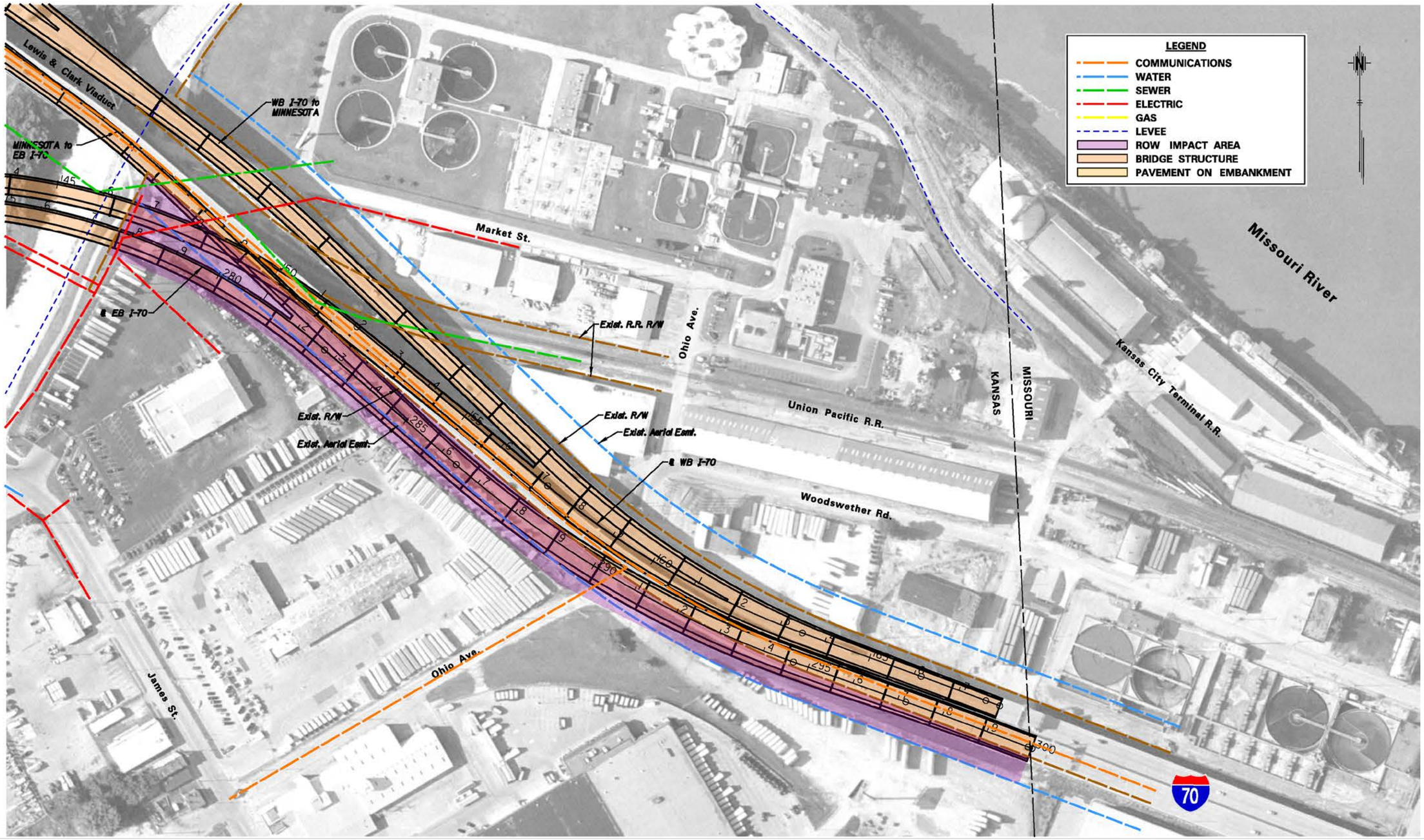
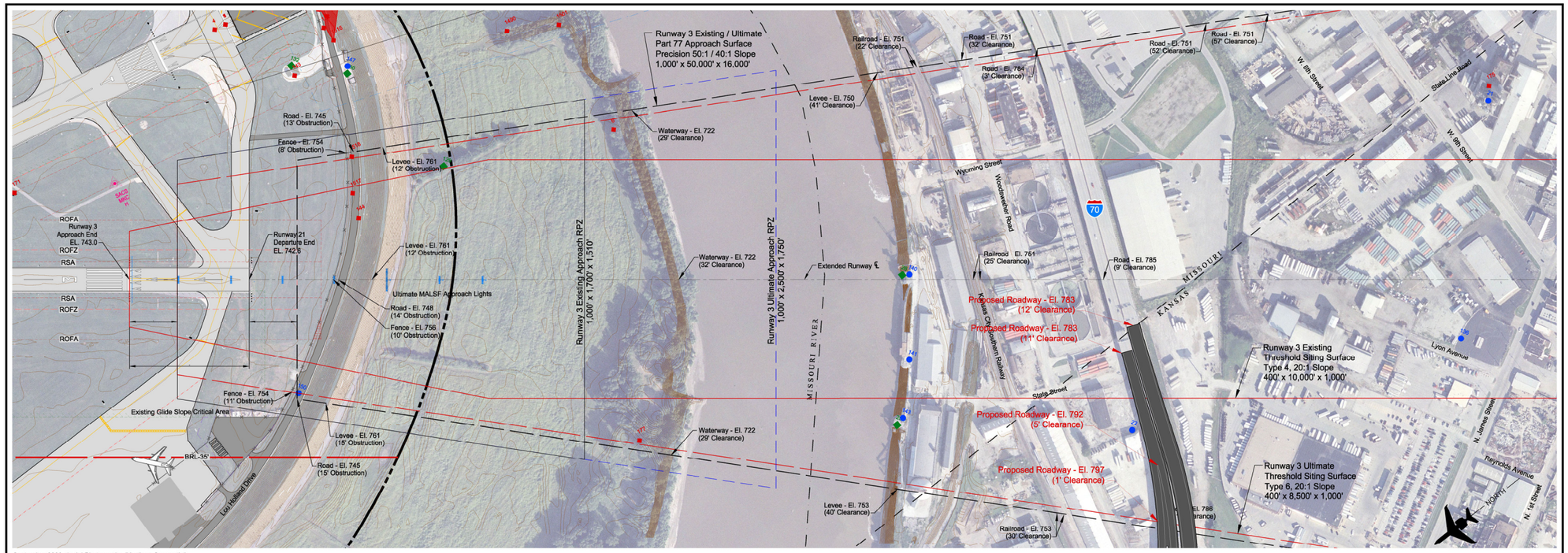
Plate - 4


LEGEND
COMMUNICATIONS
WATER
SEWER
ELECTRIC
GAS
LEVEE
ROW IMPACT AREA
BRIDGE STRUCTURE
PAVEMENT ON EMBANKMENT
N
Lewis & Clark Viaduct
WB I-70 to MINNESOTA
MINNESOTA to EB I-70
℄ EB I-70
Market St.
Exist. R.R. R/W
Ohio Ave.
Exist. R/W
Exist. Aerial Easmt.
℄ WB I-70
Union Pacific R.R.
Woodswether Rd.
KANSAS
MISSOURI
Kansas City Terminal R.R.
Missouri River
James St.
Ohio Ave.
70

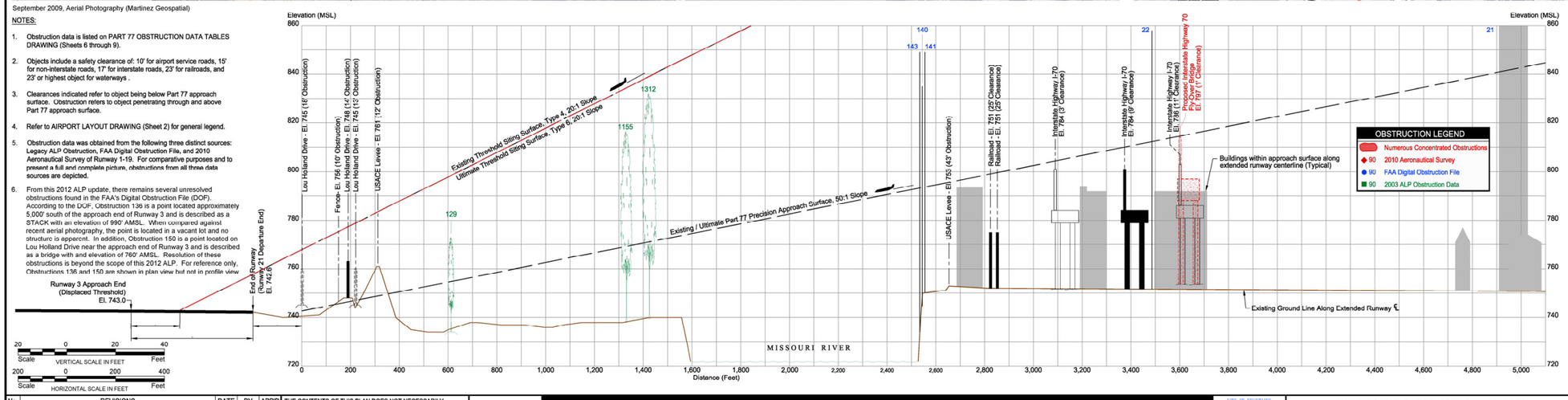
6.0 Charles B. Wheeler Downtown Airport – Part 77 Precision Approach Surface (Preliminary Information – Subject to Change)



September 2009, Aerial Photography (Martinez Geospatial)

NOTES:

1. Obstruction data is listed on PART 77 OBSTRUCTION DATA TABLES DRAWING (Sheets 6 through 9).
2. Objects include a safety clearance of: 10' for airport service roads, 15' for non-interstate roads, 17' for interstate roads, 23' for railroads, and 23' or highest object for waterways .
3. Clearances indicated refer to object being below Part 77 approach surface. Obstruction refers to object penetrating through and above Part 77 approach surface.
4. Refer to AIRPORT LAYOUT DRAWING (Sheet 2) for general legend.
5. Obstruction data was obtained from the following three distinct sources: Legacy ALP Obstruction, FAA Digital Obstruction File, and 2010 Aeronautical Survey of Runway 1-19. For comparative purposes and to present a full and complete picture, obstructions from all three data sources are depicted.
6. From this 2012 ALP update, there remains several unresolved obstructions found in the FAA's Digital Obstruction File (DOF). According to the DOF, Obstruction 136 is a point located approximately 5,000' south of the approach end of Runway 3 and is described as a STACK with an elevation of 990' AMSL. When compared against recent aerial photography, the point is located in a vacant lot and no structure is apparent. In addition, Obstruction 150 is a point located on Lou Holland Drive near the approach end of Runway 3 and is described as a bridge with and elevation of 760' AMSL. Resolution of these obstructions is beyond the scope of this 2012 ALP. For reference only, Obstructions 136 and 150 are shown in plan view but not in profile view



No.	REVISIONS	DATE	BY	APP'D

THE CONTENTS OF THIS PLAN DOES NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS DOCUMENT BY THE FAA DOES NOT IN ANY WAY CONSTITUTE ON THE PART OF THE UNITES STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

HNTB

CITY OF KANSAS CITY, MISSOURI
AVIATION DEPARTMENT

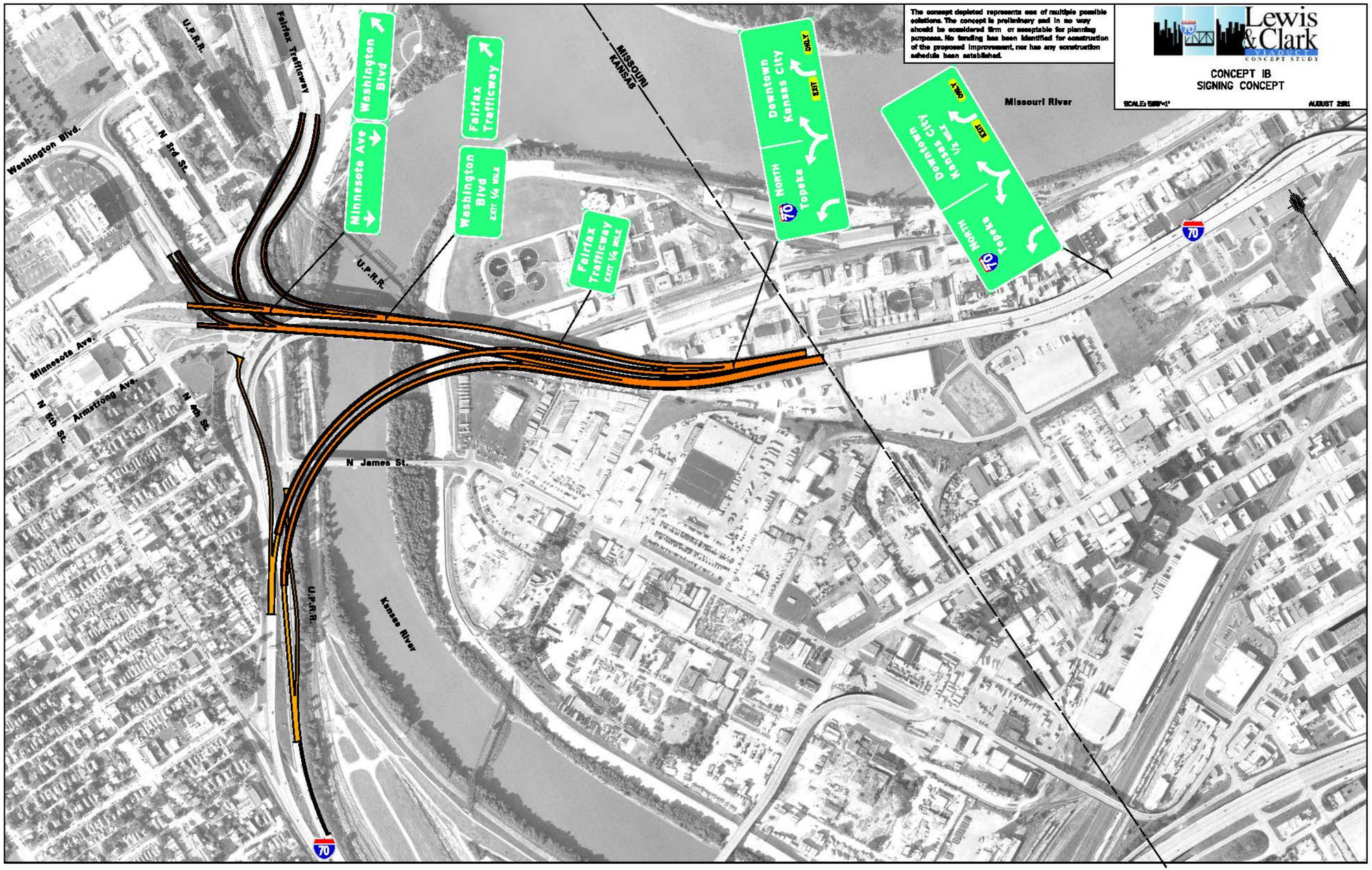
CHARLES B. WHEELER DOWNTOWN AIRPORT

CITY OF FOUNTAINS HEART OF THE NATION KANSAS CITY MISSOURI

INNER PORTION OF RUNWAY 3 APPROACH SURFACE DRAWING

dsn: Brian Tompkins | dtl: Jerry Smith | Aviation Project No: 62100340
chk'd: Will Reinhardt | appd: Mark Williams | Sheet 14 of 23

7.0 Preliminary Signing Concept for Preferred Concept Westbound I-70



Appendix C

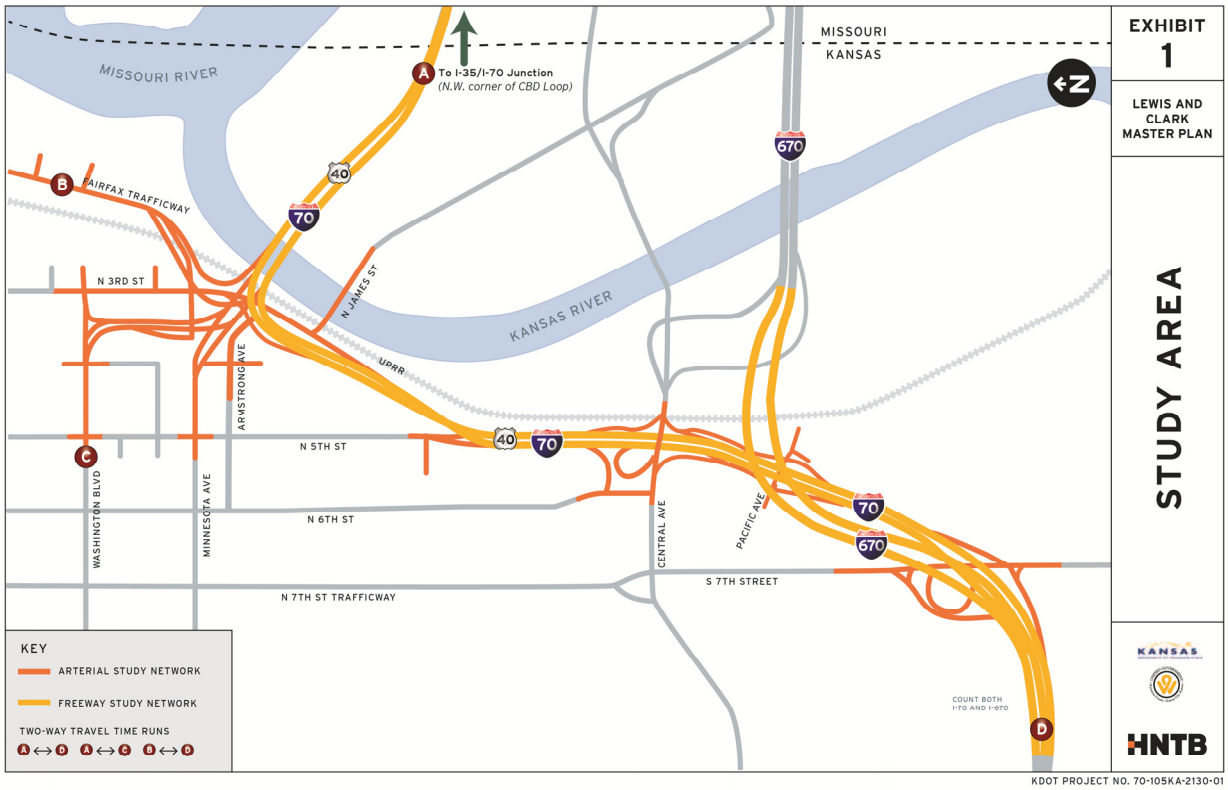
Lewis & Clark Viaduct
Traffic and Safety Analysis
Technical Report

1.0 Introduction

The Lewis & Clark Traffic and Safety Analysis Technical Report is an appendix to the Lewis and Clark Viaduct Concept Study Report. A summary of this technical report is provided in the main Concept Study Report body.

The traffic and safety study area is larger than the Lewis and Clark project limits defined in the Concept Study Report. This was done to provide a comprehensive understanding of the traffic and safety approaching the project limits. **Figure C-1** shows the traffic and safety study area limits.

Figure C-1
Traffic and Safety Study Area



The technical report is developed in the following format. Each section is summarized in the Concept Study Report.

Section 2.0 - Study Methodology
Section 3.0 - Existing and Future No-Build Conditions
Section 4.0 - Future Build Conditions
Section 5.0 - Conclusions and Recommendations

2.0 Study Methodology

Traffic and safety information was utilized to enhance the understanding of the study area and how it functions today. In addition, the information was used to develop forecasts of future traffic demand as well as traffic and safety conditions. The study methodology was reviewed with Kansas Department of Transportation (KDOT) prior to starting.

2.1 Data Collection

Study data was collected from KDOT and the UG. **Table C-1** shows the data collected and its intended use.

