Chapter 2:

EXISTING TRANSPORTATION CONDITIONS

The proposed improvement strategies identified during the PEL Study will be evaluated relative to their ability to address deficiencies in the existing transportation system. Transportation and existing infrastructure items addressed in this chapter specifically include roadway and bridge conditions; traffic conditions; safety; transit; bicycle and pedestrian facilities and operations; Missouri River navigation; railroads; the Downtown Airport; and utilities. Within these categories, there are a number of items that have been examined within the Study Area including:

Roadway and Bridge Conditions

- What are the existing bridge ratings?
- What are the existing pavement conditions?
- What are the existing lane widths, shoulder widths, and other potential geometric deficiencies for the roadway lanes, shoulders and ramps?
- What are the acceleration and deceleration ramps that present conflict points?

Traffic Conditions

- What are the existing traffic volumes based on an average annual daily traffic (AADT), as well as AM and PM peaks?
- What are the major traffic movements and distribution?
- What are the travel speeds and what are the key movements, as well as bottlenecks?
- What are the levels of service (LOS)?
- What are the travel times for moving through the Study Area?
- What are the key truck movements and average daily traffic (ADT)?
- What are the total vehicle miles traveled (VMT), total delay and other regional traffic measures of effectiveness within the Study Area?

Safety

- What is the total number of crashes and their severity?
- What are the average crash rates and how do they compare to the statewide average?
- What are the most common causes for the crashes?
- Where are the specific locations that have high crash rates?

Transit

- What are the local bus, MAX bus and streetcar routes?
- How do these routes interact within the Study Area?
- What are ridership numbers?
- What is the demand for transit service to the Northland and other areas?

Bicycle and Pedestrian Facilities

- What are the existing bicycle and pedestrian facilities?
- What are the existing bicycle and pedestrian problems?
- How do these facilities interact within the Study Area?
- What are the numbers of people using the bicycle and pedestrian facilities?

Missouri River Navigation

- What are the design requirements that bridges on the Missouri River must meet to accommodate navigation?
- Where is the navigation channel?
- What are the navigation facilities within the Study Area?
- What is the navigation season?

Railroads

- Where are the rail facilities located within the Study Area?
- Who operates the rail facilities?

Downtown Airport

- What are the airspace and runway requirements for the Downtown Airport?

Utilities

- What are the major utilities?
- Where are the utilities located within the Study Area?

ROADWAY & BRIDGE CONDITIONS

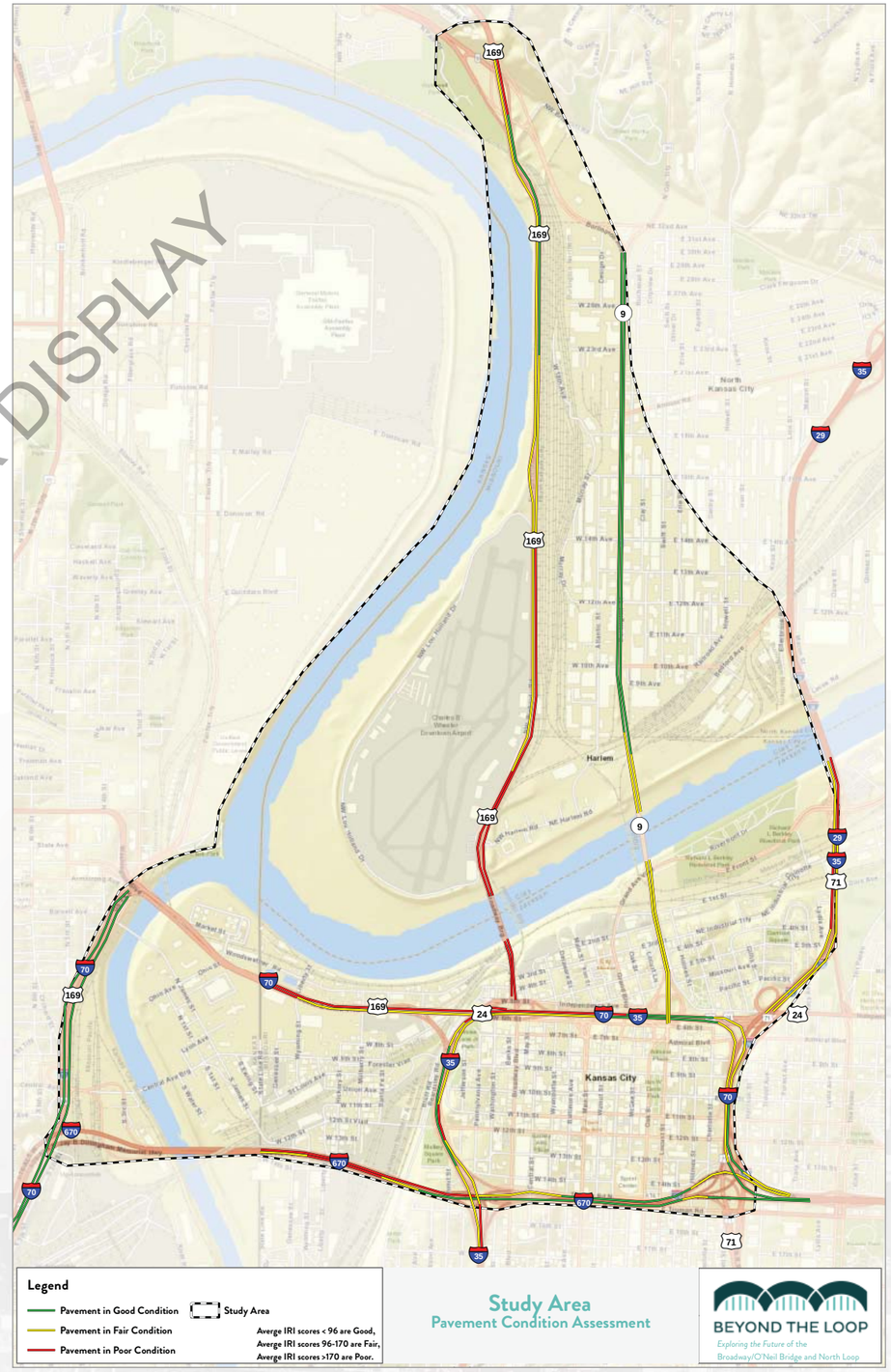
Roadway Conditions

Both Kansas and Missouri use the International Roughness Index (IRI) as the primary method to assess pavement smoothness. IRI measures the roadway profile in a single wheel track, and is reported in 'inches/mile.' IRI is a valuable tool in assessing pavement smoothness but does not gauge other pavement condition characteristics such as pavement stability and soundness. The condition of the sub-grade which provides the platform for the pavement was not assessed as part of this study.