Table C-1
Data Collection

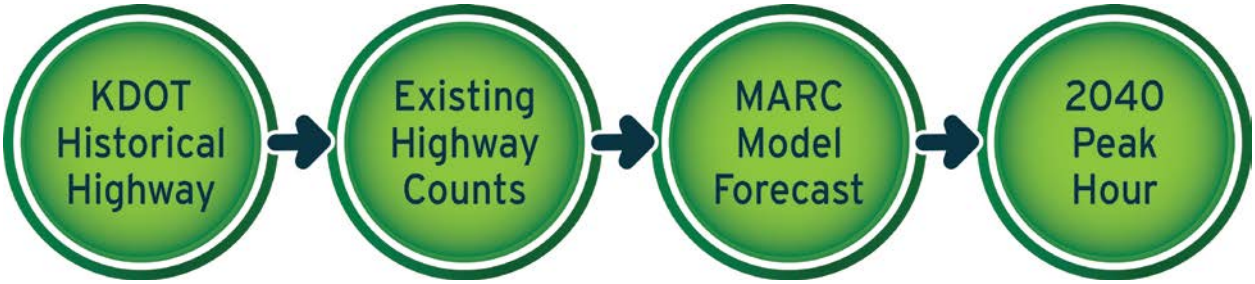
Data Source	Data Use
Crash Data	Safety analysis of mainline conditions
Existing Traffic	Understanding of existing traffic demand
Travel Time Data	Travel time and speeds for calibration of simulation model and baseline conditions.
Field Observations	Confirmation of vehicle conditions for calibration and observations of conditions.
Socio-Economic Data	Understanding of historical and future changes in population and employment in Johnson County
Transit Data	Understanding of transit usage in the study area

Source: KDOT, UG and KCATA

2.2 Traffic Forecast

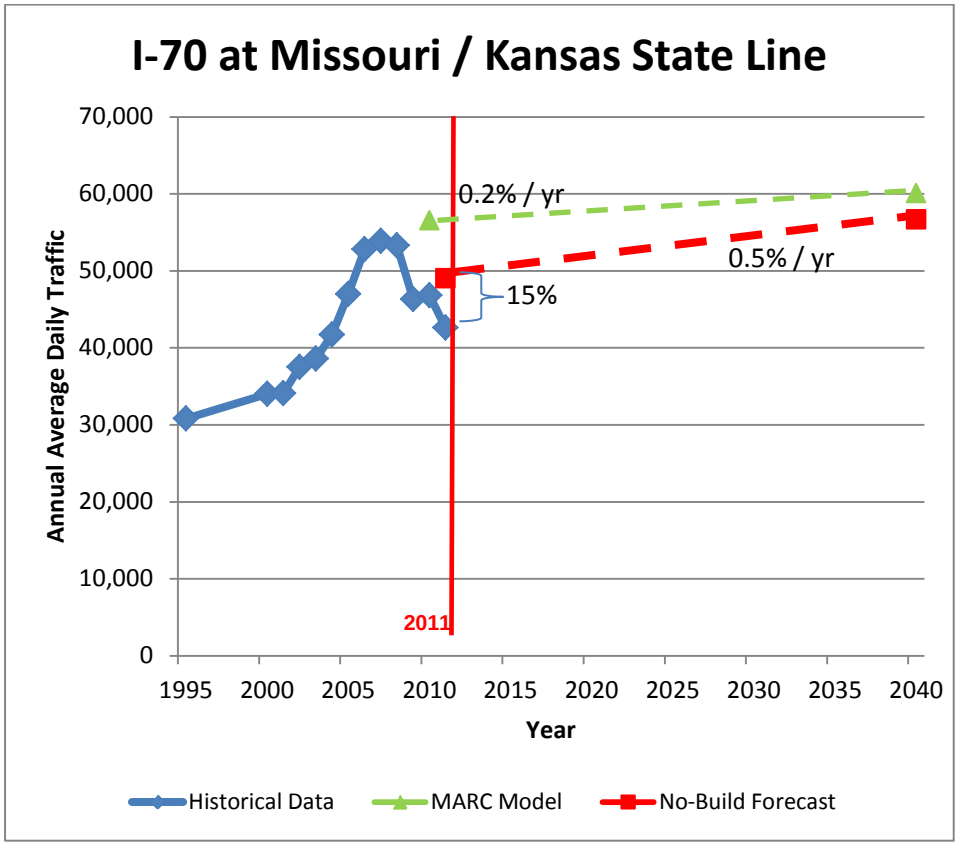
Traffic in the study area is forecast to a 2040 design year. This study utilized the same forecast methodology that was used for other recent KDOT projects such as the I-435 and US-69 and the Johnson County Gateway projects. In addition, 2040 is the current planning year for the Mid-America Regional Council (MARC) Long-Range Transportation Plan. The methodology for developing the forecasted traffic is shown in **Figure C-2**. The MARC regional model was used to develop the traffic forecast.

Figure C-2
Traffic Forecast Methodology



In order to account for the drop in historical traffic demand, as a result of the 2008 economic recession, MARC forecasted 2040 traffic was modified using a two-step process. First, the 2011 traffic volumes were inflated by 15% to return to near pre-recession 2007-2008 volumes, based on historical traffic counts. Second, the volumes were grown 0.5% per year to the year 2040. This growth rate was determined based on data from the MARC model and resulted in an overall growth factor of 1.33. This two-step process can be seen in **Figure C-3** below.

Figure C-3
Modified Traffic Forecast



2.3 Traffic Analysis

A VISSIM (version 5.3) microscopic traffic simulation model was built to analyze the study area transportation network. A screen shot of this traffic model can be seen in **Figure C-4**. Existing and future traffic forecasts combined with field observations and travel time runs were the primary inputs into the VISSIM model. Calibration of the model was performed utilizing travel time runs in both the peak and off-peak direction during the AM and PM peak hours. Field observations were used to better understand vehicle queues and congestion. The VISSIM

model was used to extract Highway Capacity Manual (HCM) equivalent information related to the freeway mainline, merge and diverge conditions and arterial street operations around the interchanges.

Figure C-4
VISSIM Model Limits

Source: Lewis & Clark VISSIM Model (version 5.3)

Level of service (LOS) results were determined using the VISSIM model and Highway Capacity Manual (HCM) 2010 methodology. LOS is a qualitative measure describing operational conditions (how well a roadway operates) in terms of average delay per motorist with regard to intersections and in terms of average passenger cars per mile per lane on the freeway. LOS is described with letter designations A (best) through F (worst). The Highway Capacity Manual provides a description of the qualitative and quantitative meaning of each letter. For this study, LOS D was assumed to be the minimum desirable LOS for this area.

2.4 Transportation Enhancements

Transportation enhancements include improvements that make the system more sustainable, multimodal, and safe. These include bicycle & pedestrian facilities, transit and Intelligent Transportation Systems (ITS).

Bicycle & Pedestrian

Bicycle & pedestrian counts were obtained at local study area intersections in order to better understand demand and routes on the local streets.

Transit

To fully take into consideration transit in the system the KCATA's 2008 Alternative Analysis and Unified Government's 2010 Comprehensive Service Analysis were used. The 2008 Alternative Analysis investigated transit options in the State Avenue corridor from downtown Kansas City, MO to the Legends development. In addition, the 2010 Comprehensive Service Analysis was utilized to find areas within our study area which need to be improved for transit mobility.

Intelligent Transportation Systems

Existing planned ITS improvements were identified in the study area. Within the constraints of the planned improvements, the ITS infrastructure was evaluated. The ITS infrastructure on I-70 and I-670 can be used to complement one another in the event of an incident or congestion.

3.0 Existing and Future No-Build Conditions

3.1 Existing Traffic

Existing highway mainline traffic volumes were collected from KDOT, while new traffic volumes were collected in the field at the interchange ramp terminals and surface street intersections. The counts were used to develop a baseline of existing traffic demand and evaluate existing traffic operations. Existing traffic was also used as the starting point to develop the future 2040 forecasts.

Today, more than 42,000 drivers use this section of I-70 daily. **Table C-2** shows the existing average annual daily traffic (AADT) and the existing peak hour traffic at three key points along the I-70 corridor within the study area. The percentage of trucks in the peak hour and corresponding peak hour truck volumes are also given.

KDOT collected data in April 2011 for a 24-hour period. The peak hour represents the four highest consecutive 15-minute periods in the morning and in the afternoon. The existing conditions operational analysis, as well as Future No-Build and Build conditions, were modeled using these two peak hour periods. The data indicated that the peak hours are 7:30 – 8:30 AM and 4:45 – 5:45 PM.

Table C-2
Existing Traffic along I-70 within the Study Area

Location	Total Two-Way Traffic Demand (AADT)	Peak Two-Way Traffic Demand (AM/PM)	Truck Percent (AM/PM)	Truck Volume (AM/PM)
I-70 East of Levee Road	42,626	3,275 / 3,811	11.9% / 8.7%	390 / 332
I-70 Turning South	14,650	1,213 / 1,502	11.4% / 8.7%	138 / 131
I-70 West of Mill St. Overpass	40,872	3,520 / 4,048	10.4% / 8.3%	367 / 334

Source: KDOT Traffic Counts 2011

Table C-3 shows the existing peak hour traffic for each of the study interchanges.

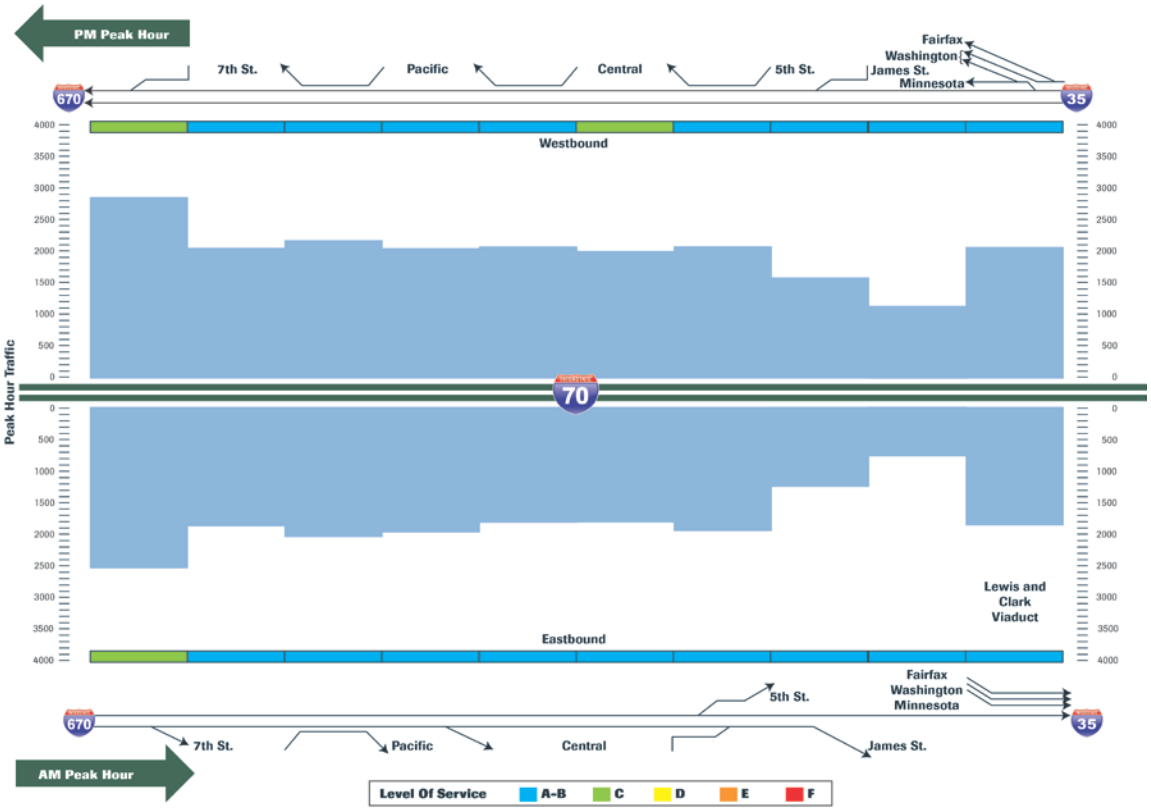
Table C-3
Existing Interchange Peak Hour Traffic

Interchange	Peak Traffic Demand (AM/PM)
7th Street	1,720 / 2,170
Pacific / Central	910 / 1,300
5th Street	830 / 750
Downtown KCK	2,710 / 2,420

Source: KDOT Traffic Counts 2011

Based on the existing data collected by KDOT, and the turning movement count data collected at intersections in the study area, an existing AM and PM peak hour traffic volume map was developed. **Figure C-5** is a summary of the existing peak hour volumes, LOS and lane geometrics.

Figure C-5
Existing I-70 Traffic Demand, LOS and Lane Continuity



As shown in **Figure C-5**:

- Corridor traffic demand averages approximately 2,000 vehicles in the peak hour in the peak direction with a high of 2,800 vehicles at the west end and a low of 800 vehicles at the I-70 eastbound single lane curve.

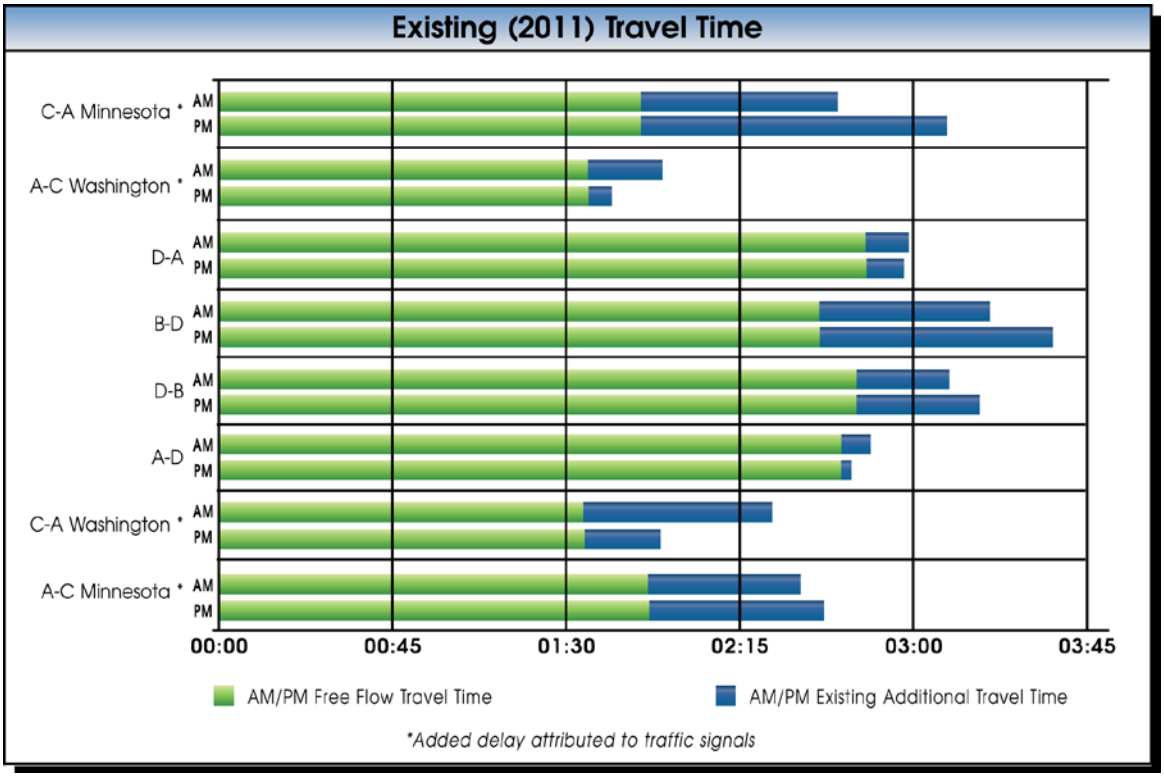
- Level of service primarily ranges between A through B with a few isolated LOS C sections, as shown in the colored bands outside of the volume bars. The poorest LOS includes:
    - LOS C at the west end near 7th Street for both directions during both peak hours
    - LOS C westbound under Central Avenue during the PM peak hour

- Each line at the top and bottom of the exhibit represents the lane geometry. Existing lane geometric issues include:
    - Eastbound 5th Street off-ramp left exit
    - Eastbound I-70 single lane mainline

Travel time runs were conducted for the study area. Information was collected for both directions during AM and PM peak hour times. **Figure C-1** shows a map of the study area and lays out the points between which the travel time data was collected.

The travel time runs were performed between the lettered points in **Figure C-1**. The travel time bar chart shows the free flow travel time and the additional travel time which should be added due to traffic signals or congestion along the route. Delay in **Figure C-6** is considered minimal and primarily occurs at signalized intersections.

Figure C-6
Travel Time Bar Chart



In order to comprehensively analyze the traffic and predict the future traffic in the study area it was important to understand how vehicles circulate on the freeways and local streets. For example, the yellow line begins on James Street and heads into the interchange area. **Figure C-7** shows the complexity of the interchange and the circuitousness of some routes.

Figure C-7
Downtown Kansas City, Kansas Circulation Map

3.2 Existing Safety

A safety analysis was performed on the existing roadway system to identify vehicle crash patterns and high density crash locations. Other safety statistics, such as crash types and crash severity were also studied. This information was used to assess safety in the study area and help develop mitigation measures such as improved geometrics and access solutions in the future build alternatives. Crash data for the five-year period of 2006 through 2010 was used. The study area crash rates were compared to the statewide average highway crash rates. The

total highway crashes and highway crash rates for each section of highway are summarized in **Table C-4**. The sections of highway which are discussed in **Table C-4** may be seen on the map in **Figure C-8**.

Table C-4
I-70 Crash Rate Table (Five Years)

2006-2010	I-70 Crash Rates					
Section	Location	Freeway Section	Statewide Highway Crash Rate	I-70 Crash Rate	Ratio	Total No. of Crashes
A	I-70 – I-670 Split to EB James St. Exit Gore	4 Lane Divided	1.20	**1.30**	1.1	177
B	I-70 – EB James St. Exit Gore to the State Line	6 Lane Divided	1.41	**2.19**	1.6	166

Source: KDOT

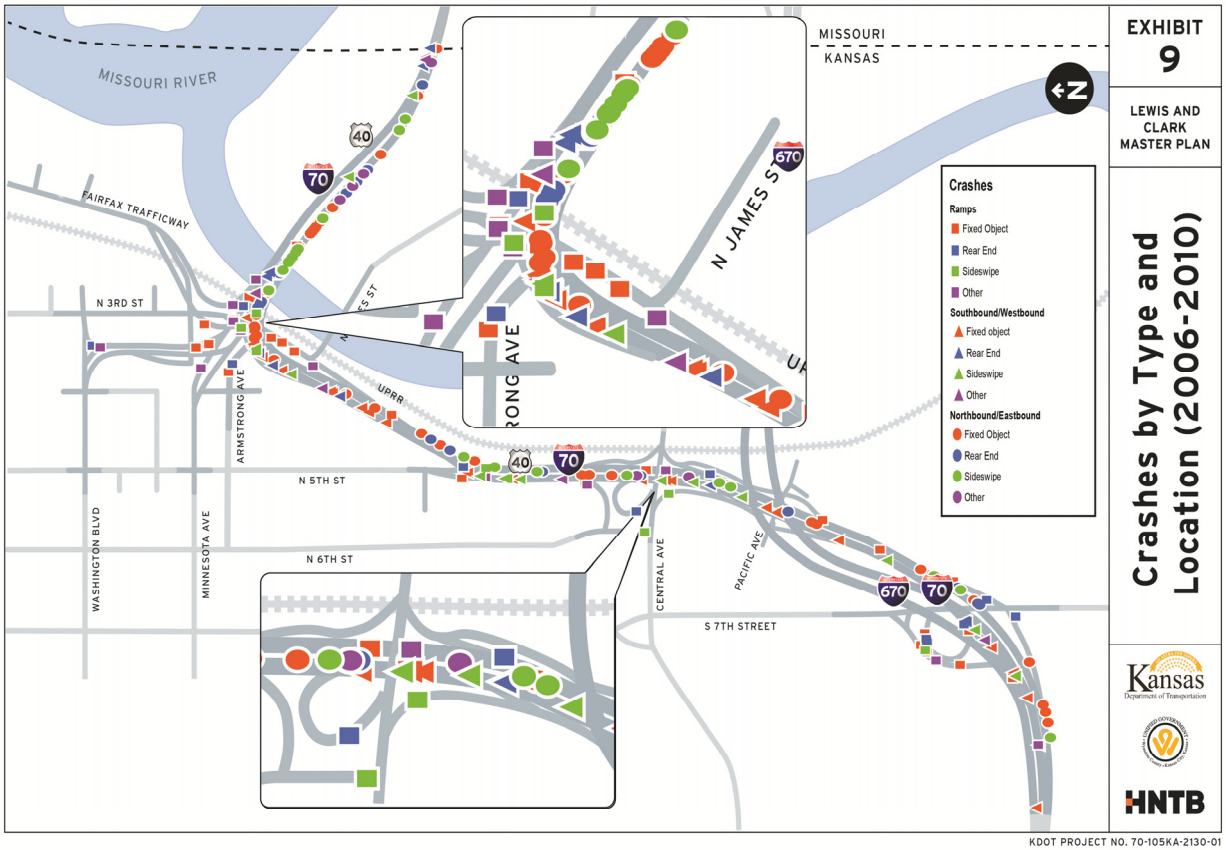
Figure C-8
Highway Sections in Table C-4

Table C-4 shows that the highway crash rates on I-70 are higher than the statewide average crash rates for similar facilities by an order-of-magnitude of 10% to 60%.

High Crash Locations

The location of crashes between 2006 and 2010 along the study highway sections are shown in **Figure C-9**. There are high concentrations of crashes on I-70 near the downtown Kansas City, Kansas 30-mph curve, and at the Central Avenue interchange. These high crash concentrations are consistent throughout the five-year period of analysis. Higher concentrations of crashes are observed near ramp merge and diverge areas and tight mainline radii corners.

Figure C-9
Crash Location Map



Type of Crashes

Table C-5 shows the percent of crashes by crash type for along I-70 in the study area. As shown in **Figure C-9** above and in **Table C-5**, fixed object crashes were the most frequently occurring type for the corridor. This crash type represents 57 percent of the overall crashes for I-70. The high number of fixed object crashes is attributed to the multiple merging and diverging areas which are closely spaced in the study area with adjacent barriers and the tight geometrics which require a slower speed than is expected for an interstate highway mainline. The crash data shows that the areas with the highest concentrations of collisions on I-70 were near the sharp corner and merge location of Washington/Minnesota in the eastbound direction. This is the same area where the geometric configuration of the roadway was observed to be difficult to navigate. The second and third most frequently occurring crash types for I-70 were sideswipes and rear ends which are prevalent in the same location. Sideswipes may occur due to merging vehicles entering from the Washington/Minnesota ramp.

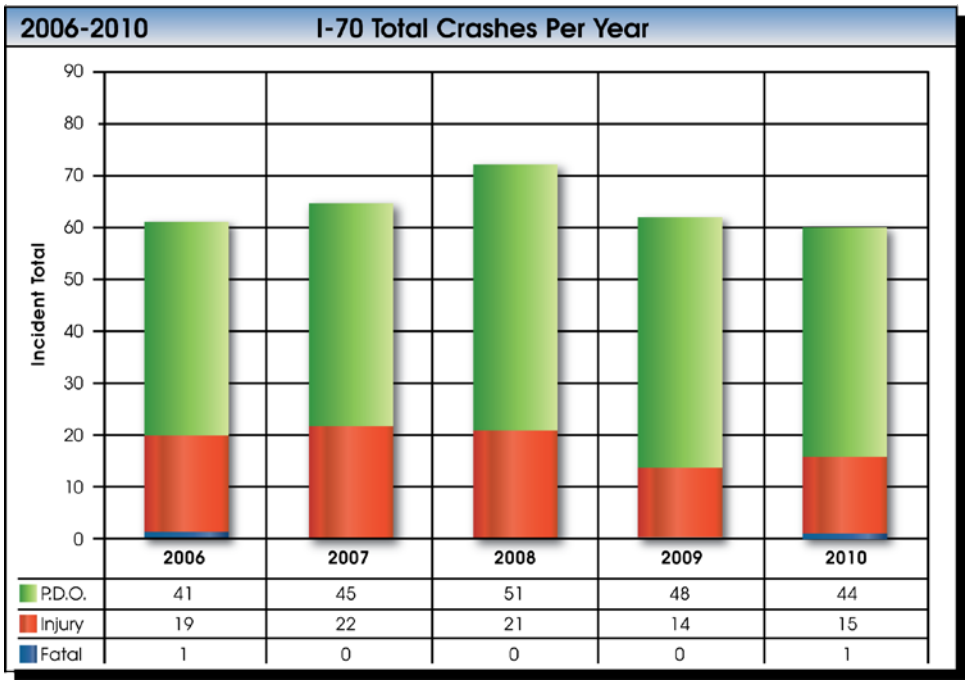
Table C-5
Crash Type Table

2006-2010 I-70 Crash Data		
Crash Type	Number	Percentage
Fixed Object	186	57%
Rear End	52	16%
Sideswipe	52	16%
Other	34	10%
Total	**324**	**100%**

Crash Severity

Figure C-10 shows the number of crashes by crash severity along I-70 in the study area. As can be seen in the graph, the majority of the accidents in the study area are property damage only crashes.

Figure C-10
Crash Severity



	2006	2007	2008	2009	2010
P.D.O.	41	45	51	48	44
Injury	19	22	21	14	15
Fatal	1	0	0	0	1

Summary of Crash Analysis

In summary, the crash data indicates that the study area has a higher total crash rate in comparison with statewide average crash rates for similar types of highways. High concentrations of crashes can be observed within the merging and diverging areas, especially in the downtown Kansas City, KS interchange core. Fixed object crashes are the highest occurring crash type in the study area.

Potential mitigation measures for the types of crashes occurring in the study area would focus on:

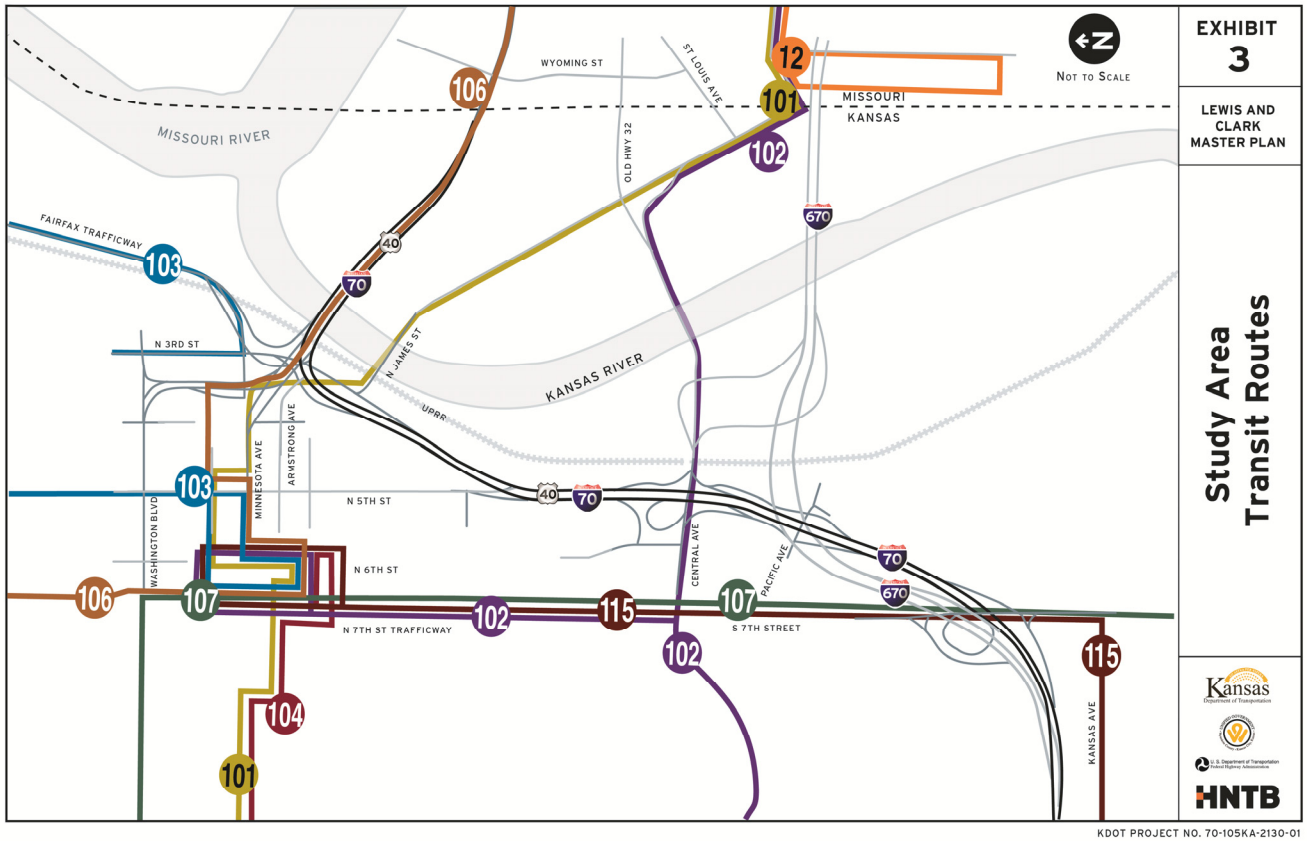
1. Adding shoulders to I-70;
2. Geometric changes to allow for consistent speeds;
3. Eliminating/minimizing conflict points with improved weaving, merging and diverge locations; and
4. Relocating fixed objects from the traveled way.

3.3 Existing Transportation Enhancements

Transit

Currently transit services are provided by the Unified Government Transit (UGT) and Kansas City Area Transit Authority (KCATA). Current 2012 routing is shown in **Figure C-11**. In 2008 the State Avenue Alternatives Analysis recommended an enhanced bus service and ultimately Bus Rapid Transit. Today the UGT operates 5 peak vehicles on 5 fixed routes serving 650 riders each weekday and the KCATA operates 9 peak vehicles on 5 fixed routes serving 4,420 riders each weekday and 1,510 on weekends.

Figure C-11
Existing Transit Routing



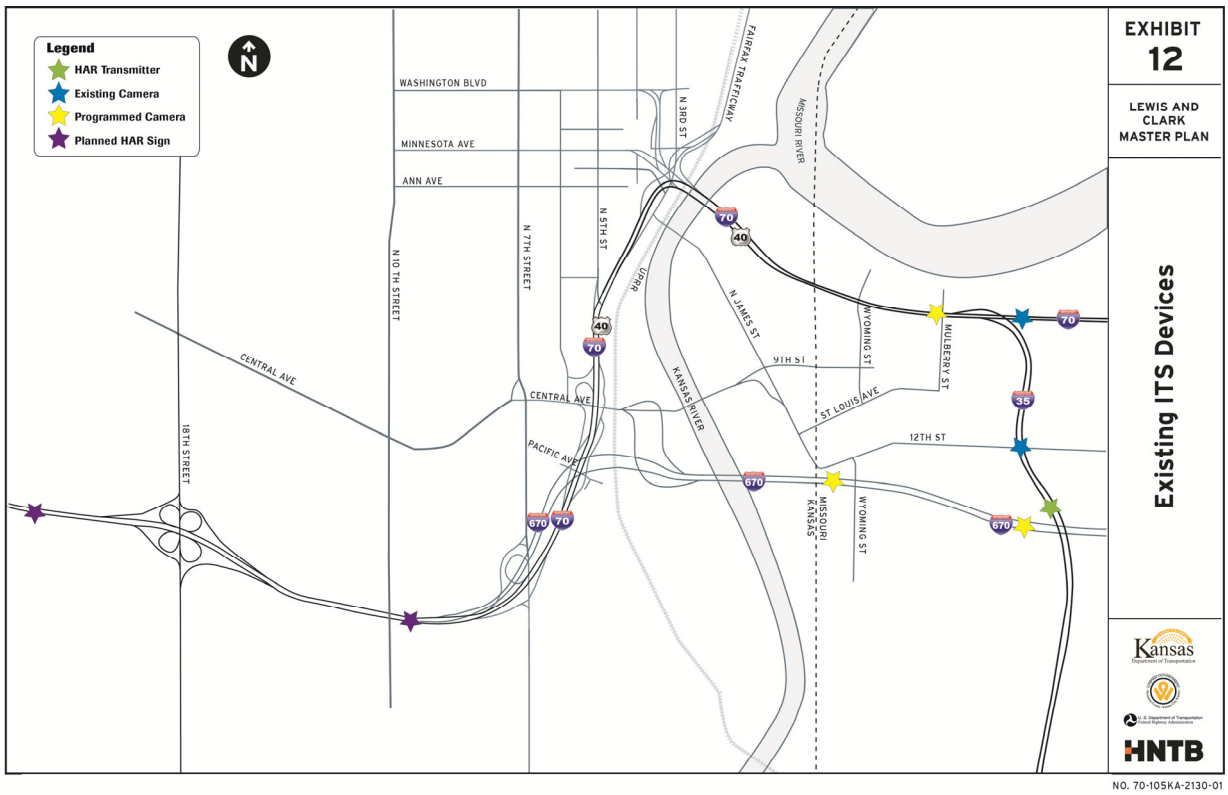
Source: KCATA 2012

Intelligent Transportation Systems

Existing ITS devices are shown in **Figure C-12**. Existing conditions for ITS show that its uses are currently limited as recurring congestion is not a problem and I-670 is a good parallel

diversion route. The ITS on this section of I-70 will be improved soon as the U.S. DOT mandates that all traffic flow information be available in real-time for all urban interstate sections by November 8, 2014. Potential Improvements for the corridor include CCTV cameras, vehicle detection and dynamic message boards. ITS can help mitigate traffic incidents that reduce capacity on the freeway.

Figure C-12
Existing ITS



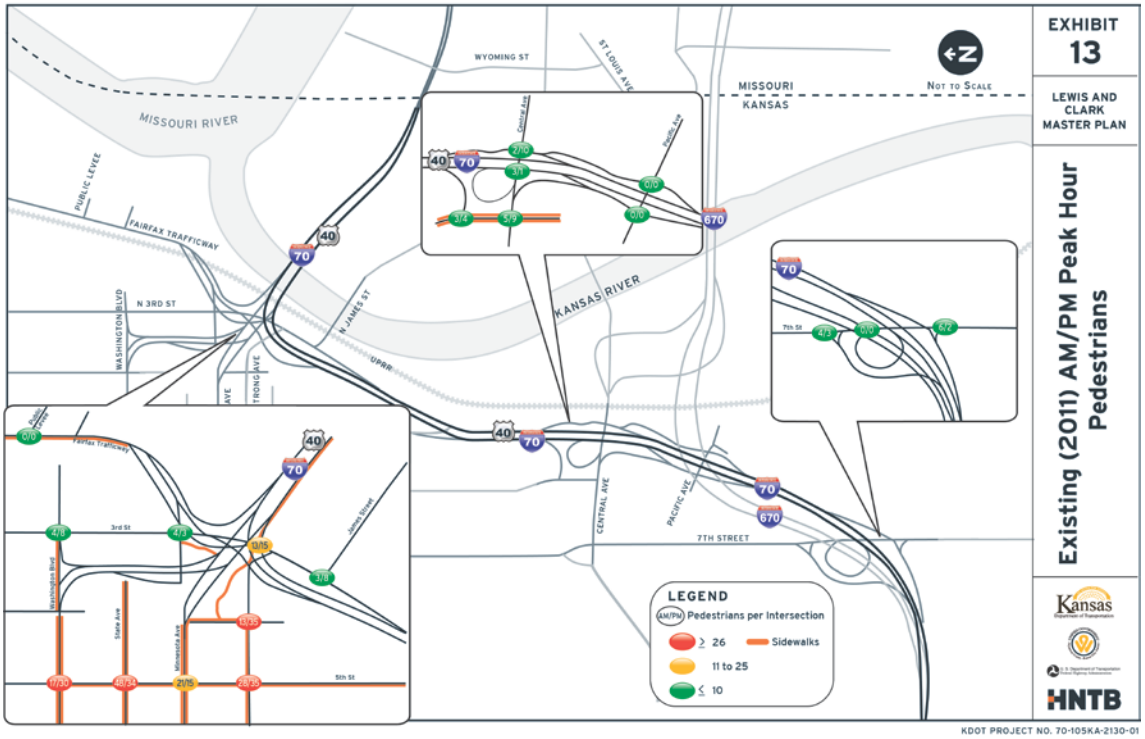
KDOT is planning in 2012 (Project No. 70-105 KA-1503-01) to install a CCTV pole, camera and radar vehicle detection on a new pole to be located on the east side of eastbound I-70 before the I-70 curve onto the Lewis and Clark Viaduct. The pole is to be located 426' east (north) of RP 423.4. Fiber is supplied by a splice into the existing Century Link fiber splice vault under the eastbound Washington Boulevard ramp to eastbound I-70. KDOT is also planning to install a camera and a digital message sign on the new westbound bridge. This layout will be included on the new westbound bridge plans for Concept 1-B.

Bicycle & Pedestrian

There are a number of bicycle & pedestrian trails, sidewalks and paths that cross through the Lewis and Clark Viaduct project study area. The Riverfront Heritage Trail is a major generator

for bicycle & pedestrians in the study area. When traffic volumes were collected during the peak hours at the study intersections, bicycle & pedestrian demand was also collected. **Figure C-13** shows the existing bicycle & pedestrian demand at the study intersections. As shown, the highest concentrations of bicycle & pedestrian demand are located along 5th Street and Armstrong Avenue. These intersections carry bicycle & pedestrian traffic between the Riverfront Heritage Trail, Strawberry Hill neighborhood and Downtown Kansas City, Kansas.

Figure C-13
Existing Peak Hour Bicycle & Pedestrians Demand



Field Observations

A field review of the study area was performed and several observations of the existing conditions were made. First, there is sufficient roadway capacity in the area. In most locations there is plenty of roadway capacity for vehicles and there were no backups or vehicle queues observed. Second, throughout the study area there are numerous tight turns, curves and weaves. The Washington/Minnesota merge to eastbound I-70 is of particular concern due to the number of accidents in this location. Third, local connectivity is poor and unfamiliar drivers have trouble accessing their destinations.

3.4 Future No-Build

Future No-Build conditions assume leaving the area "as is" except for committed projects; essentially answering the question, "How will this study area function in the future with no changes to the existing roadway configuration?" The following section helps answer this question by gaining an understanding of regional population and employment forecasts, future traffic demand, level of service, future safety and planned or committed transportation enhancements.

Regional influences are those factors which could change or modify the traffic demands in the study area in the future. These regional influences can have a direct impact on future population and economic forecast data.

- **MARC LRTP** - In June 2010, the MARC Board of Directors adopted a new long-range transportation plan — Transportation Outlook 2040 — which will guide $18 billion in multimodal investments in the bi-state region over the next three decades. This important plan outlines a new vision for how transportation investments will relate to land use in the future. MARC established a broad set of policy goals for the plan — ranging from transportation's impacts on climate change and energy, to place making, to the condition of existing transportation systems. Transportation Outlook 2040 reflects current local government plans and describes a regional land-use strategy that supports activity centers and connected transportation corridors. Transportation Outlook 2040 was developed through an extensive public outreach process that spanned two years and involved thousands of elected officials, planners, businesses, community organizations and citizens across the region.

- **Downtown Master Plan –** Approved in 2007, the Unified Government's Downtown Master Plan is the blueprint of how the Unified Government would like to see Downtown prosper. The Plan's Vision statement purposes to:

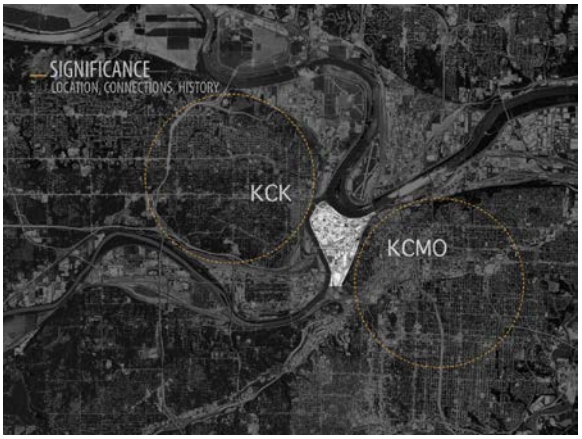
  Create a vibrant downtown that is diverse – economically, physically and culturally – in its function and unique in its context, seizing the opportunities created by its location and people.

Figure C-14
Downtown Master Plan

Figure I-2: Downtown Master Plan Map
Source: Gould Evans Associates

The Downtown Master Plan (shown in **Figure C-14**) was developed to address land use and transportation issues. Within the study area, the Mobility Framework defines how people using different modes of transportation will access and move throughout Downtown. The mobility framework has two primary functions.

- Create an integrated, multi-modal mobility system that includes all modes of transportation with parking; and
- Create a balanced mobility system that serves the downtown



Source: Kansas City Design Studio

This area lays between the downtowns of the two Kansas Cities, is on the confluence of the Kansas and Missouri Rivers, and was the original economic and industrial center for Kansas City, MO.

and connects it to other areas of the city, country and metropolitan area.

- **West Bottoms Plan -** The KCDC Studio worked with stakeholders in the local government and community to develop an urban vision for the West Bottoms. The plan was built off the significance and potential of the area, recognizing that the West Bottoms could play a key role in the development of wider Kansas City, but also seeking to emphasize the character and identity that is specific to this place. The Plan seeks to balance

  scales of urban action through strategic interventions. The Plan's intent is to establish critical connections through surgical actions, while maintaining industry and allowing for the "organic growth" that has given the area its character. (http://studio.kcdesigncenter.org/urbanvision/comprehensive-plan/)

The MARC LRTP developed a policy statement to provide guidance for the region's population and growth forecast, and to set a policy agenda to support the region's land-use strategy. The growth and land-use strategy was developed through extensive analysis of local plans, review by local officials and public input. It presents a vision for the future that is rooted in the objectives and strategies contained in local comprehensive plans, and it reflects the concerns and aspirations of the region's citizens. The following policy statements are aimed at fostering implementation of the growth and land-use strategy for a project like the Lewis and Clark Viaduct.

- Create local plans for new development and redevelopment that establish targets and clearly define priority areas.
- Give priority to funding transportation projects that serve activity centers along locally identified corridors.
- Use public policies and investments to focus development where it can be served most efficiently and affordably.
- Increase levels of transit service along priority corridors.
- Develop new and innovative incentive packages to achieve redevelopment implemented at the local level.

The population map below is from the MARC Travel Model and shows the way population is expected to have grown and changed by the year 2040 based on MARC's LRTP.

Figure C-15 uses colors to show the areas where the population in the region is expected to change.

Figure C-15
Future 2040 Population Change Map

Source: MARC LRTP 2040

As shown, redevelopment around the project area is expected to comprise much of the redevelopment in the urban core. In the Unified Government, redevelopment along the State Avenue corridor will play an important role in the County's growth in population and employment. In Kansas City, Missouri, redevelopment in downtown and the Crossroads to the south will have an impact on study area traffic growth also.