General parameters established by the Federal Highway Administration for IRI are segmented as follows:

- IRI value of 95 or less is considered good
- IRI value of 96 to 170 is considered acceptable
- IRI exceeding 171 is considered poor

Figure 2.1 - Existing Pavement Conditions



Bridge Conditions - Buck O'Neil Bridge

MoDOT recently completed an extensive inspection of the O'Neil Bridge. The inspection identified numerous structural deficiencies in need of rehabilitation or replacement. Condition assessment of the trussed-arch spans, approach spans, and supporting elements are summarized below:

- Trussed-Arch Spans — Significant deterioration of structural steel has occurred at truss elements, gusset plates, connectors, bearings and steel stringers that support the roadway. Corrosion and deterioration are most prominent near roadway expansion joints where supporting elements are exposed to roadway drainage, but also occur throughout. Many of these elements need to be repaired or replaced. In addition, fatigue retrofits, painting and repairs to hanger assemblies are needed to prolong the life of the existing structure. Likewise, condition of the roadway deck and expansion joints warrant replacement of these items.
- Structural Steel — The most severe sections of bridge deterioration occur at stringer ends of the Main Spans, keeper plates, and floorbeam webs. Ends of steel stringers that support the roadway deck are exhibiting serious deterioration and section loss due to long term exposure to chloride contaminated runoff from the deck through open joints and curbs. Cracking also occurs in the stringer webs. The stringers are supported on steel plate bearings which are also deteriorating with extensive pack rust between the steel plate bearings and bottom flange of the stringers. Section loss occurs in top and bottom flanges of the floorbeams. Pitting in the floorbeam webs occurs throughout. Pack rust occurs between stiffening angles and floorbeam webs, with holes occurring in the floorbeam stiffening angles. Tie girders at the arch spans have pack rust between top plates and connecting angles which causes cupping and bowing of the top plates. Localized areas of pitting also occur on the tie girders. Portal frames, box members and gusset plates all have pack rust between plies of steel and deterioration.
- Suspender Cable Keepers — At each of the cable supports on the mains spans from panel points T2 to T2' the lower sockets of the cables are retained by keeper angles. These angles were attached with tap bolts to the socket bearing plate. Pack rust has formed between the keeper angles and the bearing plates at most locations. The pack rust is prying the keeper angles away from the bearing plate, and in some instances the bolts have failed and the keeper angles are no longer in place.
- Expansion Joints — The finger plate expansion joints at each end of the main spans have no drainage collection system. This allows roadway drainage to flow onto underlying structural steel and pier tops. Although vertical misalignment has occurred at the joints, the finger plates are in satisfactory condition but the supporting steel structure below is deteriorating. Pack rust, deterioration and broken clip angles occur at the joint support brackets. Compression seal joints at contraction joint locations have failed in all main spans. Filler material in the compression seals is missing and armoring is missing or damaged, again allowing roadway drainage access to structural steel elements below.
- Bridge Deck — The existing bridge deck has a low slump overlay on top which has numerous cracks in both the transverse and longitudinal directions, and deterioration near drain locations. Stay-in-place forms are underneath the deck and exhibit bulging in some places. The overlay above and deck forms underneath hinder crack detection in the actual deck. Based on reported visual observations, it is estimated that half-sole repairs are required on 20% of the deck area, and full depth repairs are required on 15% of the deck area. It is also recommended that the overlay be removed and replaced. Deck saturation also occurs in the north approach spans.
- Railing — The railing has numerous locations where vehicular impact has caused damage including bent and broken rail tubes and broken rail posts. Curbs and parapets supporting rail posts are corroded and spalled. Pack

Top Picture
Buck O'Neil Bridge is a trussed arch bridge that carries 4 lanes of traffic over the Missouri River, Union Pacific Railway, BNSF Railroad, 3rd Street, 4th Street, Woodswether Road and Richards Road

Middle Left
Typical deterioration at steel elements

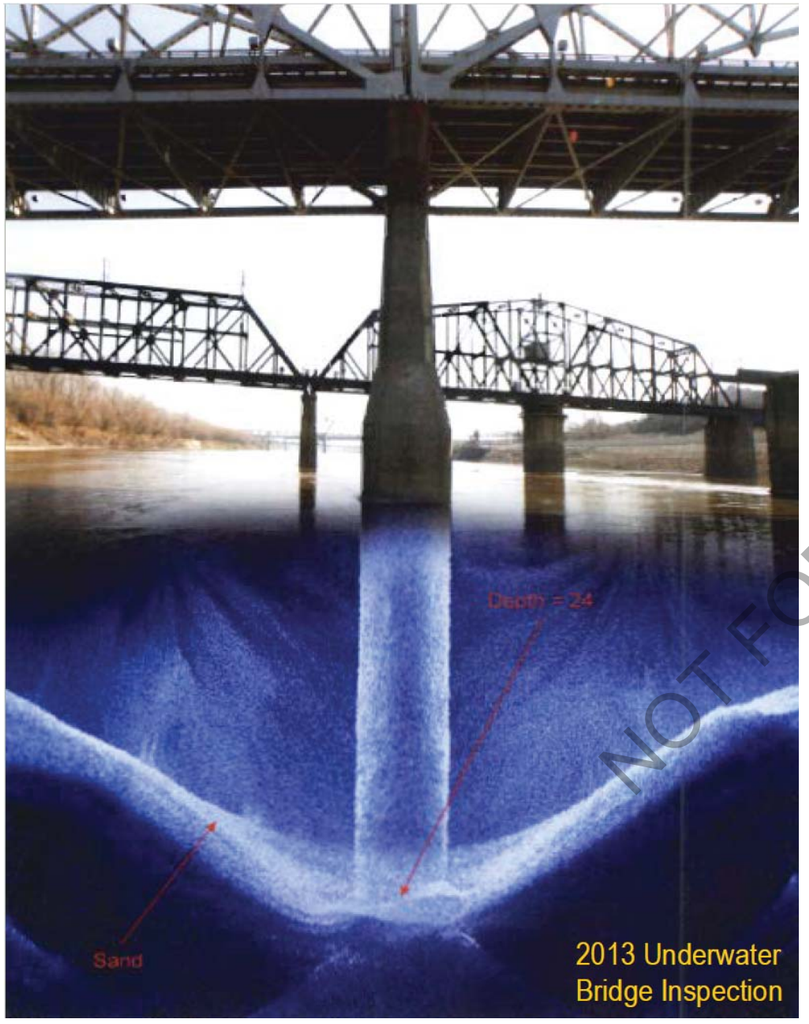
Middle Right
Pack rust at stringer bearing plates

Bottom Left
Broken retainer angle at suspender cable socket

Bottom Right
Deterioration at expansion joint support

rust is also prevalent on steel curb support brackets.

- Main Span Piers and Scour — A significant scour hole up to 24' deep is present at Pier 2. Pier 2 is located near the middle of the river at the north end of the 540' navigation span. The scour occurs on all sides of the pier. The pier is embedded approximately 1 foot into shale. This scour hole should be filled with stone or riprap to prevent further scouring in this vicinity. Faces of the piers are in generally poor conditions. Areas of delamination and spalls occur on the faces and corners. Elevated chloride content occurs in the concrete.
- Approach Span Piers - Pack rust occurs between flanges and connecting angles and end plates and connecting angles at the approach piers. Localized concrete spalling also occurs.
- North Approach Spans - Systemic cracking of the girder webs occurs at the ends of stiffeners. Cracking can primarily be classified as distortion induced fatigue cracking. Some of the cracking has propagated into the webs. Monitoring has shown the cracks continue to grow over time.



Underwater sonar investigations have identified a significant scour hole at Pier 2.

Left Picture
Concrete spalling along the shoulders

Right Picture
Deck cracking in overlay

Bottom Two Pictures
Extensive corrosion at the approach piers.

Bridge Condition - Other Study Area Bridges

Reports on the most recent bridge inspection and bridge ratings in the study area were reviewed. 2015 National Bridge Inventory System (NBIS) data was obtained for structures in Kansas. Missouri splits the inspection of their structures into a two-year cycle and the data includes records from both 2015 and 2016. NBIS bridge condition ratings were reviewed for 26 bridge structures located in Kansas and 86 in Missouri. NBIS data consists of three separate rating areas; bridge deck, bridge superstructure, and bridge substructure. A 1 to 10 rating scale is used for each component, and a general assessment of good is assigned to ratings 7 through 10, fair to ratings 5 and 6, and poor to a rating of 4 or less.

Figure 2.2 shows current NBIS ratings for all bridges in the Study Area. Six structures have one or more ratings of 4 or less and are indicated as poor. Bridge B0031 carrying I-70 over the Kansas River is in the final states of plan development and KDOT is anticipating receiving construction bids in November 2017.

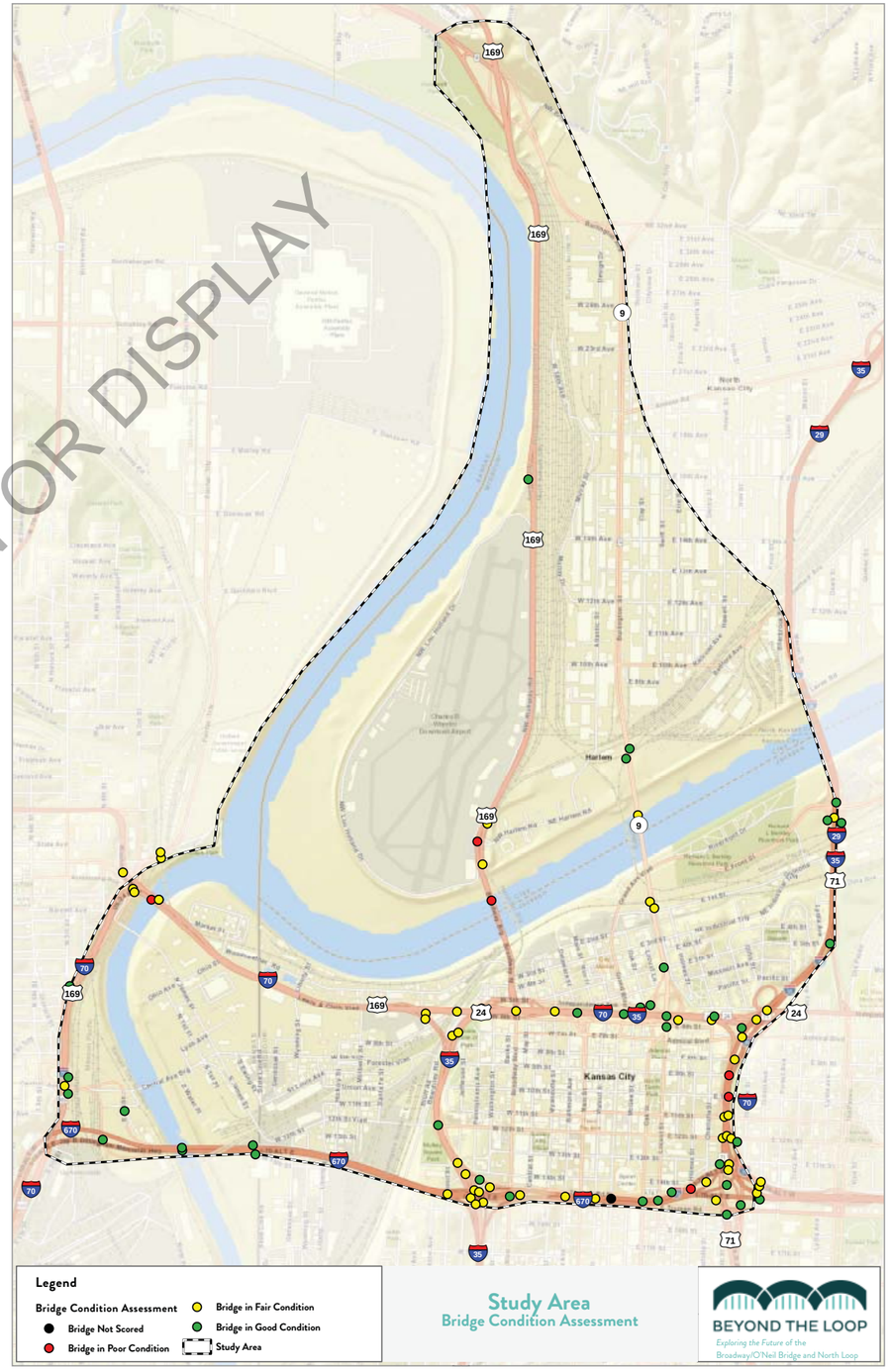
The structures with poor ratings include those listed in Table 2.2 below:

Table 2.1 -Study Area Bridges with Poor NBIS Ratings

Owner	Bridge No.	Carrying	Spanning	Deck Rating	Superstructure Rating	Substructure Rating
KDOT	B0031	I-70	Kansas River	7	4	5
MoDOT	A0825	Holmes Road	Ramp I-670 E to I-70 W	3	3	7
MoDOT	A4646	Route 169	Harlem Road	6	4	7
MoDOT	A4649	Route 169	Missouri River	5	4	5
MoDOT	L0938	9th Street	I-70	3	3	6
MoDOT	L0939	10th Street	Ramp I-70 E to 11th Street	3	3	5

Six bridges in the Study Area, including the Buck O'Neil Bridge, are considered in Poor Condition.

Figure 2.2 - Existing Bridge Condition Ratings



Roadway Inventory

The primary roadway system in the Study Area consists of interstate highways I-35, I-70, and I-670; Route 169 which is classified as an urban freeway; and Missouri Route 9, which functions as a principal arterial.

Figure 2.3 notes the number of general purpose lanes available on the primary roadway system and Figure 2.4 shows the number of lanes on the connecting ramps.