Table C-6 below is the population and employment changes which are forecast to take place by the year 2040 in Downtown Kansas City, Kansas.

Table C-6
Population and Employment Forecast

Downtown Kansas City, Kansas Population and Employment in 2010 and 2040						
	Total Population	Households	Total Employment	Retail	Services	Other Employment
2010	13,900	4,600	23,100	2,200	11,200	9,700
2040	13,700	4,700	22,600	1,900	12,600	8,100
Change	(200)	100	(500)	(300)	1,400	(1,600)

Source: MARC LRTP 2040

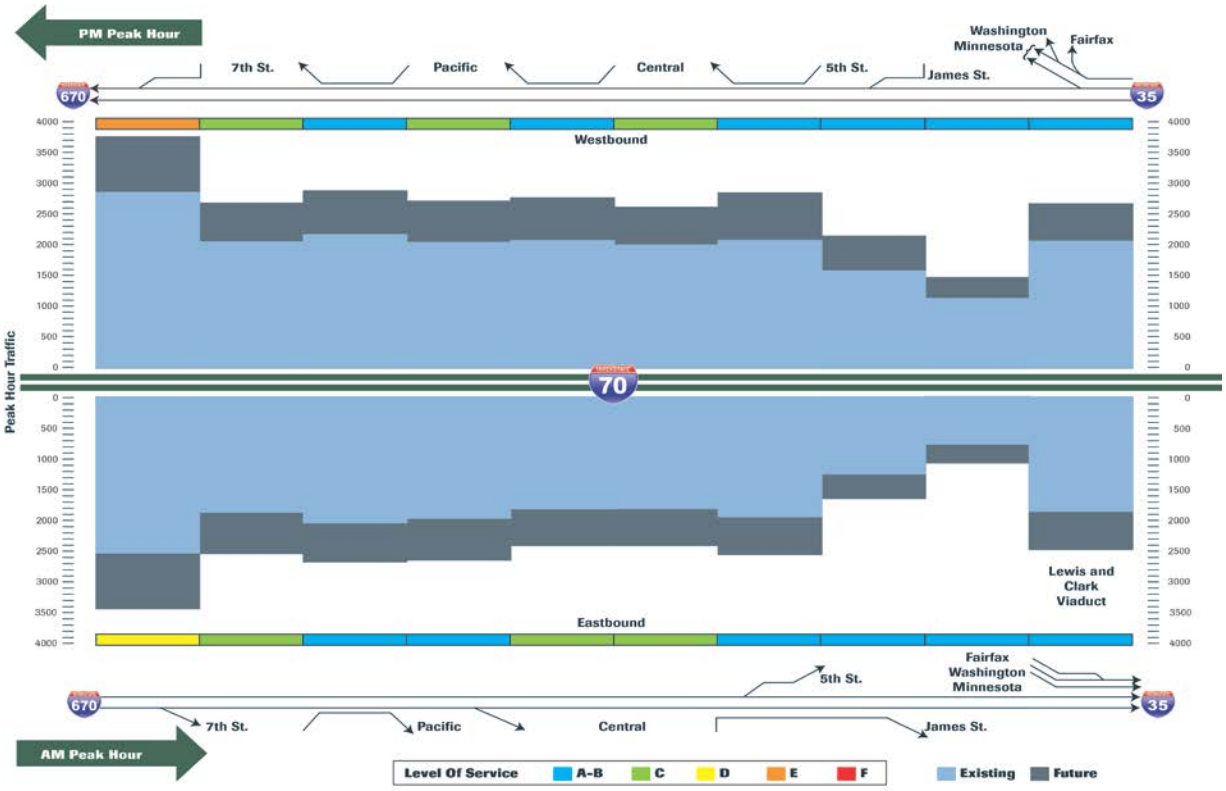
Table C-6 shows minimal growth in population and employment in Downtown Kansas City, Kansas. However, as shown above, redevelopment growth is expected to occur in the urban areas surrounding downtown Kansas City, Kansas.

When analyzing future No-Build conditions, committed projects in the area were taken into consideration. In the case of this study area, there are no committed improvements other than normal maintenance. Consequently, the current roadway is assumed to be the same roadway in the year 2040 for the No-Build condition.

3.5 Future No-Build Traffic

The forecasting methodology section of this report outlines the approach used to develop the Future No-Build traffic forecast. **Figure C-16** is a summary of the existing peak hour volumes, LOS and lane geometrics.

Figure C-16
Future 2040 No-Build Traffic and Level-of-Service



As shown in the figure:

- Corridor traffic demand averages 2,800 vehicles in the peak hour in the peak direction with a high of 3,800 vehicles at the west end and a low of 1,100 vehicles at the I-70 eastbound single lane curve. This represents an average increase of 33 percent from existing conditions.

- Level of service is primarily in the range of A through C with a few isolated LOS D/E segments. The worst LOS areas include:
    - LOS E at the west end near 7th Street in the westbound direction during the PM peak hour
    - LOS D at the west end near 7th Street in the eastbound direction during the AM peak hour

- Existing lane geometrics issues (same as existing conditions) include:
    - Eastbound 5th Street off-ramp left exit
    - Eastbound I-70 single lane mainline

3.6 Future No-Build Safety

Table C-7 shows that the crashes per year that are estimated to occur in the future by using the current crash rates with future 2040 No-Build volumes.

Table C-7
I-70 Future No-Build Crash Rates (Per Year)

2040	I-70 Crash Rates					
Section	Location	Freeway Section	Statewide Highway Crash Rate	I-70 Crash Rate	Ratio	Total No. of Crashes
A	I-70 – I-670 Split to EB James St. Exit Gore	4 Lane Divided	1.20	**1.30**	1.1	47
B	I-70 – EB James St. Exit Gore to the State Line	6 Lane Divided	1.41	**2.19**	1.6	44

Table C-7 shows that the crashes per year are expected to increase from roughly 69 crashes per year over the entire I-70 corridor to 91 crashes per year over the entire corridor. This is due to the increase in vehicle miles traveled (VMT) from 2011 to 2040.

3.7 Transportation Enhancements

Bicycle & Pedestrian

In an effort to respond to a variety of challenges, make the most of regional assets, and realize the transportation vision, there were a number of major strategies that were developed to guide regional transportation planning and investment activities over the next 30 years. One strategy focused on bicycles and pedestrians as a way to promote non-motorized transportation options. This strategy would:

- Require transportation investments to consider and include accommodations for all appropriate users, including bicycle, pedestrian and transit users.
- Work with MARC transportation committees and local stakeholders to create a policy for multimodal design considerations to support MARC's planning and programming processes.

Transit

There are planned changes to the current transit network. KCATA returned 101 Minnesota/State to the Lewis and Clark Viaduct in 2012 and headways were standardized from 20-40 minute headways to consistent 30 minute headways throughout the day.

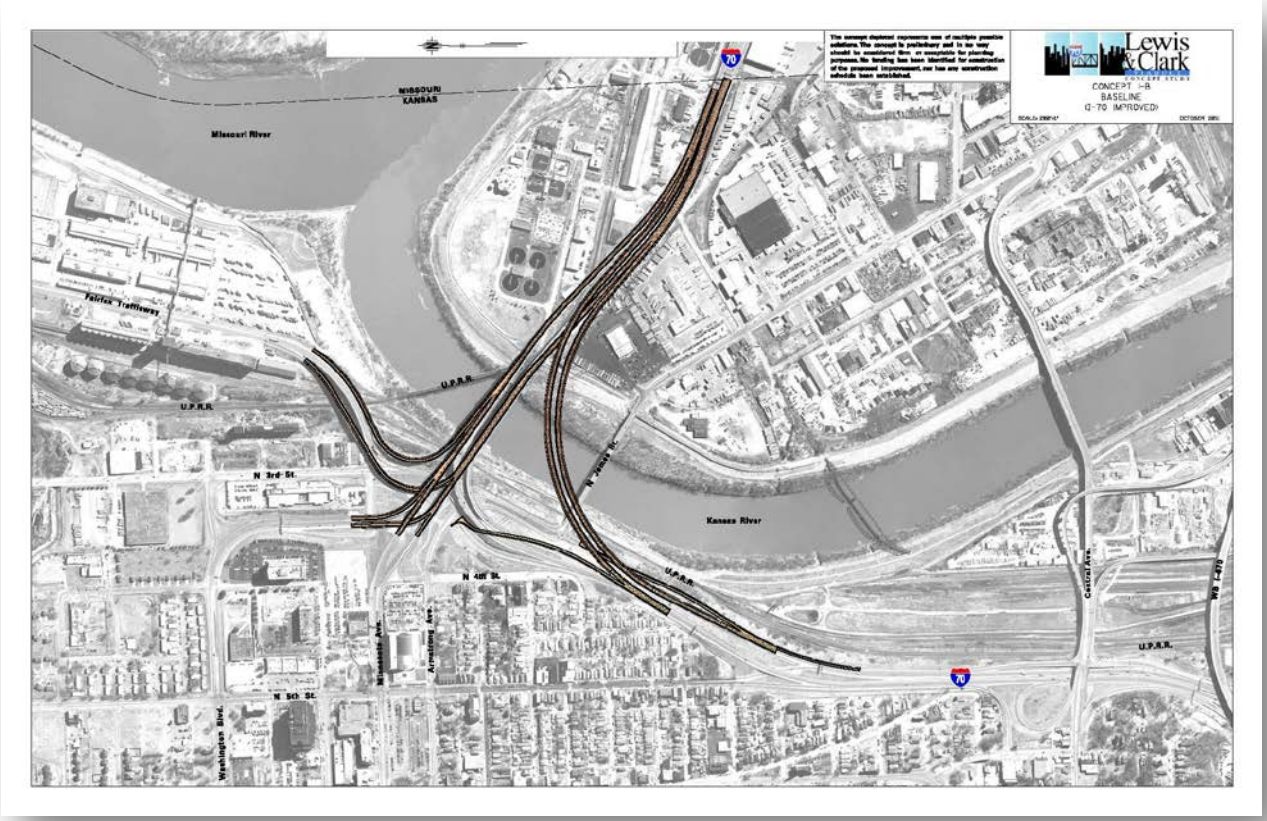
Intelligent Transportation Systems

The ITS on this section of I-70 will be improved to comply with the U.S. DOT mandate that all traffic flow information be available in real-time for all urban interstate sections by November 8, 2014. Also there is the potential for the corridor to include CCTV cameras, vehicle detection and dynamic message boards. ITS can help mitigate traffic incidents that reduce capacity on the freeway.

4.0 Future Build Conditions

The Lewis and Clark Viaduct Concept Study recommended Concept 1-B as the Preferred Concept as shown in **Figure C-17**. This section provides a summary of how the Preferred Concept performs from a transportation planning perspective.

Figure C-17
Build Concept 1-B



4.1 Future Build Concept 1-B

The Future Build Concept 1-B (shown in **Figure C-17**) has the same traffic characteristics as the Future No-Build Concept including:

- Traffic volumes;
- Surface roadway network (not freeways);
- Signal timings;
- Bicycle & pedestrian volumes and pathways.

The primary difference in the two concepts is the configuration of the I-70 main lanes as they cross the Kansas River between the Central Avenue Interchange and State Line. This section of interstate is now two lanes in the eastbound as well as the westbound direction and the

design speed is increased from 35 mph to 55 mph in the Preferred Build Concept 1-B. The Build Concept 1-B configuration results in several ramp revisions which include:

- Improved configuration for the Minnesota, Washington, and Fairfax on- and off-ramps by increasing acceleration and deceleration lane lengths and improved signage;
- Ramp lane continuity has changed to provide one lane instead of two for the Washington Boulevard westbound off-ramp and two lanes instead of one for the Minnesota westbound off-ramp.

4.2 Traffic and Safety

Since the Concept 1-B configuration changes only slightly from the No-Build Concept, level of service between the Future Build and Future No-Build is almost the same. The reason for this is that even under the Future No-Build Scenario the facility operates at a good level of service due to low traffic volumes for the available capacity, which is a function of the additional capacity of the parallel facility I-670. Some notable segments include:

- Although the Highway Capacity Manual does not recognize a level of service associated with a one-lane freeway, the No-Build I-70 eastbound curve operates at LOS C and the Build operates at LOS A with two eastbound lanes.
- The westbound I-70 mainline section west of 7th Street operates at LOS E in both the No-Build and Build. This is outside of the study area and any improvement to this would require reconstruction of the I-670 entrance gore to I-70 westbound.
- The 6th Street & Central intersection is the only location with an unacceptable level of service in the Build condition. This unsignalized intersection operates at a LOS E in both the Build and No-Build with only the southbound left turn operating at LOS E.
- The weave segment of freeway between the Central Ave and the James Street operates at an acceptable LOS in both the eastbound and westbound directions in Concept 1-B, as does the No-Build.

Travel Time

Concept 1-B decreases the travel time on I-70 mainline as well as decreasing the travel time to/from Fairfax and downtown Kansas City, Kansas. Total system-wide travel time decreases by roughly 5% in the VISSIM network as compared to the Future No-Build.

Bicycle & Pedestrian

Concept 1-B is anticipated to maintain the same bicycle & pedestrian accommodations that currently exists. Concept 1-B does not preclude future improvements to bicycle and pedestrian accommodations within the study area or along the levee.

Safety

Concept 1-B addressed many of the safety problems identified during Phase 1 of the Concept Study. Improvements to the curvature of the I-70 mainline and an additional eastbound mainline lane will likely reduce the number of accidents at the high accident locations on both of the current I-70 sharp mainline curves. Taking into account future 2040 Build Concept 1-B volumes increasing from 2011 to 2040 and the geometric design standards being improved the total number of crashes per years is expected to be 72 crashes per year. This is a reduction compared to the 91 Future No-Build Concept and roughly the same as the 69 crashes per year in existing conditions.

Lane Continuity

By improving the eastbound I-70 curve to two lanes, the total number of lanes on the I-70 mainline is the same in both directions. The westbound I-70 flyover mainline will curve to the left (south) as it does today.

Circulation / Wayfinding

No improvements to the existing local surface streets are made with Concept 1-B. As a result, the shortcomings related to circulation and wayfinding associated with the local street network in the existing and Future No-Build conditions remain with Build Concept 1-B.

Transit

Concept 1-B does not directly include any transit improvements. However, the addition of the two lane westbound off-ramp to Minnesota will decrease the travel time of the State Avenue CONNEX buses that link downtown Kansas City, Missouri and Kansas City, Kansas.

ITS

Although no cameras or detectors are a part of Concept 1-B at this time, there are plans for highway electronic guide signs at 18th Street Expressway to help drivers choose between I-70 and I-670. A more detailed ITS plan has been developed and is available separately.

Reserve Capacity

In 2040, the freeway operates with minimal congestion problems due to the parallel I-670 facility that provides a relief valve. The scope of the project entailed determining how much additional capacity the Preferred Concept could accommodate. The future volumes were determined using the 2040 volumes and growing only the freeway mainline through traffic at a constant 0.5% growth per year. Due to the minimal congestion that exists in 2040 and the low growth rate in

the corridor, percentages are referenced for the reserve capacity instead of years. It was determined that the freeway mainline through traffic could increase over 50% and continue to operate at a good LOS through the improved area. However, a 100% increase in traffic volumes result in the westbound mainline breaking down at 7th Street in the PM peak hour due to the short merge lane for the on-ramp. This in turn resulted in the mainline queuing through the study area to the north.

Sensitivity Analysis

The purpose of the sensitivity analysis was to determine how close the flyovers could be located to Central Avenue on the west end and the downtown loop ramps on the east end. The furthest west the flyovers were tested in VISSIM were adjacent to the 5th Street ramps. On the east end, the flyovers were tested in VISSIM adjacent to state line. It was found that as long as the flyover ramps remain in Kansas, the freeway operates acceptably.

5.0 Conclusions and Recommendations

The existing conditions traffic analysis shows that the interchange currently operates at an acceptable level of service. Today there are no segments that operate worse than a LOS C. This is in large part due to the parallel I-670 freeway corridor. Although the LOS is acceptable, safety remains a concern throughout much of the corridor. Safety is a concern due to the short weave distances, tight curves, and short merge/diverge lanes along I-70.

Traffic volumes are expected to increase 33% from 2011 to 2040 which amounts to roughly 0.5% per year. This growth rate includes expected residential and commercial redevelopment in surrounding neighborhoods. Even with a 33% increase in traffic volumes by 2040, only one freeway segment (WB I-70 at 7th Street) operates at a LOS E in the 2040 No-Build Concept. The remainder of the corridor operates at LOS D or better.

Since the traffic volumes remain consistent between the 2040 No-Build Concept and 2040 Build Concept 1-B and the network is very similar, the operation of the freeway and arterial streets remains consistent with the No-Build Concept. However, safety will be improved due to the improved design of the short weave segments and tight curves which will lower the current crash rates. Concept 1-B is expected to have a significant amount of reserve capacity inherent in the design, operating adequately with an additional 100% increase in traffic beyond the 2040 design volumes.

Other transportation enhancements that will occur are ITS improvements that are planned for 2012. Concept 1-B does not preclude improvements to the bicycle and pedestrian network or circulation and way-finding improvements.

Appendix D

Lewis & Clark Viaduct
Additional Environmental Evaluation

1.0 Introduction

This appendix to the Lewis and Clark Viaduct Concept Study report contains a breakdown, by topic, of the environmental issues, constraints and conceptual impacts within the Lewis and Clark Viaduct interchange study area. Also attached (on pages **D-8 to D-22**) is documentation of the Preliminary Environmental Review performed by KDOT's Environmental Services Section during this study.

2.0 Existing and Known Environmental Issues/Constraints

Major environmental resources identified for the project area include:

- Significant community resources – Strawberry Hill Museum and Cultural Center, St. John the Baptist Catholic Church, Reardon Civic Center, Hilton Garden Inn, First Baptist Church.

- Neighborhoods – Strawberry Hill, Gateway Plaza.

- Major governmental facilities - Environmental Protection Agency (EPA) Lab and Region 7 Offices, Housing and Urban Development Offices, U.S. Social Security Administration, U.S. District Court.

- Listed and potentially eligible National Register of Historic Places –
  - Historic: No NRHP listed sites within project area; eight (8) NRHP eligible as contributing resources in a potential historic district within the Strawberry Hill Neighborhood, including the Strawberry Hill Museum, the St. John the Baptist Catholic Church and several residences. The St. John's Orphanage/Scroggs House is also included and is currently listed in the Register of Historic Kansas Places. One (1) abandoned Kansas City Southern railroad bridge over the Kansas River is also potentially eligible for the NRHP. The bridge is currently included on the "Historic and Notable Bridges of the U.S." list.
  - Archaeology – Phase I investigation completed and project clearance granted by the Kansas State Historical Society. However, if any buried resources are discovered during

future construction phases, the remains should be left in place and the State Archaeologist should be contacted immediately.

- Streams – Kansas River (designated by the Kansas Department of Health & Environment as a Special Aquatic Life Use Water (S); designated by the Corps of Engineers as a jurisdictional stream; not designated by the U.S. Coast Guard as a navigable waterway).

- Floodplains – Federal Emergency Management Agency (FEMA) flood insurance maps show 100-year Zone AE floodplain for the Kansas River.

- Levees – The levee units at and immediately upstream of the project area are Central Industrial District (CID) Kansas and Armourdale, both under the jurisdiction of the Kaw Valley Levee District. In addition to the levee district, the Corps of Engineers provides engineering oversight and review of anything related to the levees and their function.

- Major wetland and/or habitat complexes associated with the Kansas River – National Wetlands Inventory Mapped Wetlands and Waters of the U.S. map indicate two (2) emergent wetlands. The emergent wetlands may have become forested wetlands. A decision on whether the wetlands are Corps of Engineers' jurisdictional wetlands will be determined after wetland delineations are performed in future, more detailed design phases of the project.

- Public parks – Kaw Point Riverfront Park, St. John's Park.

- Threatened and endangered species –
  - Federal (Wyandotte County): Pallid Sturgeon listed by U.S. Fish and Wildlife Service (USFWS) as endangered species and is known to inhabit the Missouri River and may inhabit the Kansas River during times of high flows. The USFWS has designated no critical habitat for the Pallid Sturgeon in Kansas.
  - State (Wyandotte County): Kansas Department of Wildlife and Parks lists the American Burying Beetle, Chestnut Lamprey, Eastern Spotted Skunk, Eskimo Curlew, Flathead Chub, Least Tern, Pallid Sturgeon, Piping Plover, Redbelly Snake, Sicklefin Chub, Silver Chub, Silverband Shiner, Smooth Earth Snake, Snowy Plover, Sturgeon Chub, and Western Silvery Minnow as threatened and endangered species in Wyandotte County. Of these species, the Chestnut Lamprey, Flathead Chub, Least Tern, Pallid Sturgeon, Piping Plover, Redbelly Snake, Sicklefin Chub, Silver Chub, Silverband Shiner, Smooth Earth Snake, Sturgeon Chub, and Western Silvery Minnow have state designated critical habitat in Wyandotte County. However, since suitable sand bars and woodland tracts are not currently found to be present within the project area, the Least Tern, Piping Plover, Smooth Earth Snake and Redbelly Snake are unlikely to be found within the project area. These findings will be reassessed during future design and NEPA phases of the project.