Figure 2.3 - Through Lanes by Direction

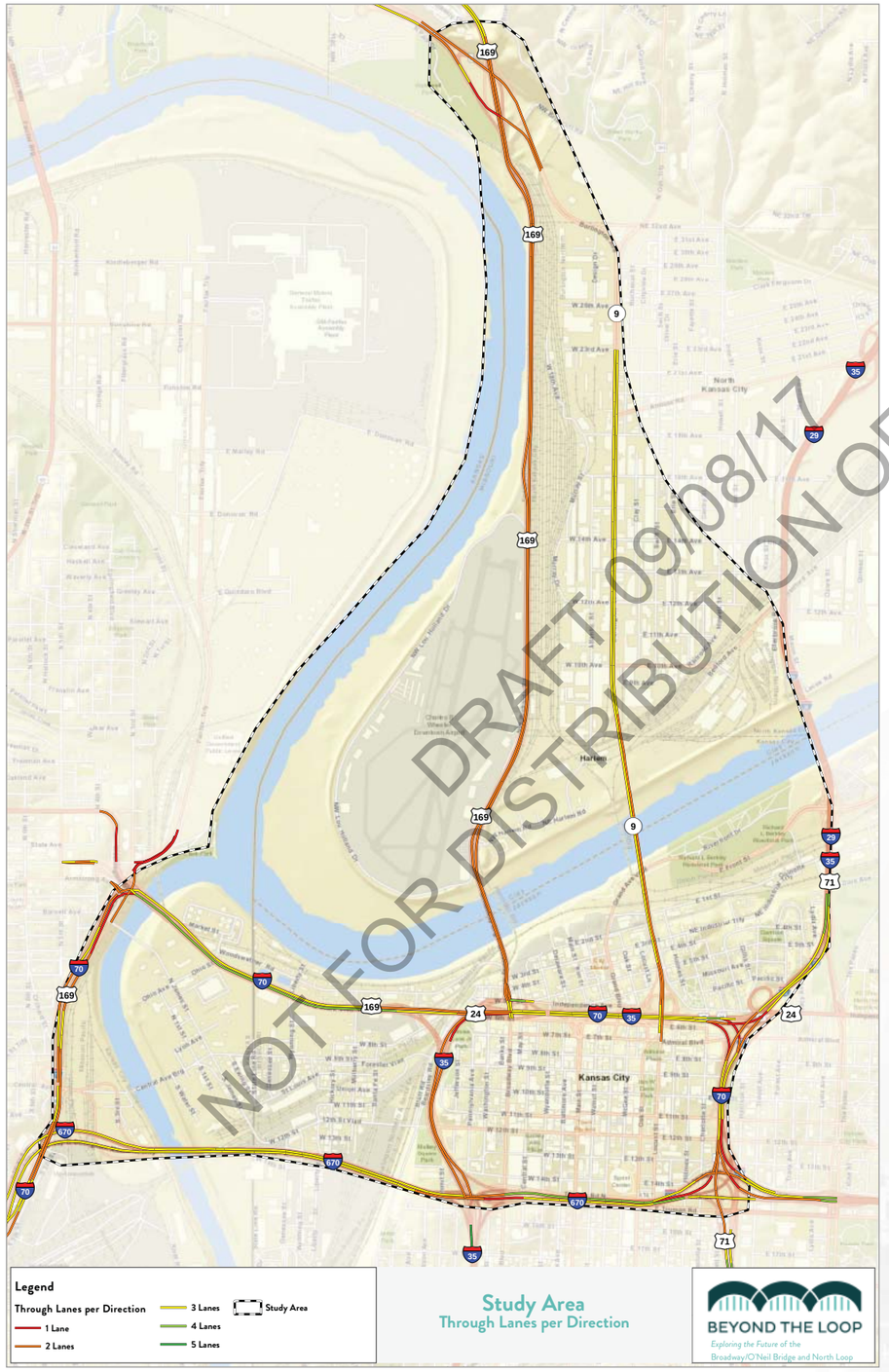
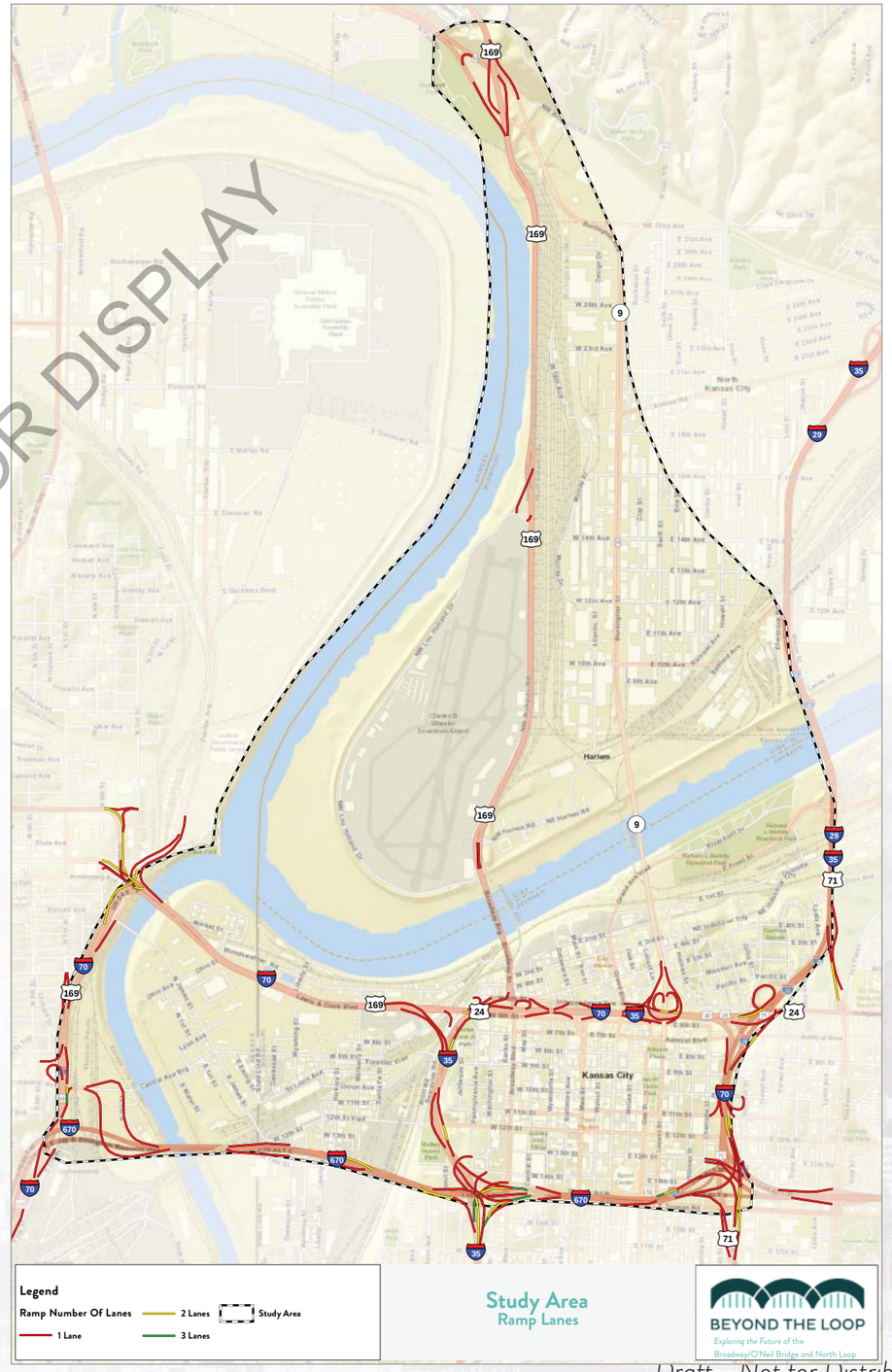


Figure 2.4 - Ramp Lanes



Geometric Deficiencies

The project team investigated existing lane widths, shoulder widths, and horizontal curvature to compare with the currently desired design guidelines established by AASHTO. Significant deficiencies existing in the following four areas:

- Mainline Shoulder Widths - The existing shoulder width on most of the interstate system is less than the current AASHTO design guideline recommends. Figure 2.5 illustrates the outside shoulder width compared to the desired design and Figure 2.6 notes the inside shoulder width.
- Ramp Shoulder Widths - The existing shoulder width on most of the ramps is less than the current AASHTO design guideline recommends. Figure 2.7 illustrates the outside shoulder width for ramps in the Study Area compared to the desired design. Figure 2.8 notes the inside shoulder width for ramps.
- Ramp Curvature - Many of the existing ramps have a horizontal curvature below the current design guideline. The horizontal curvature was rated as meeting the current design guideline, nearly meeting the guideline, and below current design guidance. Figure 2.9, on the next page, shows the ramps in the Study Area and an assessment of horizontal curvature.
- Acceleration and Deceleration Lanes - Most of the acceleration and deceleration lanes provided for ramp movements do not meet current design standards for desired length. Additionally, nine locations within the Downtown Loop have a shared use acceleration/deceleration lane, with seven of the nine locations using a shared lane that is less than a desired minimum of 600 feet. The short length and shared function of the acceleration and deceleration lanes impacts travel efficiency and adds conflict points for weaving traffic. Figure 2.10 illustrates current acceleration and deceleration lane lengths in comparison to the recommended design length established by AASHTO for ramp movements in the Downtown Loop.