- Major trail systems – Riverfront Heritage Trail, MetroGreen Future Trails along Kansas River levees.

- Major hazardous material sites – An active BP gas station with three underground storage tanks and two pump islands; a vacant commercial site, J&J Metals with potential soil contamination; active and abandoned grain elevators with possible soil contamination; active wastewater treatment plants.

- Designated EPA Environmental Justice areas of concern - Section 8 Housing is located on the north side of Washington Boulevard, between 4th and 5th Streets. Gateway Plaza Townhomes is a family low income housing complex subsidized by the Housing and Urban Development Division. This housing development also includes Gateway Park, which contains a baseball field with bleachers and a playground area. The Environmental Protection Agency lists the residential areas within the project area as 40%-100% minority population; and 20%-30% below poverty level in Strawberry Hill neighborhood and 40%-100% below poverty in the Gateway Plaza neighborhood (2010 U.S. Census demographics information).

- Railroads – Union Pacific Railroad.

- Potential sensitive noise receptors – Strawberry Hill neighborhood, St. John the Baptist Church, Gateway Plaza Neighborhood.

- Permits –
  - Corps of Engineers' Section 404 permit if fill placed below the ordinary high water mark;
  - Kansas Department of Agriculture, Division of Water Resources' (DWR) Stream Obstructions or Channel Changes permit if construction or modifications of culverts or bridges, or changes made to the cross sections of a DWR jurisdictional stream channel.
  - Kansas Department of Wildlife and Parks Action permit for any work conducted within the Kansas River. The permit relates to designated critical habitat and spawning periods for threatened and endangered species.
  - Kansas Department of Agriculture, Division of Water Resources' Floodplain Fills permit for fills averaging over 1 foot in height placed within the 100-year floodplains of streams, with drainage areas over 240 acres.
  - Corps of Engineers' Section 408 permit if flood control levees for the Kansas River are impacted by the project. The Kansas City District Corps of Engineers has jurisdiction within the project area.
  - U.S. Coast Guard Section 9 Bridge permit is not currently anticipated to be required, but the Coast Guard requests to review bridge plans during the design phases of the project.

3.0 Preferred Concept Environmental Impacts

A summary of the potential environmental impacts identified for the Concept 1-B include the following:

- No direct impacts to significant community resources would be required, including the Strawberry Hill Museum and Cultural Center, St. John the Baptist Catholic Church, Reardon Civic Center, Hilton Garden Inn, and the First Baptist Church.

- No direct impacts to the neighborhoods of Strawberry Hill or Gateway Plaza would be required. Additional right-of-way could be required for the modified ramp from Armstrong Avenue to I-70 eastbound. However, a retaining wall could be constructed to minimize or eliminate right-of-way takings. No displacements to residences in the neighborhoods would be required.

- No direct impacts to the major governmental facilities within the project area would be required, including the Environmental Protection Agency (EPA) Lab and Region 7 Offices, Housing and Urban Development Offices, U.S. Social Security Administration, and U.S. District Court.

- Listed and potentially eligible National Register of Historic Places –
  - Historic: No NRHP listed or eligible sites within project area would be acquired due to the proposed project concept that would result in an adverse effect to an historic resource. However, as the project moves forward into subsequent design and NEPA phases, monitor for potential visual and noise impacts to eligible resources, including those contributing resources in the potential historic district within the Strawberry Hill Neighborhood, including the Strawberry Hill Museum, the St. John the Baptist Catholic Church, the St. John's Orphanage/Scroggs House, and several residences.
  - Archaeology – Phase I investigation completed and project clearance is granted by the Kansas State Historical Society. However, if any buried resources are discovered during future construction phases, the remains should be left in place and the State Archaeologist should be contacted immediately.

- Kansas River and Floodplains - As the project moves forward, there will be several potential impacts to the Kansas River and its 100-year floodplain that will need to be evaluated as a result of the Preferred Concept. Near the eastern limits of the project area the Preferred Concept will likely require additional right-of-way within the 100-year floodplain. If fills averaging over 1 foot in height are placed within the 100-year floodplain of the Kansas River, a Kansas Department of Agriculture, Division of Water Resources' Floodplain Fills permit will be required prior to construction.

Several other permits will also be required since the project requires work within the Kansas River to construct new bridge crossings. The following permits will likely be required as a result of the Preferred Concept:

- Corps of Engineers Section 404 permit if fill placed below the ordinary high water mark;
- Kansas Department of Agriculture, Division of Water Resources (DWR) Stream Obstructions or Channel Changes permit since construction and modifications of bridges.
- Kansas Department of Wildlife and Parks Action permit for work conducted within the Kansas River due to designated critical habitat and spawning periods for threatened and endangered species.
- If the Corps of Engineers flood control levees for the Kansas River are impacted by the project during construction, a Section 408 permit will be required. The Kansas City District Corps of Engineers has jurisdiction within the project area and should be coordinated with during subsequent design and NEPA phases of the project.
- U.S. Coast Guard Section 9 Bridge permit is not currently anticipated to be required, but the Coast Guard requests to review bridge plans during the design phase of the project.

- Wetlands and Wooded Areas - Due to the relocation of the I-70 eastbound and westbound river bridges, the emergent wetlands and some wooded areas will likely be impacted by the Preferred Concept and will require mitigation if determined to be jurisdictional by the Corps of Engineers. A determination by the Corps of Engineers on whether the wetlands are jurisdictional, and a more detailed wetland delineation and quantification of wetland impacts will be conducted during subsequent design and NEPA phases of the project.

- Threatened and endangered species – The replacement of the Lewis and Clark viaduct and the relocation of the I-70 eastbound and westbound river bridges will affect wooded areas on the east bank of the Kansas River and will require new bridge piers and work to be performed during construction within the Kansas River. One federal listed endangered species (Pallid Sturgeon) and several state listed threatened and endangered species could be impacted and require mitigation or avoidance of spawning periods during construction of the project. The state listed species include the American Burying Beetle, Chestnut Lamprey, Eastern Spotted Skunk, Eskimo Curlew, Flathead Chub, Least Tern, Pallid Sturgeon, Piping Plover, Redbelly Snake, Sicklefin Chub, Silver Chub, Silverband Shiner, Smooth Earth Snake, Snowy Plover, Sturgeon Chub, and Western Silvery Minnow as threatened and endangered species in Wyandotte County. Of these species, the Chestnut Lamprey, Flathead Chub, Least Tern, Pallid Sturgeon, Piping Plover, Redbelly Snake, Sicklefin Chub, Silver Chub, Silverband Shiner, Smooth Earth Snake, Sturgeon Chub, and Western Silvery Minnow have state designated critical habitat in Wyandotte County. Further investigations in these areas will be required in subsequent design and NEPA phases prior to construction. Since suitable sand bars and woodland tracts are not currently found to be present within the project area, the Least Tern, Piping Plover, Smooth Earth Snake and

Redbelly Snake are unlikely to be found within the project area. These findings will be reassessed during future design and NEPA phases of the project.

- Major trail systems – The Riverfront Heritage Trail will be impacted by the project. The Riverfront Heritage Trail is a recreational bike-pedestrian trail that is aligned through the I-70/Fairfax/Minnesota Avenue interchange area. It is also suspended under the east bound I-70 bridge over the Kansas River and continues under the east bound viaduct on-grade to Ohio Avenue, where it is then aligned adjacent to the south side of the viaduct. There is also a trailhead parking area at the interchange, under the bridge leading to Minnesota Avenue. Impacts to the trail due to the proposed reconstruction and relocation of the current I-70 eastbound river crossing and modifications to the existing interchange ramps will need to be evaluated during subsequent design and NEPA phases to determine the best options for relocating the trail connection across the river. The future MetroGreen trails should not be affected by the project since the floodplain levees will remain in-place.

- Public parks – The Preferred Concept will not require right-of-way from the Kaw Point Riverfront Park or the St. John's Park. If during the design phases of the project it is determined that right-of-way will be required from either park, a Section 4(f) Evaluation or *de minimis* Section 4(f) will need to be completed to determine the best options to avoid, minimize and mitigate park impacts.

- Major hazardous material sites – The Preferred Concept will not impact any known hazardous waste sites in the project area.

- Designated EPA Environmental Justice areas of concern – The Preferred Concept will not directly impact the Section 8 Housing located on the north side of Washington Boulevard, between 4th and 5th Streets and all existing access to area neighborhoods is being maintained within the Preferred Concept. In addition, there are no displacements of residential properties within the Strawberry Hill neighborhood. Consideration will need to be given to potential noise, air quality and visual impacts to these populations during future design and NEPA phases of the project.

- Railroads – Coordination with the Union Pacific Railroad will be required during design and construction of the river crossings since the reconstructed and relocated I-70 river bridges cross over existing Union Pacific trackage.

- Potential sensitive noise receptors – For this concept study, only high level information on potential sensitive noise receptors, such as residences and churches, was collected for the study. The Strawberry Hill neighborhood, St. John the Baptist Church, and Gateway Plaza Neighborhood are located in the project area for the Preferred Concept and considered sensitive noise receptors. There is potential that realigning the existing I-70 river crossings may reduce existing noise levels for residential properties near 4th Street in the Strawberry

Hill neighborhood. However, there is the potential for noise level increases at the point where the new I-70 river crossings tie in with the existing I-70 alignment west of the river, depending on additional right-of-way needs in this area. KDOT will perform more detailed noise analysis in subsequent design phases to determine noise impacts and noise mitigation needs.

MEMO

Kansas
Department of Transportation
Bureau of Design

DATE: October 4, 2011
TO: James Brewer, P.E., Engineering Manager, State Road Office
FROM: Scott Vogel, Chief, Environmental Services Section
RE: Preliminary Environmental Review
70-105 KA-2130-01
ACIM 0706(119)
Lewis and Clark Viaduct
Wyandotte County

A preliminary environmental review for the Lewis and Clark Viaduct study area was initiated based on the study area April 25, 2011 (Environmental Investigation Project Boundary). Environmental Services was requested to screen for noise, archeology, historic, streams, wetlands, wildlife, floodplains, and hazardous waste. The following is a summary of each environmental task evaluated.

NOISE: The project concept may meet the criteria of a Type I project (addition of through traffic lanes, significant change in horizontal or vertical alignment, the addition of auxiliary lanes, addition or relocation of interchange lanes or ramps). Traffic noise analysis will be required if the project meets Type I criteria. Design details are not available and the project is not funded for construction, however, preliminary screening for noise was conducted to identify potential impacted receptors if the project would meet Type I criteria.

The distance to the 66 dB noise level from the centerline of the nearest proposed traffic lane was estimated to determine the potential number of impacted residential receptors. Screening level modeling estimates this distance to be approximately 400 feet from I-70 and 50 feet or less from the other streets within the project study area boundary. Any residential receptors falling within this distance may be impacted by traffic noise. The screening level analysis assumes a flat level roadway and topography between the noise source and receptors. If the projects final design meets Type I criteria a detailed noise study must be completed.

ARCHEOLOGY - CLEARED: A Phase I archeological investigation was initiated on April 29, 2011. Based on the findings of this investigation the Kansas State Historical Society Archeologist recommended, and the State Historic Preservation Officer (SHPO) concurred, clearance of the project at the Phase I level. Due to the buried nature of these resources, ground disturbance of the area may encounter previously unknown sites. If any are discovered the remains should be left in place and the State Archeologist should be contacted immediately.

CULTURAL & HISTORICAL: The study area was initially evaluated utilizing data from the Wyandotte County Appraisers Office. Following the office review, an Activity I survey was conducted to photograph all structures potentially eligible for listing in the National Register of Historic Places (NRHP). The photographs were submitted to the State Historic Preservation Officer (SHPO) for review on September 22, 2011.

In a letter dated September 27, 2011 (attached) the SHPO identified eight properties that are eligible for the NRHP as contributing resources in a potential historic district. In addition, the St. John the Baptist Catholic

Church and the St. John's Orphanage/Scroggs House (currently listed in the Register of Historic Kansas Places) were determined individually eligible for the NRHP. The locations are shown on the attached Historic Structures map.

If the project would have an adverse effect on any of these properties, additional Section 106 consultation will be required. If any right of way is acquired from a property eligible for or listed in the NRHP, a Section 4(f) evaluation would be required.

STREAMS: The Kansas Department of Health & Environment Feb. 12, 2009 Kansas Surface Water Register classifies segment 1 of the Kansas River as a Special Aquatic Life Use Water (S). An S water is defined as, "Surface waters that contain combinations of habitat types and indigenous biota not found commonly in the state, or surface waters that contain representative populations of threatened or endangered species." The Kansas River is the only stream in the study area shown on the USGS topography map.

In Wyandotte County the Kansas Department of Agriculture, Division of Water Resources (DWR) has jurisdiction over streams with drainage areas over 240 acres. Construction or modification of culverts or bridges, or changes made to the cross sections of DWR jurisdictional stream channels requires Stream Obstructions or Channel Changes permits from the DWR.

The Kansas River is a Corps of Engineers (COE) jurisdictional stream and a Section 404 permit will be needed for fill placed below the ordinary high water mark. Currently, if the area of fill below ordinary high water is over 1/10 acre stream mitigation would be needed.

In a telephone conversation with the Eighth Coast Guard District, St. Louis, Mo. on April 25, 2011, Dave Stutt, US Coast Guard, said that a Coast Guard bridge permit would not be required for a bridge over the Kansas River at this location. The Coast Guard requested to review bridge plans to confirm that a Coast Guard bridge permit would not be needed.

WETLANDS: The attached National Wetlands Inventory Mapped Wetlands and Waters of the U.S. map illustrate wetlands mapped by the US Fish & Wildlife Service (USFWS). The National Wetlands Inventory (NWI) map shows two emergent wetlands located on the east bank of the Kansas River within the study area. In more recent aerial photographs it appears that trees have taken over those areas. The emergent wetlands shown on the NWI map may have become forested wetlands. National Wetlands Inventory mapped wetlands may or may not qualify as COE jurisdictional wetlands when wetland delineations are performed using the methods described in the US Army COE Interim Regional Supplement to the COE Wetland Delineation Manual: Midwest Region. Wetlands may have developed in other low or poorly drained areas not shown on the NWI map. Placement of fill in COE jurisdictional wetlands requires Section 404 permits from the COE. Currently, mitigation would be required for wetland impacts over 1/10 acre.

WILDLIFE:
Federal: In Wyandotte County the USFWS lists the endangered Pallid Sturgeon. Information from the USFWS indicates the Pallid Sturgeon inhabits the Missouri River and may inhabit the Kansas River during times of high flows. The USFWS has not designated critical habitat for the Pallid Sturgeon in Kansas.
State: In Wyandotte County the Kansas Department of Wildlife and Parks (KDWP) lists the following threatened or endangered species: American Burying Beetle, Chestnut Lamprey, Eastern Spotted Skunk, Eskimo Curlew, Flathead Chub, Least Tern, Pallid Sturgeon, Piping Plover, Redbelly Snake, Sicklefin Chub, Silver Chub, Silverband Shiner, Smooth Earth Snake, Snowy Plover, Sturgeon Chub, and Western Silvery minnow.

Table I. State threatened or endangered species in Wyandotte County with designated critical habitat (DCH), DCH description, and spawning date restrictions.

Species name	Designated critical habitat	Spawning date restrictions
Chestnut Lamprey	Missouri River	April 15 – November 15
Flathead Chub	Kansas River	July 1 – Aug. 15
Least Tern	Kansas River sandbars	June – July (nesting period)
Pallid Sturgeon	Missouri River	June 1 – July 31
Piping Plover	Kansas River sandbars	June – July (nesting period)
Redbelly Snake	Suitable woodland habitat	NA
Sicklefin Chub	Missouri River	May 1 – June 30
Silver Chub	Kansas River	Apr. 1 – May 31
Silverband Shiner	Missouri River	July 1 – Aug. 15
Smooth Earth Snake	Suitable woodland habitat	NA
Sturgeon Chub	Kansas & Missouri Rivers	May 1 – June 30
Western Silvery Minnow	Missouri River	June 1 – Aug. 15

Due to state threatened and endangered species in the Kansas River an Action Permit from KDWP will be needed for any work in the water. The KDWP conditions Action Permits to restrict work in the water during the spawning periods of threatened or endangered fish. Least Terns and Piping Plovers are shore birds that require barren sand bars for nesting and foraging. Recent aerial photographs of the study corridor do not show the presence of barren sandbar habitat in the study area. Redbelly Snakes and Smooth Earth Snakes prefer old growth oak forest. It is unlikely the wooded areas in the study area would be considered suitable Redbelly Snake or Smooth Earth Snake habitat due to being isolated from other suitable woodland tracts in which the snakes may be found, and being located within the floodplain.

FLOODPLAINS: The attached Federal Emergency Management Agency flood insurance rate map 2003630030A shows the mapped 100 year floodplain within the project area. In Wyandotte County the DWR has jurisdiction over fills averaging over 1 foot in height placed within the 100 year floodplains of streams having drainage areas over 240 acres. Fills averaging over 1 ft. in height placed within DWR jurisdictional floodplains require Floodplain Fills permits. Division of Water Resources regulations require that a floodplain fill should not have an unreasonable effect on adjacent landowners, be adverse to the public interest and environmental concerns, or lack environmental mitigation. Fills placed in a floodway would require a hydraulic analysis showing no rise in the base flood profile.

LEVEES: Flood control levees are located along the Kansas River within the study area. Flood control levees are normally under the jurisdiction of local levee districts and the COE. The Kansas City District COE has jurisdiction in this area. Any proposed change to a COE jurisdictional levee must conform to COE design standards and be approved by the COE. If a levee includes a road or trail used by maintenance vehicles clearance under a bridge may be an issue.

HAZARDOUS WASTE: A field inspection of the study corridor by Environmental Services staff was conducted on June 22, 2011. Potential hazardous waste impacts or underground fuel storage tanks were noted at the following locations.

1. An active BP gas station in the NW quadrant of 5th Street and Armstrong. Three underground storage tanks located approximately 35 ft. north of Armstrong centerline and 95 ft. west of 5th Street centerline. Two pump islands located 40 ft. west of 5th Street centerline.

2. In the NE quadrant of 3rd Street and Fairfax Avenue is a vacant commercial site, formerly J&J Metals. It is unclear exactly what type of business this was, but there is potential for soil contamination. At the same site, behind the building to the north, there has been some illegal dumping. Noted contents of this area include an empty container of home pesticide, several tires and miscellaneous junk (see attached photographs).

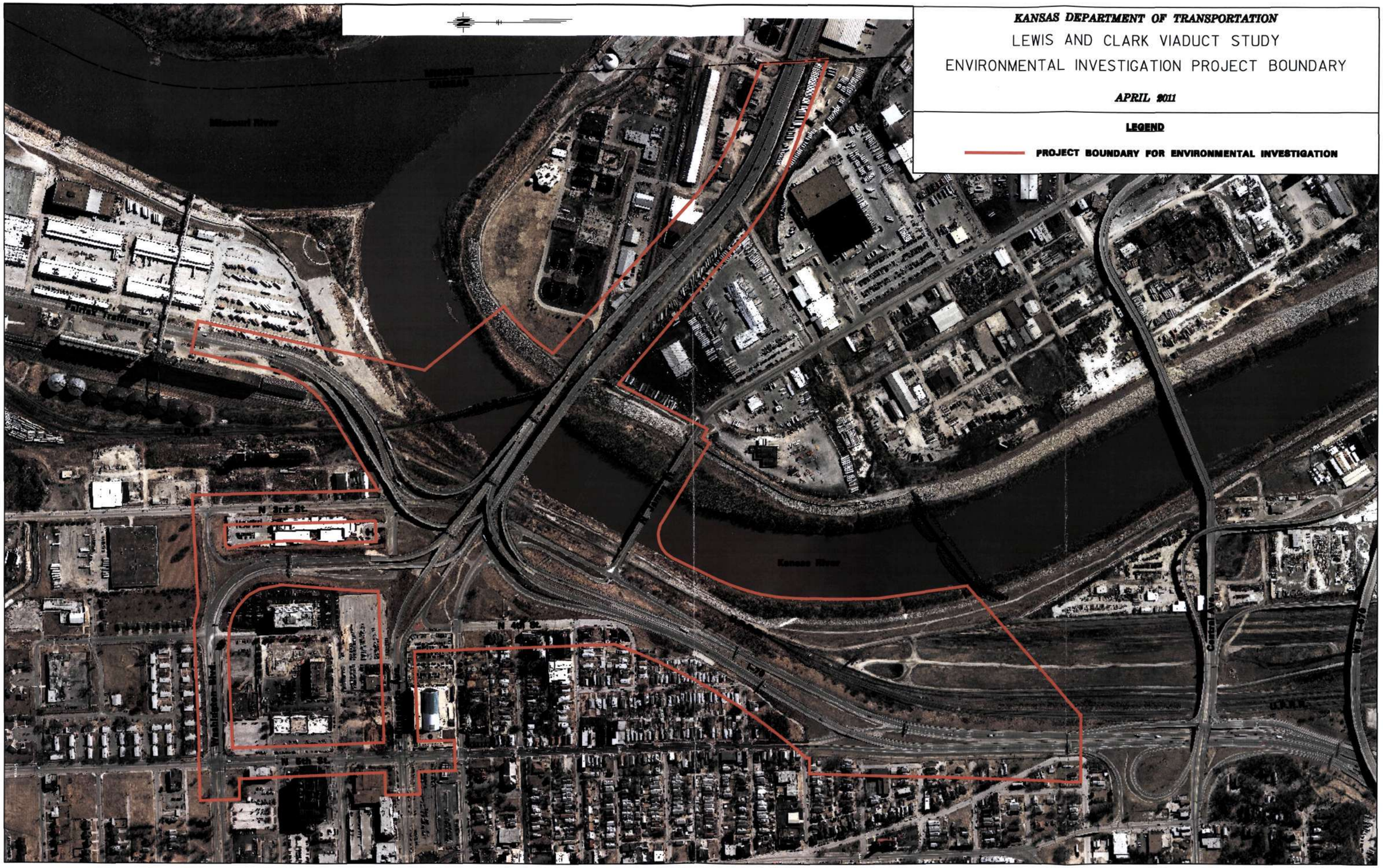
3. Adjacent to the above site, to the northeast and just outside of the study area is an abandoned grain elevator. Older grain elevators can be associated with soil contamination from the use of pesticides and drying agents (methyl bromide, carbon tetrachloride, and others).