Figure 2.5 - Outside Shoulder Widths

Figure 2.6 - Inside Shoulder Widths

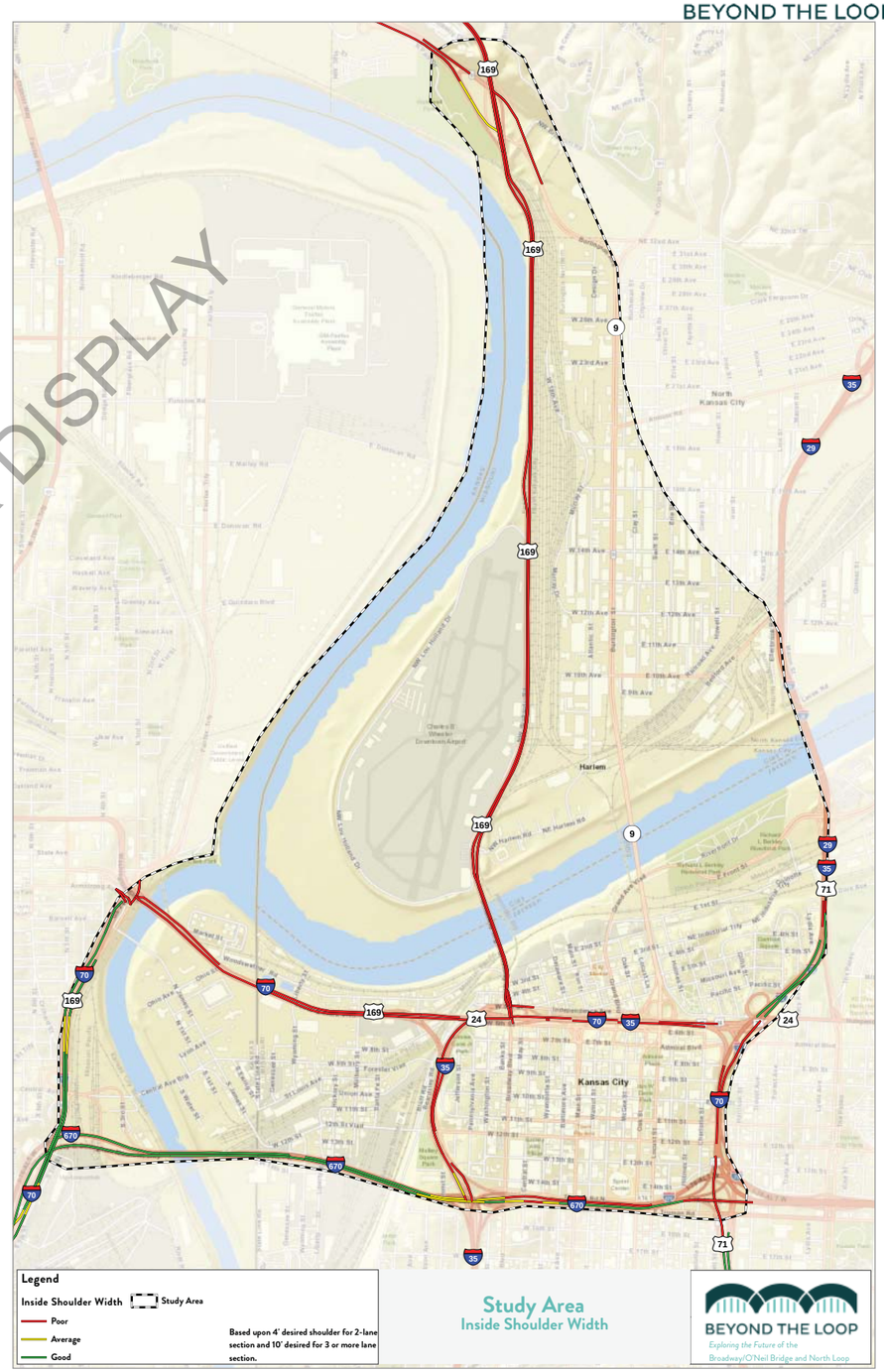


Figure 2.7 -Outside Ramp Shoulder Widths

Figure 2.8 - Inside Ramp Shoulder Widths

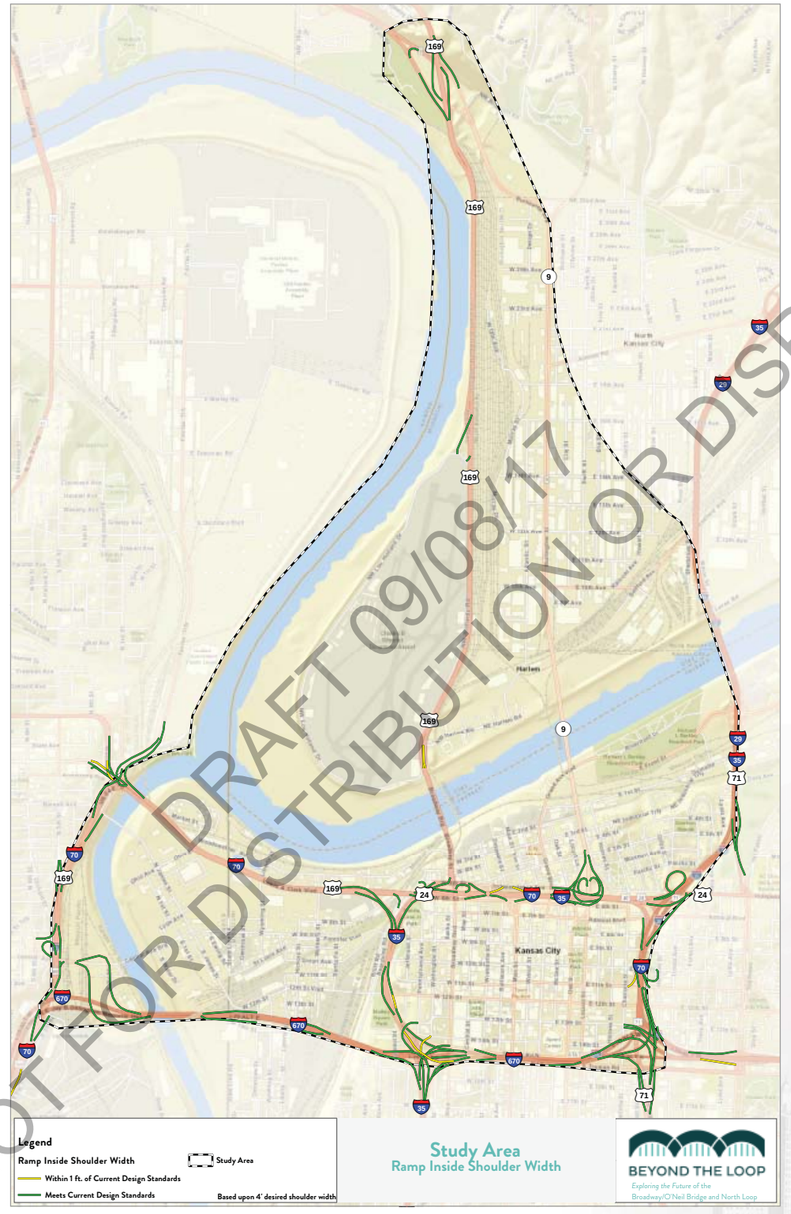
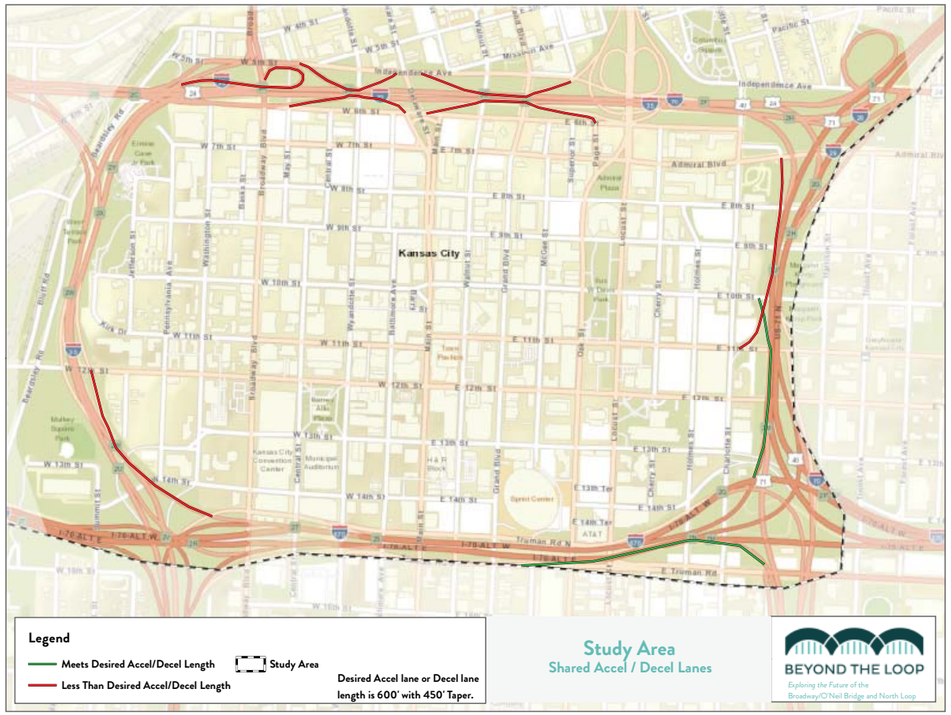