4. On Fairfax Trafficway toward the east limits of the study area, on the south side of Fairfax, are more grain elevators and a large grain storage building. These are just outside the study area limits, but there is potential for soil contamination as previously described.

There were no other sites identified within the study area that would pose obvious hazardous waste concerns.

If you have any questions contact this office at (785) 296-0853.

SPV:MPF
Attachments


KANSAS DEPARTMENT OF TRANSPORTATION
LEWIS AND CLARK VIADUCT STUDY
ENVIRONMENTAL INVESTIGATION PROJECT BOUNDARY
APRIL 2011
LEGEND
PROJECT BOUNDARY FOR ENVIRONMENTAL INVESTIGATION
Missouri River
Fairfax Trafficway
N 3rd St
N 4th St
N 5th St
Kansas River
Central Ave
MO 1-670

KSR&C No 11-09-168

6425 SW 6th Avenue
Topeka, KS 66615

Kansas

phone: 785-272-8681
fax: 785-272-8682
cultural_resources@kshs.org

Kansas Historical Society

Sam Brownback, Governor
Jennie Chinn, Executive Director

September 27, 2011

Scott Vogel
Environmental Services Section, Bureau of Design
Kansas Department of Transportation
Eisenhower Office Building, 700 SW Harrison
Topeka, KS 66603

Re: Lewis & Clark Viaduct Study, Kansas City – Wyandotte County
KDOT Project # 70-105 KA-2130-01

Dear Mr. Vogel:

We have reviewed the updated plans received September 22, 2011 regarding the above-referenced project in accordance with 36 CFR Part 800. In reviews of this nature, the State Historic Preservation Officer (SHPO) determines whether a federally funded, licensed, or permitted project will have an adverse effect to properties that are listed or determined eligible for listing in the National Register of Historic Places. The SHPO has determined that eight properties are eligible as contributing resources in a potential historic district that extends beyond the study area. The properties are: 204 Orchard, 511, 513, 520 Northrup, 514 Ohio, 517 Splitlog, 413 Sandusky, 504 N. 4th. St. John the Baptist Catholic Church at 708 N. 4th is individually eligible for the National Register. The St. John's Orphanage/Scroggs House at 720 N. 4th is currently listed in the Register of Historic Kansas Places and is individually eligible for the National Register.

Thank you for giving us the opportunity to comment on this proposal. Please submit any comments or questions regarding this review to Kim Gant at 785-272-8681, ext 225 or kgant@kshs.org.

Sincerely,

Jennie Chinn
State Historic Preservation Officer

Patrick Zollner
Director, Cultural Resources Division
Deputy State Historic Preservation Officer

70-105 KA-2130-01
Lewis & Clark Viaduct Study
Wyandotte County

70-105 KA-2130-01
Lewis & Clark Viaduct Study
Wyandotte County

70-105 KA-2130-01 National Wetland Inventory Mapped Wetlands and Waters of the U.S.

Approximate study area

Palustrine System

Emergent

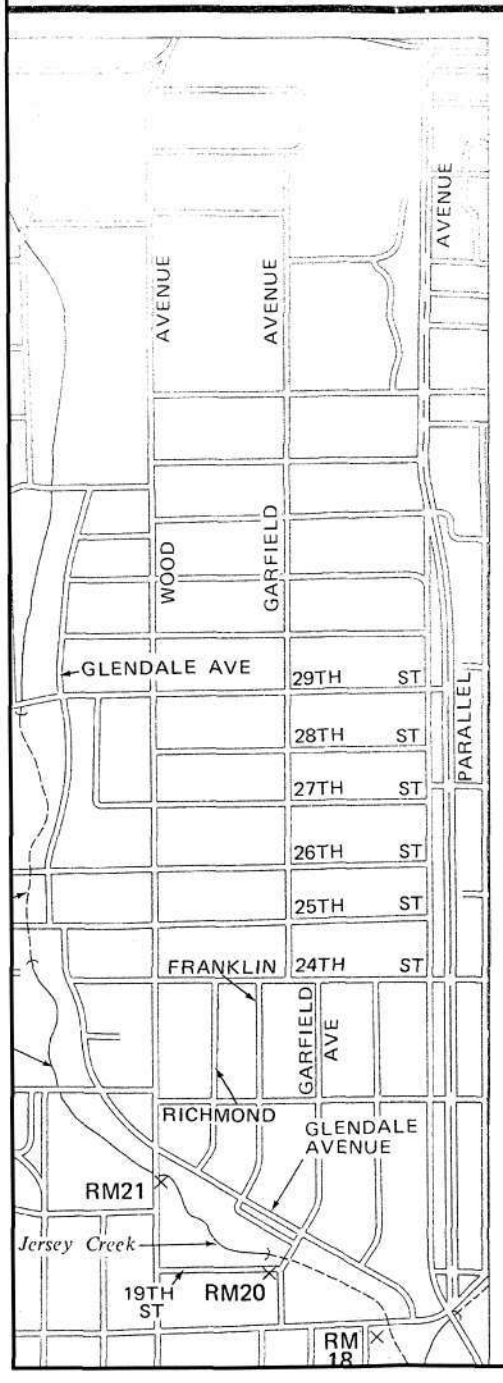
Forested

Riverine System

0 250 500 1,000 1,500 2,000 Feet

N W E S

Drawn By: Mike Fletcher
Date: October 1, 2011



KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74
100-Year Flood Boundary
500-Year Flood Boundary

ZONE B
ZONE A1 DATE
ZONE A5 DATE
ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7 ×

River Mile — • M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave

APPROXIMATE SCALE
1000 0 1000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
KANSAS CITY,
KANSAS
WYANDOTTE COUNTY

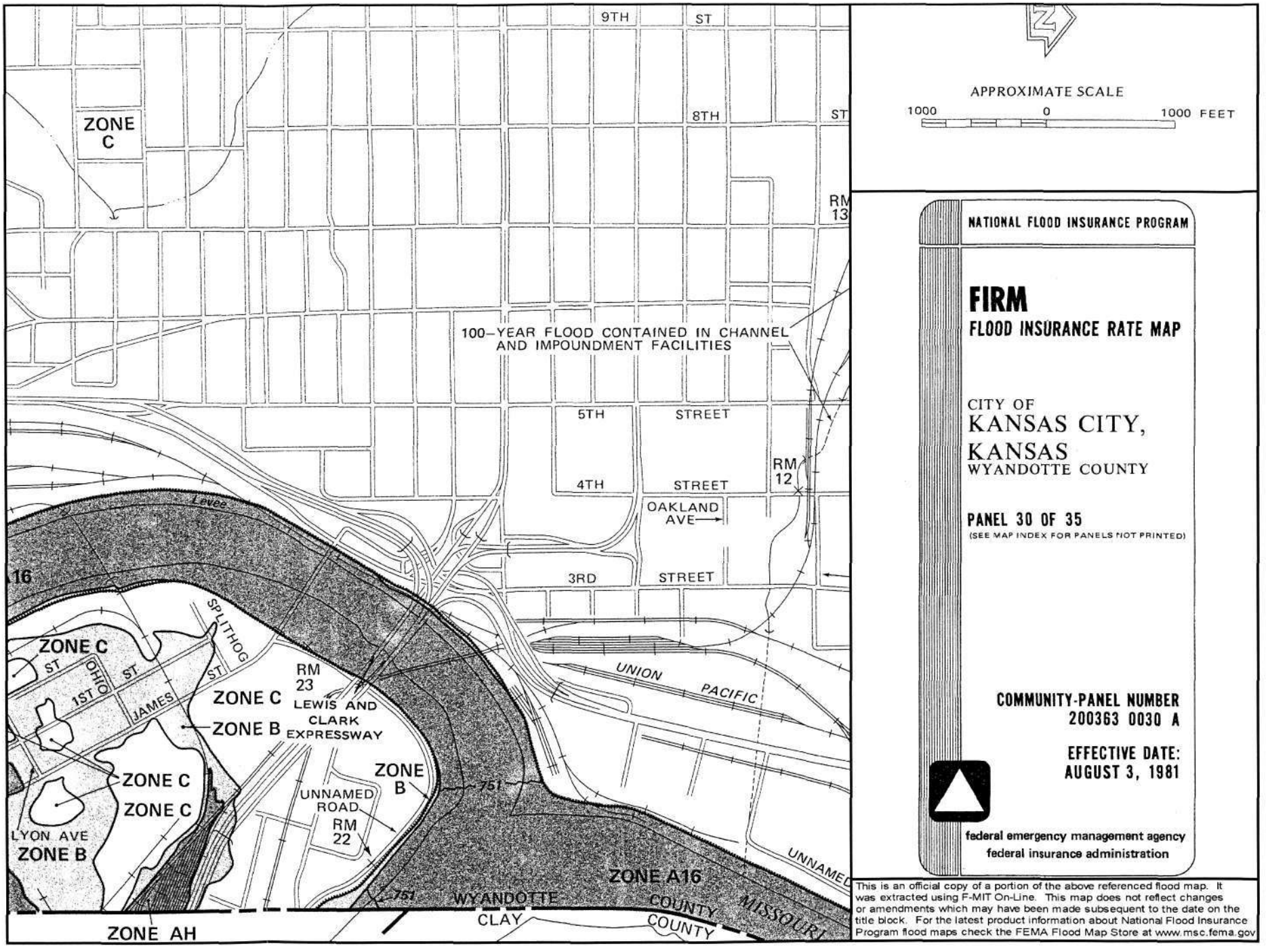
PANEL 30 OF 35
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
200363 0030 A

EFFECTIVE DATE:
AUGUST 3, 1981

federal emergency management agency
federal insurance administration

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov


9TH ST
8TH ST
ZONE C
RM 13
100-YEAR FLOOD CONTAINED IN CHANNEL AND IMPOUNDMENT FACILITIES
5TH STREET
4TH STREET
RM 12
OAKLAND AVE
3RD STREET
Levee
A16
SPLITHOG
ZONE C
ST
OHIO
1ST ST
JAMES ST
RM 23
LEWIS AND CLARK EXPRESSWAY
ZONE C
ZONE B
UNION PACIFIC
ZONE C
ZONE C
ZONE B
UNNAMED ROAD
RM 22
751
LYON AVE
ZONE B
ZONE A16
WYANDOTTE COUNTY
CLAY COUNTY
MISSOURI
ZONE AH
APPROXIMATE SCALE
1000 0 1000 FEET
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY OF
KANSAS CITY,
KANSAS
WYANDOTTE COUNTY
PANEL 30 OF 35
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J & J
METALS
1010 North 2nd St.


BUILDING AMERICA


Home Pest Control
Indoor & Outdoor Insecticide


7
CONRAIL

Appendix E

Lewis & Clark Viaduct
Additional Hydrology & Hydraulics Information

Project Background

For the purpose of the study, the Lewis and Clark Viaduct is considered a series of nine bridges making up an interchange with I-70, Minnesota Avenue, Washington Boulevard, and Fairfax Trafficway in Kansas City, Kansas (KCK). The viaduct provides a vital link for I-70 across the Kansas River and was the first roadway to connect the cities of Kansas City, Kansas and Kansas City, Missouri. **Exhibit 1** shows the bridge units making up the Lewis and Clark Viaduct.

With portions of the viaduct dating to as early as 1907, annual maintenance and repair costs on the nine aging bridge structures continues to increase. As a result, in the spring of 2011, the Kansas Department of Transportation established a Study Team consisting of the Federal Highway Administration, Unified Government of Wyandotte County & Kansas City, Kansas, Mid-America Regional Council and Missouri Department of Transportation. The Team was to evaluate the condition of each of the nine aging bridges that make up the viaduct and develop a priority phasing plan for rehabilitation and/or replacement of the existing bridges. Additionally, the Study Team used this opportunity to evaluate the feasibility of other roadway improvements in conjunction with the bridge improvements.

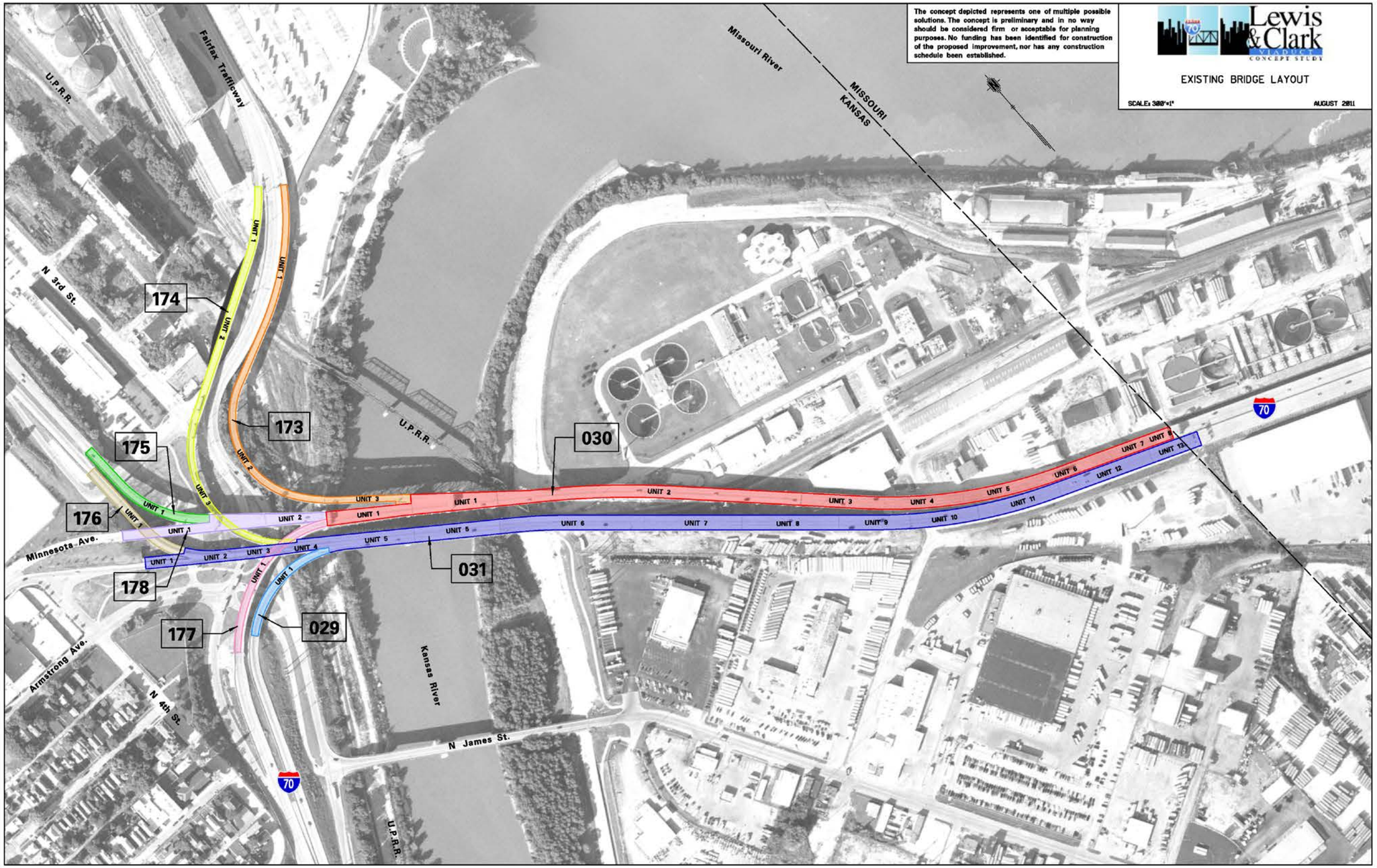
Purpose of the Study

The purpose of the Lewis and Clark Viaduct Concept Study is to develop a preferred concept for rehabilitation and/or replacement of the nine Lewis and Clark Viaduct bridges and associated roadway improvements within the study area that facilitates safe and efficient traveler mobility and can be implemented in phases. The study responds to these needs in a manner that:

- ***Improve infrastructure condition*** by rehabilitating or replacing aging and deficient bridge and roadway infrastructure, thereby decreasing maintenance costs.
- ***Enhance traveler safety*** by improving geometric design conditions (including roadway and bridge shoulder widths, horizontal and vertical curves and lane continuity issues) to address high crash locations and pedestrian conflict points within the study area.
- ***Improve traveler mobility and accessibility*** by incorporating improved study area routing, signage and wayfinding while maintaining multimodal access for transit, bicycles and pedestrians as a part of the roadway and bridge improvements.

- ***Support sustainable design*** by integrating environmental, multimodal and visual design applications into the proposed roadway and bridge improvements, where practical, to enhance the quality of life and aesthetics of the study area.
- ***Support economic development and redevelopment initiatives within the Kansas City, Kansas Downtown Master Plan*** to create a vibrant downtown that is economically, physically and culturally diverse.

Exhibit 1
Existing Conditions



Study Methodology

The Lewis and Clark Viaduct crosses the Kansas River approximately 1,500 feet upstream of its confluence with the Missouri River. Within the study area, the Kansas and Missouri Rivers are bound by levees owned and maintained by drainage districts made up of stakeholders that benefit from the levees. The levee units at and immediately upstream of the project area are Central Industrial District (CID) Kansas and Armourdale, both under the jurisdiction of the Kaw Valley Drainage District. The Fairfax levee unit is slightly downstream of the project area and should not be impacted by this project. The U.S. Army Corps of Engineers provides engineering oversight and review of anything related to the levees and their function. Any impact to flood elevations on the Kansas River must be cleared by the affected drainage districts and the Corps of Engineers.

The Kansas River is a FEMA regulatory waterway with a defined floodway. While the FEMA 100-year floodplain is contained within the levees, the existence of a floodway means that any work within it must not cause a rise in the 100-year water surface elevation without submittal of a Conditional Letter of Map Revision (CLOMR) and notifying all impacted property owners. Minor increases can propagate significant distances on major rivers, which could potentially lead to impacts within the Argentine levee unit reach, also under the jurisdiction of the Kaw Valley Drainage District. While impacts to the 100-year water surface elevation should be evaluated, the design event for these levee systems is the 500-year flood. The Kaw Valley Drainage District's concern will be the 500-year rather than the 100-year event.

Existing Conditions

In 1998 the Corps of Engineers began a process to evaluate the levee systems in the Kansas City Metropolitan area. This process started with a Reconnaissance Study and proceeded into the Feasibility Study phase. As part of the Corps' process, updated hydraulic models were created. HNTB obtained these models from the Corps of Engineers to use as the base model from which this study would be conducted. A cursory review was performed on the geometry and in general the model is representative of the existing conditions. The following updates should be considered during future design phases but were not deemed necessary for the concept study:

- The piers for the existing I-70 bridges/ramps, and the existing Union Pacific Railroad Bridge downstream of the I-70 bridges should be surveyed to confirm their impact on the Kansas River. The skew of the UPRR Bridge with respect to flow should be considered as well.

- Between James Street and the I-70 bridges/ramps there is only one cross section besides the face sections for the bridges. To accurately model the proposed conditions, several additional cross sections are needed. Because the channel, overbanks, and

levees through this area create a fairly uniform cross section, interpolated cross sections were used for this Lewis and Clark Viaduct Concept Study. As design proceeds, actual survey, LiDAR, or hydrographic data should be used to accurately establish the geometry of these intermediate cross sections.

These noted future modifications to the existing conditions model would be consistent in both the existing and proposed models; any change in design water surface elevations should be consistent in both models and the net impact of the project should be the same.

Design Events: The 500-year flood discharge is the primary design event because of the presence of the levee units. The Corps models account for tailwater from the Missouri River, but not coincident 500-year peak discharges (which would result in greater than 500-year discharges in the Missouri River downstream of the confluence). The Corps' current design standard for levees is risk based rather than freeboard based, and thereby deems the 500-year design event (top of protection elevation) to be one that captures 90% of the 0.2% probability floods (500-year events) that are statistically feasible. The levees were originally designed for a 500-year design event that only captures 50% of the 0.2% probability storms that are statistically feasible, plus 3 feet of freeboard. In addition to the 500-year, impacts to the 100-year profile are also reported for FEMA purposes. However, the Corps 100-year discharges are used instead of the FEMA regulatory discharges because they are more conservative and because they are based upon more recent hydrology than FEMA's discharges. The FEMA regulatory discharges should be modeled during the preliminary design process to determine the need for FEMA submittals. It is possible that FEMA may adopt the new Corps discharges in the near future.

The Corps models also have 4 different combinations of Missouri River and Kansas River discharges simulating the interaction between these rivers: (1) Kansas Control; (2) Lower Missouri Controls Kansas; (3) Upper Missouri Controls; and (4) Lower Missouri Controls Upper Missouri. For this study, the "Kansas Control" discharges were used because they produce the highest possible discharge on the Kansas River with a statistically feasible tailwater on the Missouri River. This event also produces the highest velocities on the Kansas River, and therefore will show the highest increases in water surface elevation from adding new bridges or encroachments within the levees.

The Corps is currently in the process of assessing the level of protection of the levees with respect to the risk based approach discussed above, and therefore adequacy of the existing levees is unknown at this time.

The existing I-70 Bridges span the Kansas River and the levees and do not have freeboard or capacity issues. A scour analysis was not performed with this study to determine whether the substructure of the existing bridges meet current scour standards.

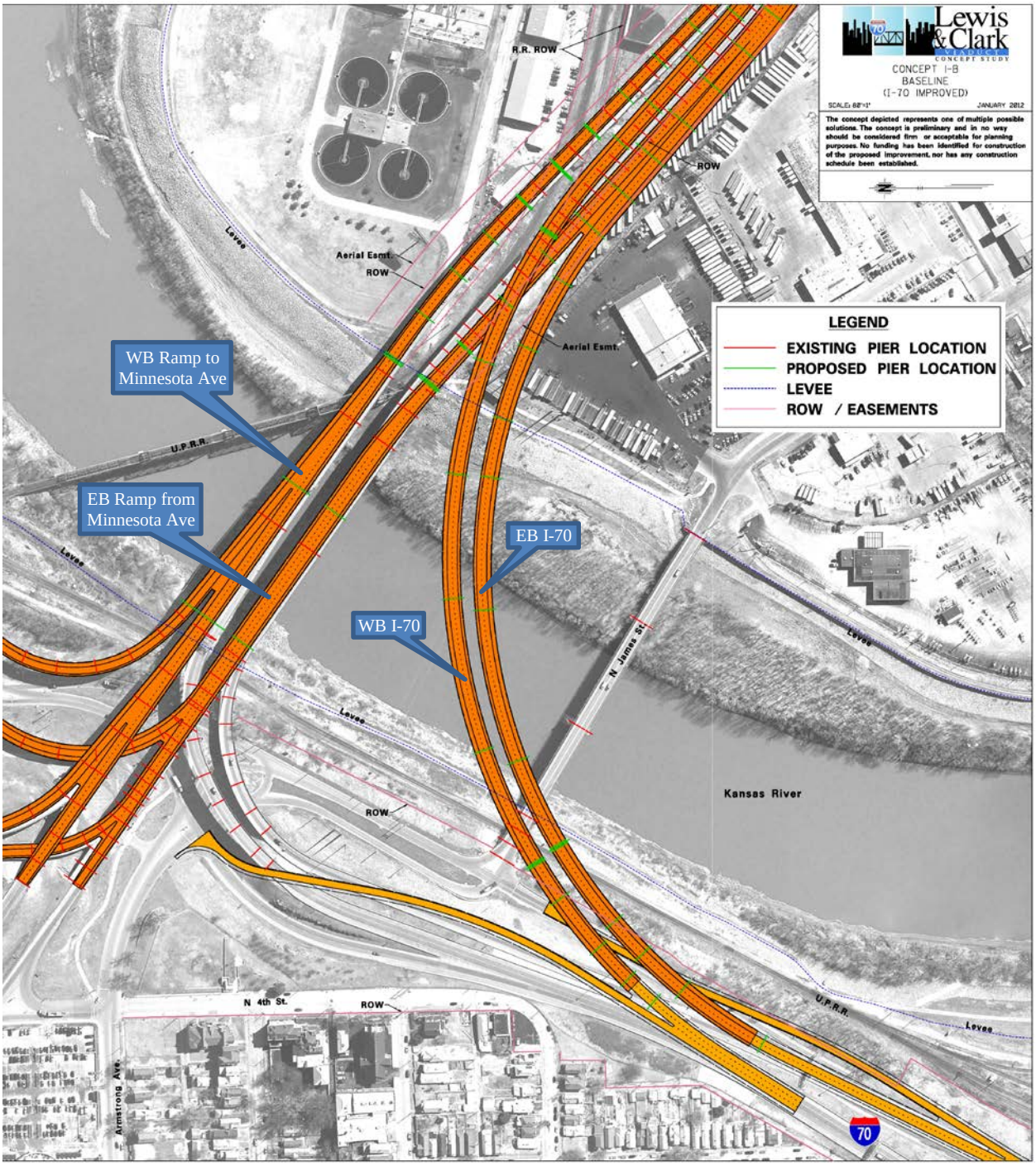
Proposed Conditions

The preferred concept includes new I-70 bridges with larger radii to facilitate higher speed on the highway. At the location of the current I-70 river spans, new bridges will be constructed to accommodate access into and out of downtown Kansas City, Kansas. The structures modeled are illustrated in **Exhibit 2**. The following conceptual pier sizes and modeling approaches were used to model the preferred concept:

- For the two bridges replacing the existing I-70 bridges connecting directly to Minnesota Avenue, 8 foot wide Tee-Piers aligned with the river flow and aligned with each other were used. The widths of these bridges were assumed to be consistent with the existing bridges. Consistent with the Corps existing conditions model, these bridges were modeled as two separate bridge routines using standard step energy as the bridge modeling approach.

- For the two new I-70 bridges, the piers are radial to the curvature of the roadway, but are aligned with the river flow from bridge to bridge. There are three separate sets of piers falling between the levees between James Street and Minnesota Avenue. The piers are assumed to be 10’ x 14’ in dimension. Because the piers fall far enough apart (upstream to downstream), three bridge routines were used for each set of piers using standard step energy as the bridge modeling approach. The skew of the piers to the flow was taken into account with the width of the impact modeled. If all three piers were put into a single bridge routine, all encroaching upon one cross section normal to the flow of water, the flow area impacted would be overestimated. Another modeling approach considered for these bridges was to model each pier as a localized blocked obstruction; this approach slightly reduced backwater caused by the new bridges, but was deemed non-conservative for a planning phase analysis.

Exhibit 2
Preferred Concept



Ultimately there will be two more bridges crossing the river than in the existing conditions. However, the existing bridges have more and larger piers than the proposed structures, and all encroach upon one cross section normal to the flow, therefore having a greater impact on the design water surface elevation. As illustrated in **Table 1**, the selected preferred concept (in its final configuration) results in a slight decrease in both 100-year and 500-year water surface elevations.

Table 1: Backwater Elevations Taken at HEC-RAS River Station 0.504 (Immediately Upstream of the James Street Bridge)

Storm Event	Existing Conditions Water Surface Elevation (feet)	Post-Project Conditions Water Surface Elevation (feet)	Difference Post - Existing (feet)
100-yr	752.64	752.62	-0.02
500-yr	757.92	757.91	-0.01

Project Phasing

Due to the large cost of the overall viaduct and interchange reconstruction, the proposed improvements will most likely be staged over many years. Therefore, a phased approach to the hydraulic models was taken in addition to modeling the effects of the ultimate build-out scenario.

The phased hydraulic models described in this section are not to suggest the most appropriate approach to phasing, but rather to determine what could ultimately be the most impacting to design water surface elevations. Also, the descriptions of the phases are not all inclusive of what will be required, and are focused on what is changing between the Kansas River levees. The "phases" referenced are illustrated on **Exhibit 3** and the hydraulic results summarized in **Table 2**:

- Model I includes Phase 1 – Replacement of the westbound I-70 bridge (Bridge 030)
- Model II includes Phases 2 and 3 – Construction of new eastbound and westbound I-70 bridges
- Model III includes Phases 1, 2, 3, and Additional Phases – this is the ultimate build-out scenario previously addressed in the "Proposed Conditions" section of this memo.

Table 2
Hydraulic Model Results

Storm Event	Existing Conditions Water Surface Elevation (feet)	Model I Water Surface Elevation (feet)	Model II Water Surface Elevation (feet)	Model III Water Surface Elevation (feet)
100-yr	752.64	752.63	752.70	752.62
500-yr	757.92	757.90	758.03	757.91

- For Model I, the result is a net decrease in both the 100-year and 500-year design events. The new bridge will have fewer and narrower piers encroaching on the waterway between the levees than the existing bridge. The Study Team did recognize that the piers of this new bridge will not align with the existing eastbound I-70 bridge and took that into account using a single bridge routine with all piers from both bridges included. However, the full length (parallel to flow) that the individual piers interact with flowing water will not equal the total combined length along the river of the two bridges (because the piers of the individual bridges will not align for this phase). Therefore, only an average width of the two bridges was used for this bridge routine. Prior to setting up the model this way, the new bridge was modeled as a separate bridge using the Corps model approach with two bridge routines, which is the same as for the existing conditions. The result for the dual bridge routine model was a greater decrease in the design water surface elevations post-project and, therefore we believe our "shadow modeling" approach does properly account for the non-aligned piers from the upstream to the downstream bridge.

- For Model II, the result of an increase over the existing conditions is expected because two new bridges are being constructed and no existing conditions are changing.

- For Model III, the net change in water surface elevations versus the 2012 pre-project conditions is a slight decrease, again because the new bridge will have fewer and narrower piers encroaching on the waterway between the levees than the existing bridge being replaced.

The results of this phased hydraulic study are all reported relative to the 2012 pre-project conditions to illustrate the impacts of the project measured against one consistent starting point. Measuring the results from phase to phase does not accurately portray the impacts of the

project on the existing function of the levee systems. This concept was communicated to the Corps of Engineers and the Kaw Valley Drainage District, and they agreed with this approach.

During coordination meetings with the Corps and Drainage District, potential rise mitigation alternatives were discussed. Evaluating "temporary" increases through risk methodology was suggested by the Corps to help indicate whether or not mitigation of the interim rise is necessary. If required, mitigation could include one or more of the following:

- Removal of the abandoned RR Bridge upstream of James Street. This structure is otherwise unaffected by the viaduct study.
- Clearing of trees in the vicinity of the project for hydraulic benefits
- Overbank excavation in the vicinity of the project

COE and Drainage District Coordination

On May 21, 2012, a meeting was held with the Corps of Engineers, Kaw Valley Drainage District, Fairfax Drainage District, KDOT, Unified Government, and HNTB. The meeting minutes from that meeting are attached, and in general the following topics were discussed:

- Project introduction and overview
- Stakeholder expectations – FEMA/DWR, Corps, Drainage Districts
- The design and construction implications of pier placement on or near the levees
- Preliminary river hydraulic modeling results
- Preliminary phased river hydraulic modeling results
- Next Steps – including a follow-up meeting and H&H submittal to Corps and Kaw Valley Drainage District

On July 25, 2012, a meeting was held with the Corps of Engineers and the Kaw Valley Drainage District as a follow-up to the May 21 meeting. The meeting minutes from that meeting are attached, and in general the following topics were discussed:

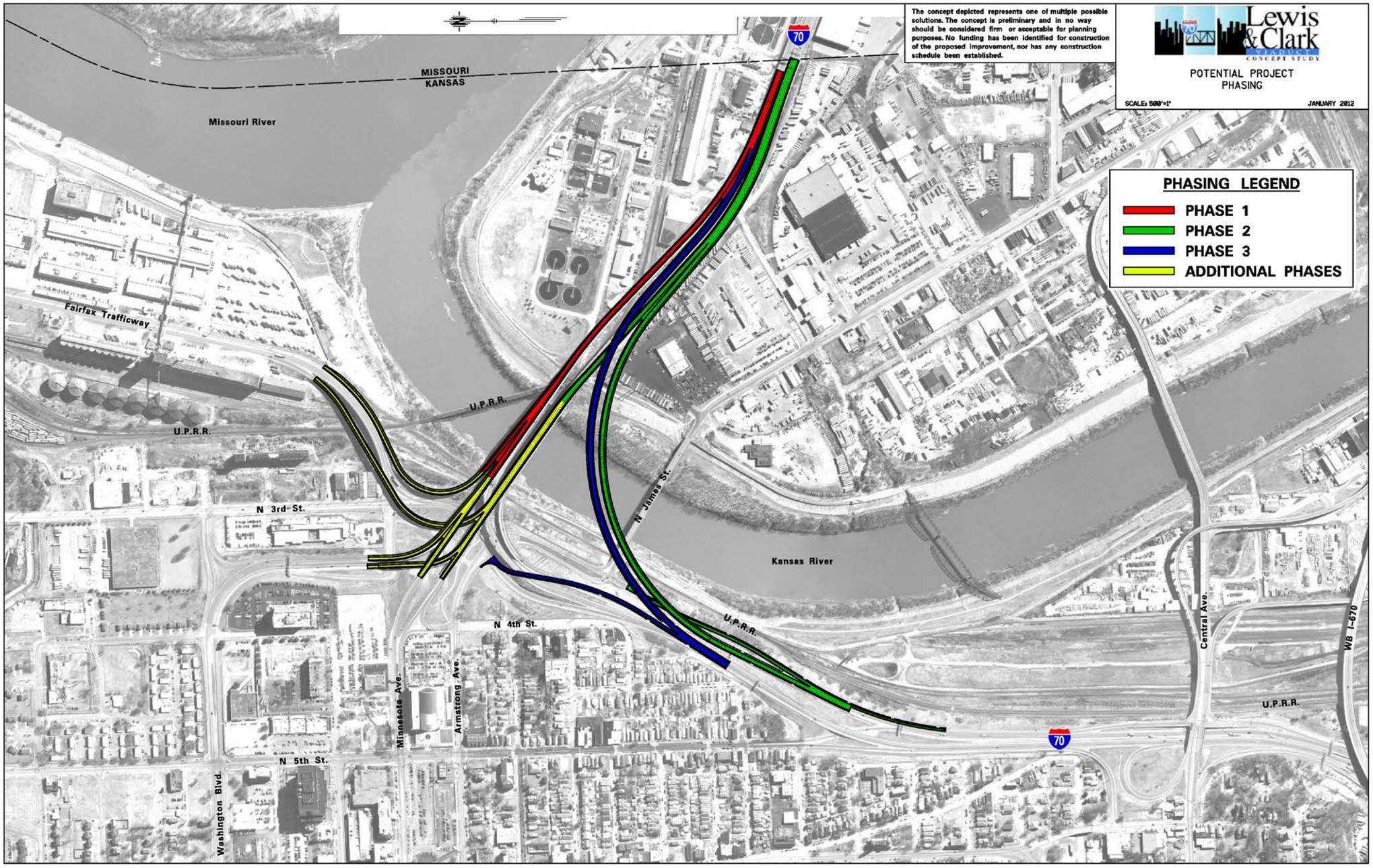
- Project overview and overview of phases modeled
- Specific modeling techniques used for each phase
- Phase 1 is currently being designed and is programmed for construction in 2016. This phase alone does not cause a rise in 100 or 500 year water surface elevations.
- Future phases (specifically when the new I-70 flyover bridges are build) will result in a rise in 100 and 500 year water surface elevations. Once the existing EB I-70 Bridge is replaced with the new ramp, this rise will be eliminated.
- Implications of this interim rise, and potential rise mitigation
- Study wrap-up

FEMA Coordination

On September 14, 2012, a phone call with FEMA Region VII was held to discuss the FEMA requirements with the project. The following key considerations were discussed:

- FEMAs primary concern is with the 100 year water surface elevation (not the 500 year)
- The Corps' Upper Mississippi River System, Flood Frequency Study will be the basis for the new FEMA maps to be issued in the near future. That study was done using the UNET hydraulic modeling program. FEMA took the Corps profiles and converted them to HEC-RAS (with up to a 0.5' tolerance) and mapped the new floodplains using that data. The Corps' Upper Mississippi River System, Flood Frequency Study is the same base model that was used for the Lewis and Clark Viaduct H&H study.
- All applicable FEMA submittals will be required with this project (CLOMRs and LOMRs) because of work in the floodway.
- Because of the uncertainty between phases, FEMA would require that map revisions occur after each phase.
- Any rise proposed within the levees would require a CLOMR and property owner notifications. However, it was stated that property owner notifications were only required for the directly impacted properties (i.e. within the levees, not all those protected by the levees). A rise is considered anything greater than 0.00 feet.
- A key consideration with any project causing a rise is confirming that FEMA freeboard requirements are still met for the 100 year event (3' along levee and 4' at structures). If the rise were to negate this freeboard requirement, the levee would be de-certified by FEMA. Based on Corps model used for this study and the levee elevations in the base model, in the condition where up to 0.06 feet of rise is occurring in the 100 year event, the minimum freeboard elevation is 5.8 feet. Therefore this should not be a problem but further investigation of the top of levee elevations, FEMA restudy, and any additional information that comes available should take this concern into consideration to confirm that FEMA freeboard requirements are still met.

Exhibit 3
Potential Project Phasing



MEMO

HNTB

MEETING DATE: May 21, 2012

PROJECT NUMBER: 70-105 KA-2130-01

MINUTES TAKEN BY: Tim Morgan

ATTENDEES: See Attached Attendees List

LEWIS AND CLARK VIADUCT CONCEPT STUDY
RIVER HYDRAULICS OVERVIEW AND RESULTS
CORPS AND LEVEE DISTRICT COORDINATION
MEETING DOCUMENTATION

A meeting was held with the Corps of Engineers (KC District), Kaw Valley Drainage District, Fairfax Drainage District, KDOT, and HNTB to discuss results of the preliminary river hydraulics for the Lewis and Clark Viaduct Concept Study, potential impacts to the Kansas River levees during construction, and potential pedestrian trail routes on and around the levees. Items discussed were as follows:

Project Overview

- HNTB performed the last bi-annual inspection on the Lewis and Clark Viaduct bridges in spring 2011 to confirm condition of bridges. At that time, improvements were recommended. The priorities of the improvements were identified as: (1) Westbound I-70, BR030 – Units 3-7 (east of the river); (2) BR031 – Eastbound Viaduct; (3) Westbound truss over river.
- The study was initiated to determine whether repair/rehab or replacement was the best way to address the existing condition of the bridges, and to identify a long-term plan for improvements based on bridge condition, geometrics, safety, access, etc. The study included public involvement and a traffic study.
- Several alternatives were investigated and the screening process identified the recommended alternative as Concept 1B as the ultimate solution (see attached exhibit).
- An interim project (Phase 1) was identified because of the condition of structure BR030 (Units 3-7). The entire BR030, including the westbound river truss, will be replaced in Phase 1. This project will essentially maintain traffic similar to today, but set the viaduct up for future phases including new I-70 bridges with flatter curves for higher speed travel. Bid letting for this “interim” project is programmed by KDOT for August 2016.
- The interim project will be designed by a consultant other than HNTB.

Pier Placement near Levees

- The conceptual pier layout for Phase 1 includes piers in the top of the levee on the east side of the river and includes piers at the base and within the levee on the west side of the river.
- The actual location of the top of the levee on the east side of the River was discussed, and the consensus was that the dry side was filled up to the top of the levee when the treatment plant was built. However, it is still important to note that the original embankment on the dry side of the levee is a critical feature that will have to be considered during bridge design. HNTB will research old records to determine where the original toe of the levee was on the dry side.
- The Corps and Drainage Districts both acknowledged that they don't foresee anything in the plan that simply cannot be done, but new piers in the levee embankments will require a higher level of review and will add costs during construction to mitigate the effects of the construction and the new structure.
- Preliminary reaction to placing a new pier near the top of the east levee is that doing so may require costly mitigation during construction to ensure that the strength and function of the levee is not compromised. The design team should look at shifting this pier to the east.

River Hydraulic Modeling Results

- The hydraulic modeling was completed using the latest Corps model.
- The Corps model also has 4 different combinations of Missouri River and Kansas River discharges simulating the interaction between these rivers: (1) Kansas Control; (2) Lower Missouri Controls Kansas; (3) Upper Missouri Controls; and (4) Lower Missouri Controls Upper Missouri. For this study, the "Kansas Control" discharges were used because they produce the highest possible discharge on the Kansas River with a statistically feasible tailwater on the Missouri River. This event produces the highest velocities on the Kansas River, and therefore will show the highest increases in water surface elevation due to changes to new structures or encroachments within the levees.
- Ultimate Build-Out results in slight decrease in both 100- and 500-year backwater elevations (taken upstream of James Street).
- Because the Lewis and Clark Bridge improvements will most likely be staged over many years, a phased approach to the hydraulic models was taken in addition to modeling the effects of the ultimate build-out scenario.
- Phase 1 - Replacement of the WB River Bridge (BR030) (referred to as interim project)
- Phase 2 – Addition of the new EB and WB I-70 River Bridges
- Phase 3 – Ultimate Condition - Replacement of what is the existing eastbound I-70 bridge (BR031) (will be Minnesota Avenue after the new EB/WB bridges are built).
- Attached table reports the water surface elevations for the existing conditions and the phases described above. Phase 1 has been programmed by KDOT in August 2016. It is important to note that conceptual hydraulic modeling of Phase 1 showed that there is a slight decrease in both 100- and 500-year water surface elevations.