Figure 2.9 - Ramp Radii

Figure 2.10 - Acceleration and Deceleration Lanes



TRAFFIC CONDITIONS

This section presents the existing study area traffic operational conditions including travel volumes, levels of service (LOS), travel speeds and travel times, and typical origins and destinations.

Travel Volumes

MoDOT's continuous counters provided the vehicular traffic counts. The counts were collected during the AM and PM peak periods and daily on weekdays between January 25, 2017 and April 19, 2017. The truck average annual daily traffic count information is from MoDOT's Vehicle Count Map. Note that truck percentages on interstates in the downtown Kansas City area are relatively high at around 18 percent in most locations.

Figure 2.11 - Percent of Heavy Trucks - 2016

Figure 2.12 - Average Annual Daily Traffic (AADT) and AM/PM Peak Period Traffic - 2016

Figure 2.13 - Average Annual Daily Traffic (AADT) and AM/PM Peak Period Traffic - 2040

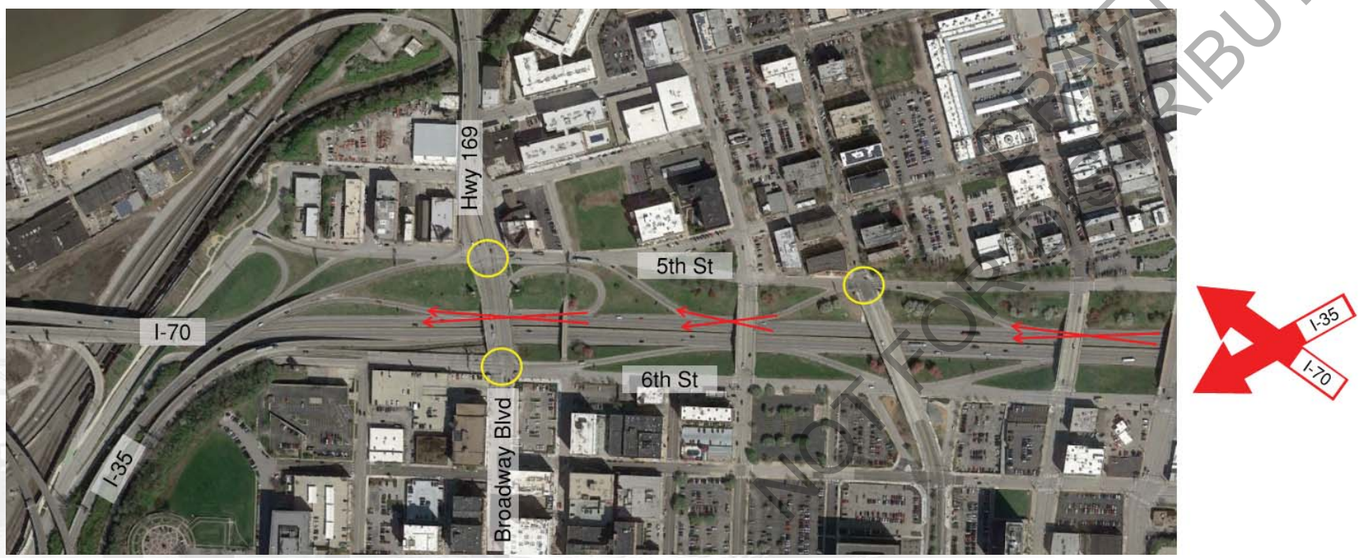
Travel Level of Service

Level of Service (LOS) describes overall roadway operations and the traveler's ease of making appropriate maneuvers. Below is a description of the A-F ranking scale for LOS and example images are shown to the right.

- LOS A describes free-flow, uninterrupted traffic conditions.
- LOS B indicates slightly restricted maneuverability that closely resembles free-flow operations.
- LOS C represents slightly restricted traffic flows that noticeably differ to free-flow conditions.
- LOS D describes the point in which traffic speeds begin to decline due to increased traffic.
- LOS E indicates heavy congestion in which the roadway is operating at capacity.
- LOS F represents a breakdown of traffic flow resulting in excessive queues.

The Downtown Loop was designed and built to the standards of its day, however, that was a long time ago. Modern interstate highways have much different design standards. Designs once considered acceptable have now become undesirable in facilitating higher traffic volumes. The overwhelmed designs are evident throughout the downtown loop, especially along the entrance and exit ramps on the north and east sides of the loop.

Closely spaced on and off ramp configurations often result in a weaving behavior that requires the crisscrossing of traffic on the highway. Weaving areas are often the largest source of traffic congestion with the effect compounded when multiple weave areas are too close to one another or overlap. Other influence factors on weaving segments include upstream traffic signals which could affect the grouping of vehicles entering the highway. Closely spaced vehicles entering the highway at once often result in a ripple effect that further degrades traffic operations. Modern design practice tries to limit interactions on weaving segments. Figure 2.11 on the following page identifies the roadway segments experiencing unacceptable LOS in both the AM and PM peak periods.



There are four overlapping, undesirable traffic weaves on westbound I-70 along the North Loop. These overlapping weaves drastically reduce traffic operations in this area.

Table 2.3 - LOS Definitions

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

*Vehicles per Mile per Lane or Passenger Cars per Mile per Lane

Figure 2.X - LOS Examples for Basic Freeway Segments (HCM 6th Edition)

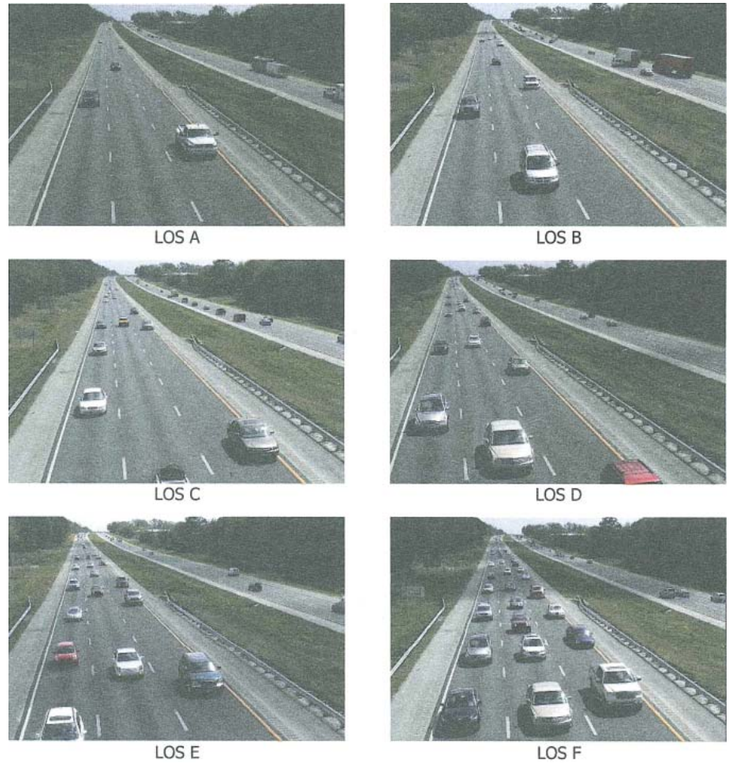
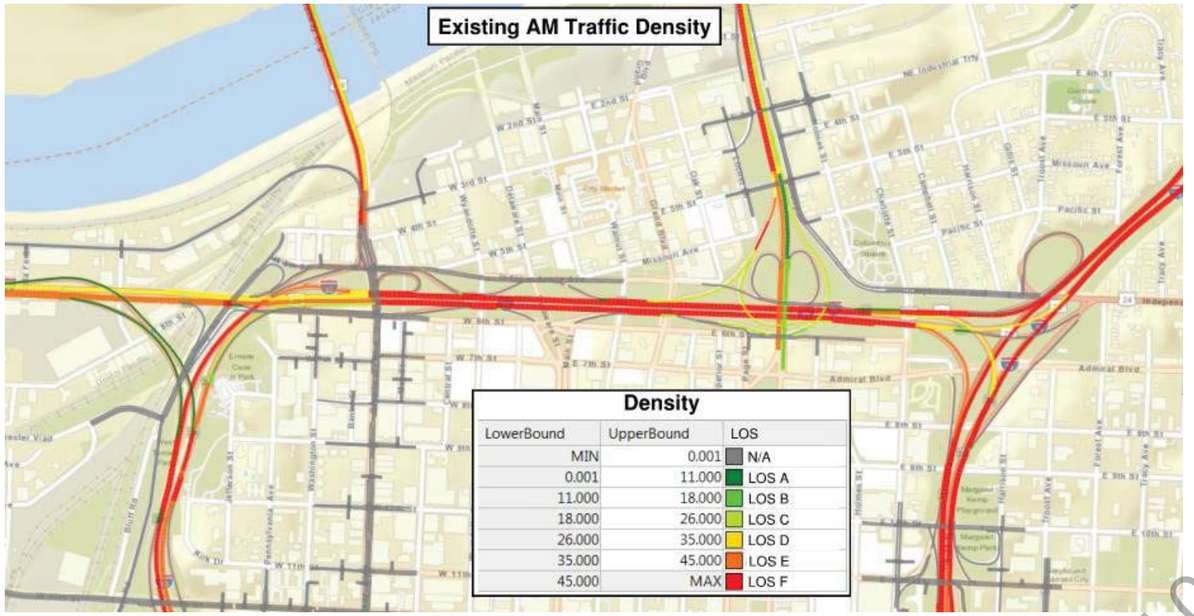
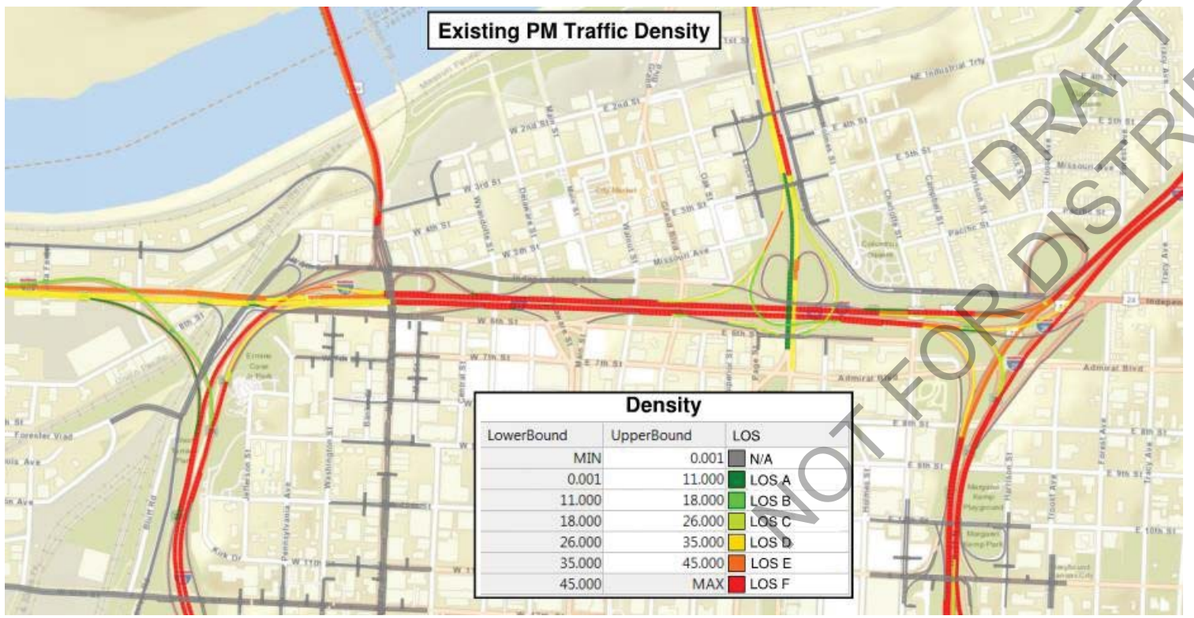


Figure 2.11 - Level of Service Density - AM Peak Period (Top), PM Peak Period (Bottom) - 2016