- The Corps and Levee Districts confirmed that the 500-year storm is the event they consider to be the design storm, and should be the focus of our analysis.
- The Corps and Levee District inquired about scour potential. HNTB has not investigated scour at this point in the design process.
- HNTB described modeling techniques, and believes that the approach to modeling the new structures was a conservative one. Corps suggested submitting concept models for review by their H&H staff. This will occur at the next phase of design.
- Coordination with FEMA Region VII should also occur at a future phase of design.

Next Steps

- All Actions Items listed below will be completed as a part of the preliminary design phase of the project. No further action is required to complete the Lewis and Clark Viaduct Master Plan Study.
- HNTB to investigate levee plans available from our levee periodic inspections.
- H&H submittal to Kaw Valley Drainage District and Corps
- Meeting with Drainage Districts and Corps H&H staff

Copies distributed by email to:

Attendees on Attached List

Backwater Section @ RS 0.504 (Upstream of James Street Bridge)

Storm Event	Existing Conditions	Proposed Phase 1	Proposed Phase 2	Proposed Phase 3 (Ultimate)
100yr	752.64	752.63	752.70	752.62
500yr	757.92	757.90	758.03	757.91

Proposed Phase 1 - Replacement of the WB River Bridge
Proposed Phase 2 - Addition of the new EB and WB I-70 River Bridges
Proposed Phase 3 - Ultimate Condition - Replacement of the Exist. EB River Bridge

LEWIS AND CLARK VIADUCT CONCEPT STUDY
RIVER HYDRAULICS OVERVIEW AND RESULTS
CORPS AND LEVEE DISTRICT COORDINATION MEETING

ATTENDANCE LIST

Brenda Foree	HNTB - Bridge	bforee@hntb.com
Terry Fleck	KDOT	fleck@ksdot.org
John McClannahan	DRG (Kaw Valley Drainage District)	jmcclannahan@drgengineers.com
Greg Weatherd	HNTB	gweatherd@hntb.com
Sean Gellhaus	HNTB	sgellhaus@hntb.com
Stephen Dailey	Fairfax Drainage District	spdailey@sbcglogal.net
Mark Hurt	KDOT - Bridge	hurt@ksdot.org
Bill Heatherman	Unified Governement Wyandotte	bheatherman@wycokck.org
Charles Detrick	COE - Kansas City District	charles.w.detrick@usace.army.mil
Pete Jarchow	HNTB - Water Resources	pjarchow@hntb.com
Tim Morgan	HNTB - Water Resources	cmorgan@hntb.com

MEETING DATE: July 25, 2012

PROJECT NUMBER: 70-105 KA-2130-01

MINUTES TAKEN BY: Tim Morgan

ATTENDEES: See Attached Attendees List

LEWIS AND CLARK VIADUCT CONCEPT STUDY
RIVER HYDRAULICS OVERVIEW AND RESULTS
CORPS AND LEVEE DISTRICT COORDINATION MEETING #2
MEETING DOCUMENTATION

A meeting was held with the Corps of Engineers (KC District), Kaw Valley Drainage District, KDOT, and HNTB to discuss results of the preliminary river hydraulics for the Lewis and Clark Viaduct Concept Study, and preliminary comments by the Corps review team. This meeting was a follow-up to a May 2012 meeting when the project was first introduced to the Corps and Drainage District. Items discussed were as follows:

Project Overview

- HNTB presented project background and an overview of the preferred alternative selection process. HNTB is in the process of finalizing the study at this time and will include the comments and findings from the Drainage District and Corps review process with the final study submittal to KDOT.
- As a follow up to the meeting in May 2012 where potential physical impacts to the levees was discussed, HNTB updated the attendees on the work that was done to further define a preliminary bridge span layout and pier locations. It is important to note that HNTB's design is preliminary and the new design consultant will be responsible for the final design of the bridge and further coordination with the Drainage District and Corps regarding physical impacts to the levees.
- The hydraulic modeling was completed using the latest Corps model (created for the 2006 KC Levees Phase 1 Report).
- Ultimate Build-Out results in slight decrease in both 100- and 500-year backwater elevations (taken upstream of James Street).
- Because the Lewis and Clark Bridge improvements will most likely be staged over many years, a phased approach to the hydraulic models was taken in addition to modeling the effects of the ultimate build-out scenario.
- Model I – Replacement of the WB River Bridge (BR030) (referred to as interim project)

- Model II – Addition of the new EB and WB I-70 River Bridges
- Model III – Ultimate Condition - Replacement of what is the existing eastbound I-70 bridge (BR031) (will be Minnesota Avenue after the new EB/WB bridges are built).
- Corps requested that our interim and final conditions bridges also be input to their future conditions model

Phase 1 Discussion

- Phase 1 which includes replacement of the WB River Bridge (BR030) has been programmed by KDOT for letting in August 2016.
- HNTB's hydraulic analysis of the impacts of Phase 1 shows a slight decrease in water surface elevations for the 100 and 500 year storm events.
- HNTB presented its approach to modeling Phase 1 of the project, which was to combine the separate bridges into one bridge routine to more accurately model non-aligned piers for the river bridges. The Corps review team agreed with the modeling approach taken by HNTB

Future Phases Discussion

- Because the Lewis and Clark Bridge improvements will most likely be staged over many years, a phased approach to the hydraulic models was taken in addition to modeling the effects of the ultimate build-out scenario.
- A question arose as to whether or not a phased approach to this project would require each phase to compare back to the existing 2012 condition or the immediately preceding phase. Corps concurred with KDOT and HNTB that always using the existing 2012 condition as the baseline was appropriate.
- Model II (addition of new EB and WB I-70 River Bridges) is the scenario in which a rise would occur. HNTB's model shows that up to a 0.06 rise for the 100 year condition and 0.11' rise for the 500 year condition would occur with the construction of these new bridges without offsetting mitigation.
- Model III, the ultimate condition, (replacement of what is the existing EB I-70 Bridge) lowers water surface elevations below the 2012 existing conditions.
- It is important to note that this phasing scenario is not 100% set at this time. Future funding opportunities, structural deficiencies, or other controls may warrant a different phasing scenario beyond Phase 1 (Model I) which is programmed by KDOT for letting in August 2016.

Potential Rise Mitigation Discussion

- Because there is a potential interim rise shown with Model II, a discussion about the implications of this occurred at the meeting.
- The rise does propagate a significant distance upstream of project (beyond the extents of the Kansas River levee system).
- Corps indicated Kansas River levee/wall system probably exceeds the 500 year design event in the immediate area of the proposed bridges project. This information should not be considered absolute at this time, because the Corps is presently studying the potentially affected levee systems for possible improvements, but cannot release information until the studies are complete and published.

- Corps H&H indicated that they don't really use the term freeboard, they indicated that they evaluate level of protection by risk methodology.
- Evaluating "temporary" increases through risk methodology was discussed. Corps would likely request KDOT's consultant to do so, rather than do it themselves. This analysis would help to indicate whether or not mitigation of this interim rise is necessary.
- Mitigation alternatives discussed at the meeting included:
    - Removal of the abandoned RR bridge upstream of James Street. This has been preliminarily looked at by HNTB and would offset the rise potential from Model II. Both the Corps and Drainage District did not have objections to this alternative at this time.
    - Corps suggested that clearing of trees could be assessed for hydraulic benefits and potential mitigation for the rise.
    - Overbank excavation could be considered. Sedimentation of this area would have to be evaluated to ensure that compensatory excavation remained effective.
- These potential mitigation alternatives will be added to HNTB's final hydraulic memo which is included as an appendix to the Lewis & Clark Concept Study Report.

Next Steps

- Corps to provide comments on hydraulic modeling to Kaw Valley Drainage District. HNTB and KDOT would like to have this information to include with the final concept study document. Corps did clarify that they will provide comments on the submittal, but cannot give approvals.
- As designs are further evaluated for Phase 1 and future phases of the Lewis & Clark Viaduct projects, the Corps and Drainage Districts should be kept updated on changes.
- Corps and Drainage Districts to keep KDOT updated on findings of the current levee studies evaluating the needs for levee raises on the Kansas River.
- HNTB to finalize Study Report.

Copies distributed by email to:

Attendees on Attached List

LEWIS AND CLARK VIADUCT CONCEPT STUDY
RIVER HYDRAULICS OVERVIEW AND RESULTS
CORPS AND LEVEE DISTRICT COORDINATION MEETING #2

ATTENDANCE LIST

Terry Fleck	KDOT	fleck@ksdot.org
Mark Hurt	KDOT - Bridge	hurt@ksdot.org
Bill Heatherman	Unified Governement Wyandotte	bheatherman@wycokck.org
Joe Roth	DRG (Kaw Valley Drainage District)	jroth@drgengineers.com
Jim Jenkins	Kaw Vally Drainage District	913-342-2382
Charles Detrick	COE - Kansas City District	charles.w.detrick@usace.army.mil
Adam Q. Jones	USACE-ED-HH	adam.q.jones@usace.army.mil
Chance Bitner	USACE-ED-HH	chance.j.bitner@usace.army.mil
Greg Weatherd	HNTB	gweatherd@hntb.com
Brenda Foree	HNTB - Bridge	bforee@hntb.com
Pete Jarchow	HNTB - Water Resources	pjarchow@hntb.com
Tim Morgan	HNTB - Water Resources	cmorgan@hntb.com

Appendix F

Lewis & Clark Viaduct
Miscellaneous Information

1.0 Introduction

This appendix to the Lewis and Clark Viaduct Concept Study report contains miscellaneous correspondence from local government leadership. Attached are two letters (dated December 30, 2011 and May 1, 2012) regarding opinions, issues, comments and concerns relative to the Lewis & Clark Concept Study.

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY
& KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT

ONE McDOWELL PLAZA 701 NORTH 7TH STREET, 66101 (913) 573-5400
FAX (913) 573-5435

December 30, 2011

Debbie Tanking, Program Manager
Kansas Department of Transportation
700 SW Harrison St
Topeka, KS 66603-3754

RE: Lewis and Clark Viaduct Study – U.G. Staff Recommendations on Locally Preferred Options

Dear Ms. Tanking:

The Lewis and Clark Viaduct is a critical link between Kansas and Missouri along I-70. Opportunities to improve major infrastructure like this in a significant way come rarely, and the process KDOT and its engineering consultant, HNTB, are following to study concepts and solicit community feedback is greatly appreciated.

The study is at a crucial stage. Six concepts have been presented for public comment and several additional ones have been discussed. KDOT will next select two concepts for more in-depth analyses, along with the baseline concept of rehabilitating or replacing the bridges in-kind. Community input at this stage is vital – key choices must be made to narrow the field of alternatives carried forward.

The team has already received significant input through the two public meetings, the issues workshop, outreach to the KCK Chamber, Fairfax Industrial Association and others, interviews with individual stakeholders, and online feedback through the website and social media.

The Unified Government staff wishes to comment on the major issues that have been identified and to provide suggestions on the selection of the two concepts for further consideration. While this letter does not speak for all in our community, we have attempted to find balance between the feedback heard from our residents, businesses, community leaders and our elected officials, while recognizing the limits and constraints that KDOT is working under. These comments were presented to the Unified Government Planning Commission and Public Works and Safety Standing Committee in December, 2011.

I. Major Issues.

A. Improving the I-70 Curve for Safety. There appears to be consensus that the new I-70 should have a wider curve, at least as much as has been shown in Concepts 1B through 4B.

B. Industrial Area Access, Including Direct Access to Fairfax. It is vital that safe, convenient and direct access remain for both the Fairfax Industrial District and the Central Industrial District, both of whom are major employers for the region. There is particular concern regarding the access ramps into the Fairfax District.

Benefits of the current configuration include: separation of car and truck traffic, separation of truck traffic from downtown and residential neighborhoods, reliability gained by having multiple secondary routes, and quick access to I-70. Fairfax leaders ask that they not lose these benefits. Great access is what drew many of them here initially.

In addition, most do not support the roundabout concept, based on difficulty of navigation, reliance on a single point of entry close to downtown, mixing of cars and trucks, and concerns over accidents from hazardous or liquid loads.

C. Additional Widening of I-70 to Regain Strawberry Hill and River Access. The UG Downtown Master Plan envisioned a wider curve than currently proposed for I-70, along with a realignment of I-70 to a Kansas River Crossing further south. These steps would open a substantial area of Kansas River frontage for recreation and redevelopment. KDOT has significant reservations about the feasibility of this concept, but has agreed to take a closer look. The outcome of that assessment will have a substantial bearing on the local preference.

D. Downtown and Neighborhood Redevelopment. The Minnesota Avenue exit is the main gateway into downtown Kansas City, Kansas and to local neighborhoods. It is vital that improvements to I-70 and associated ramps contribute to, and not detract from the economic vitality and beauty of downtown. Bridges and structures need to be built with an eye towards architecture and landscaping, green space needs to be preserved, and allowance made for a significant entry-way feature into downtown. Vehicles leaving I-70 need to transition to slower speeds.

E. Trails and Access to the River. The Kansas River frontage is an underutilized resource for recreation and could become a significant tourism and redevelopment attraction. The Riverfront Heritage trail over the Kansas

River needs to be retained or replaced, and the long planned connector between it and Kaw Point needs to be added, as well as accommodation for trails extending south. It appears that all of the concepts under consideration can accommodate these features, and we strongly urge KDOT to include access to the river and trail considerations in the final planning of the alternatives.

F. Status of State Avenue. *(this section was added after the December presentations to Planning Commission).* During the public meetings, a comment was made that the U.G. consider making State Avenue the prime ramp connection to I-70 instead of Minnesota. A separate comment suggested that we consider State Avenue as the destination of the secondary ramp that currently serves Washington Avenue. The City's master plan does not support either suggestion. We believe Minnesota and Washington should remain the two local connections.

II. Guidance on Local Preferences.

In weighing these various issues, the Unified Government staff believes that the local preferences, in order, are as follows:

1. I-70 Relocation per Downtown Master Plan, with Direct Access to Industrial Areas. This concept, though not yet analyzed by KDOT, is the stated preference of the community, as evidenced by our Master Plan and by the advocacy of senior elected officials and staff. It will undoubtedly be the most costly alternative, but may provide the greatest value to local and state taxpayers in terms of economic development and quality tourism. The feasibility of this concept needs to be examined.

2. I-70 Curve Widened, with Direct Ramps into Fairfax Similar to Existing (Concept 1B, with possible modifications). This concept was developed after the September Issues workshop and presented to the public in November. It widens the I-70 curves similarly to the other KDOT proposals, relocating them south of the current river crossing but not by as much envisioned in the Downtown Master Plan. It also features a separate crossing of the Kansas River in the current I-70 location to serve Minnesota Avenue and local access – with on and off ramps at Fairfax and Washington Boulevard similar to what is there currently.

   While much of the public finds the current configuration of ramps and exits to be confusing, staff has come to appreciate how the current system of interwoven ramps and streets helps serve downtown and the industrial areas while keeping heavy truck and car traffic separated. This concept reduces some confusion by splitting off local access from I-70 further to the east. With more work, we think some additional modifications could be considered to ease navigation.

Please note that we are recommending this option over the more elaborate Concept 4B which would have placed new Fairfax Ramps over the Kansas River in a direct alignment with Fairfax Trafficway. The primary input we heard from Fairfax and CID leaders was to keep the benefits of the current configuration, which Concept 1B appears to do. The extra costs and impacts of 4B do not appear to be offset by the benefits.

3. I-70 Relocation with Box-Style Local Road (Concept 2B). This is the community's 3rd choice, largely because of the lack of direct ramps into and out of Fairfax. Each of the two industrial districts would still be served with on-grade access roads, relatively free of downtown congestion. The Armstrong Street connector near the EPA building would become the primary on-ramp to eastbound I-70 and would see a large increase in truck traffic, which is not desirable. However, if the direct ramps from Fairfax are not provided, this is likely the best remaining way to get trucks onto I-70 after the current I-70 curves are widened.

The Unified Government appreciates KDOT's foresight in commissioning this study and for inviting us to participate. We hope these comments assist KDOT management in the selection of alternatives that can generate strong and sustained local support. We continue to be ready to assist KDOT in evaluating the public and community input received.

Sincerely,

Bill Heatherman, P.E., County Engineer

cc: Mayor Joe Reardon
Dennis Hays, County Administrator
Robert Roddy, Director of Public Works
Rob Richardson, Director of Urban Planning and Land Use

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY
& KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT

ONE McDOWELL PLAZA 701 NORTH 7TH STREET, 66101 (913) 573-5400
FAX (913) 573-5435

May 1, 2012

Debbie Tanking, Program Manager
Kansas Department of Transportation
700 SW Harrison St
Topeka, KS 66603-3754

RE: Lewis and Clark Viaduct Study – Follow-up Discussion on Preferred Options

Dear Ms. Tanking:

On March 21, 2012, Mayor Reardon and UG staff met with the KDOT and the HNTB study team to discuss the engineering and feasibility review of the "UG Master Plan Option" for the Lewis and Clark Viaduct. This was the option that the Unified Government identified as its #1 local preference in our December 2011 letter. The master-plan option moves I-70 away from the Missouri/Kansas River confluence and opens up river frontage for beneficial use, recreation and development.

KDOT and HNTB expressed significant reservations about the feasibility of this option, for reasons of high cost, right-of-way acquisition, funding timelines, construction sequencing, and federal environmental permitting. Mayor Reardon and UG staff reiterated the community's support of the Master Plan option approved in 2008 after extensive public consultation. We expressed our disagreement with the view that federal environmental reviews should put the local preference at a disadvantage for consideration. We asked that the long-term value to the community and state be given greater weight.

Despite this, the Mayor also expressed a desire to find a consensus around the viaduct design that to the extent possible conforms to the Master Plan. We believe that recreational access to the riverfront and first-class aesthetics are necessary and essential to support our Master Plan.

Based on all this, and subsequent conversations, it appears that a "Tentatively Preferred Consensus Option" that both KDOT and the UG could support would be based around Option 1B as shown in the November public meeting. This option preserves the current system of direct access into the Fairfax Industrial District and keeps Fairfax and CID-bound industrial truck traffic separated from the downtown entrance.

To conform to the recreational and aesthetic objectives of the Master Plan, the following would be needed:

A. Recreational Access: The existing Riverfront Heritage trail connector across the Kansas River would be replaced with a similar quality of pedestrian and bike crossing as part of the system of bridge construction.

In addition, the City ultimately anticipates a system of connecting trails linked to this river crossing - north to connect to a modified version of the "Kaw Point Connector" to allow access to Kaw Point Park and the site of Lewis and Clark's landing, and to the south on both sides of the river to connect to hoped-for future trails along the levee system. Room for all these features would be needed through the project area. We ask that KDOT assist in the construction and/or funding of a portion of this system. Our most urgent priority is the Kaw Point connector to the north.

B. First-Class Aesthetics: The Lewis and Clark viaduct on I-70 is the premier gateway into Kansas in the heart of a major urbanized area, and lies at one of the significant river confluences of the Midwest. It should be built with first-class aesthetics and in a way that complements the history that surrounds it. Multiple viewers and users should appreciate the facility, including drivers on I-70; drivers entering and leaving downtown KCK; pedestrians using the Riverfront heritage trail below; observers from the bluffs of Strawberry Hill and downtown high-rises; and boaters and observers from the river and Kaw Point Park.

We understand from recent conversations that KDOT is willing to work with us to develop these concepts further. The UG does expect that the State of Kansas (through state and federal funding) will provide financial support for these features as part of the overall plan for reconstruction of the viaduct. We understand that a portion of the enhancements would involve a state/local partnership, and that the conversation regarding these matters would extend beyond the end of the current study.

As a further note, there has been little discussion of sound walls along the relocated I-70. We understand that there are detailed studies that go into making these decisions, but these features may have an impact on public opinion and on any recreational and aesthetic designs. The present study should clearly address the issue and provide context for the community.

Lastly, we do believe that the Lewis and Clark Viaduct study should end with a strong statement of recommendations and conclusions, and that the final sequence of public presentations be scheduled.

The Unified Government appreciates KDOT's attention to the future of the Lewis and Clark Viaduct and for the substantial and sustained engagement you have offered as we have evaluated these difficult issues. We look forward to our continued partnership on these improvements to I-70.

Sincerely,

Bill Heatherman, P.E., County Engineer

cc: Mayor Joe Reardon
Dennis Hays, County Administrator
Robert Roddy, Director of Public Works
Rob Richardson, Director of Urban Planning and Land Use