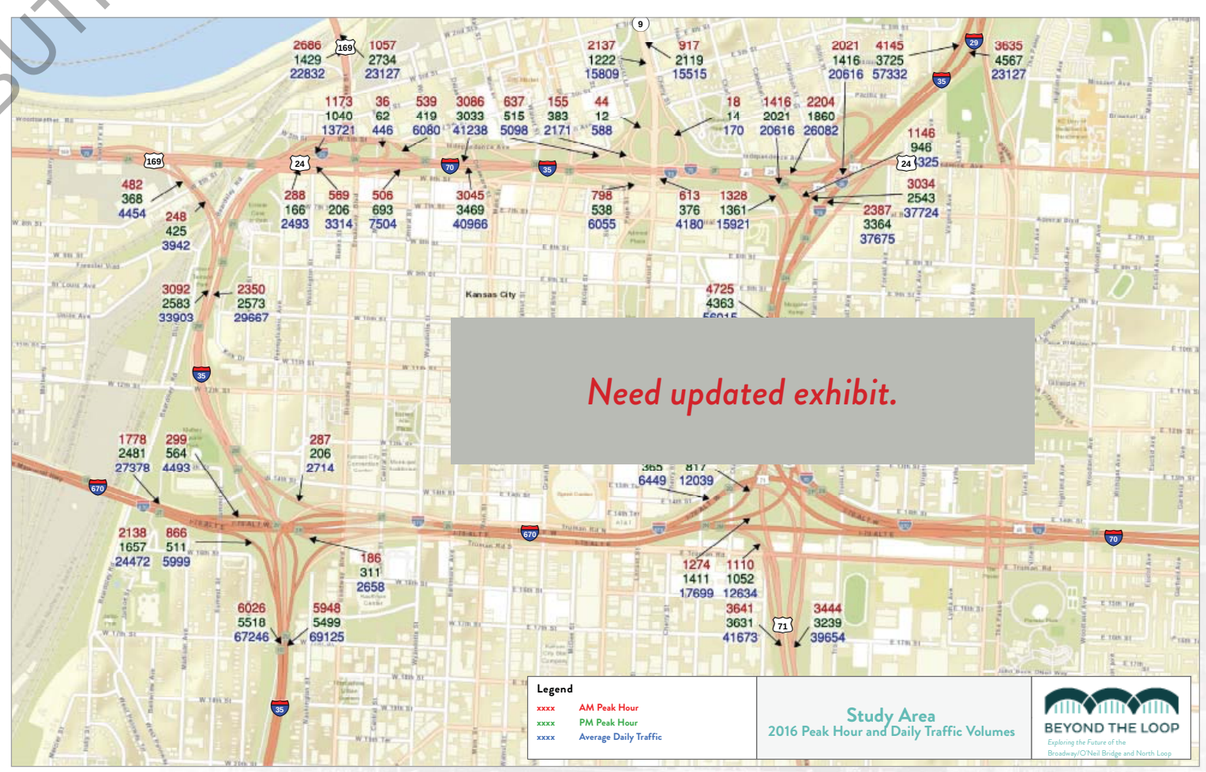




Traffic modeling of current day roadways show LOS F for much of the downtown Kansas City highways during the morning and evening peak hours.

This section still in development.

Figure 2.12 - Average Travel Speeds - 2016



Need updated exhibit.

Travel Origins and Destinations

The Loop is Kansas City's largest generator of daily traffic. Understanding the travel patterns of the Loop's traffic is an important factor for this study. Origin-Destination (O-D) pairs were analyzed for both AM and PM peak hours and were summarized into three types: system-to-system movements, system-to-central business district (CBD) movements, and CBD-to-system movements. System-to-system movements are movements from a major roadway, an interstate or limited access highway, to another major roadway. For the purposes of the O-D data collected, these were the longest trip types, with the trips starting and ending outside the study area. System-to-CBD movements, and similarly CBD-to-system movements, were trips that started on a major roadway and ended at the CBD. The CBD-to-system were the reverse trip, or a trip starting at the CBD and ending on a major roadway.

O-D pairs were collected through a series of high-definition aerial photographs in which every 10th vehicle entering the study area on a major roadway was tracked to determine vehicular routing and estimated volume. Vehicles were tracked from entry of the designated zone until exiting the designated zone which encompassed the entirety of the downtown Kansas City highway Loop system. The extents of local roadways of downtown inside the highway Loop system were not assessed in this procedure.

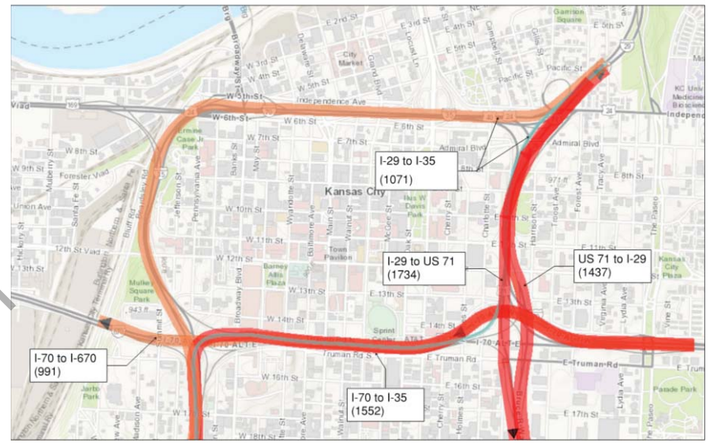
System-to-System Movements

The Loop is Kansas City's largest generator of daily traffic. Understanding the travel patterns of the Loop's traffic is an important factor for this study. Approximately 38% of all AM traffic entering the perimeter of the Loop on a major roadway is destined to the Loop. That number falls to 19% in the PM. In the opposite direction, in the morning 12% of the traffic is from the Loop and 30% in the PM.

The five heaviest AM peak hour system-to-system routes in terms of vehicular volumes are:

- *I-29 (NE Corner) to Hwy 71 (SE Corner) – 1734 vehicles*
- *I-70 (SE Corner) to I-35 (SW Corner) – 1552 vehicles*
- *Hwy 71 (SE Corner) to I-29 (NE Corner) – 1437 vehicles*
- *I-29 (NE Corner) to I-35 (SW Corner) – 1071 vehicles*
- *I-70 (SE Corner) to I-670 (SW Corner) – 991 vehicles*

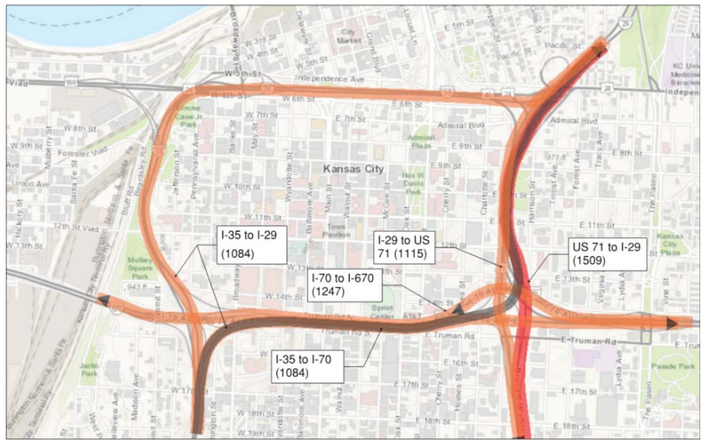
AM Top 5 Loop System Movements

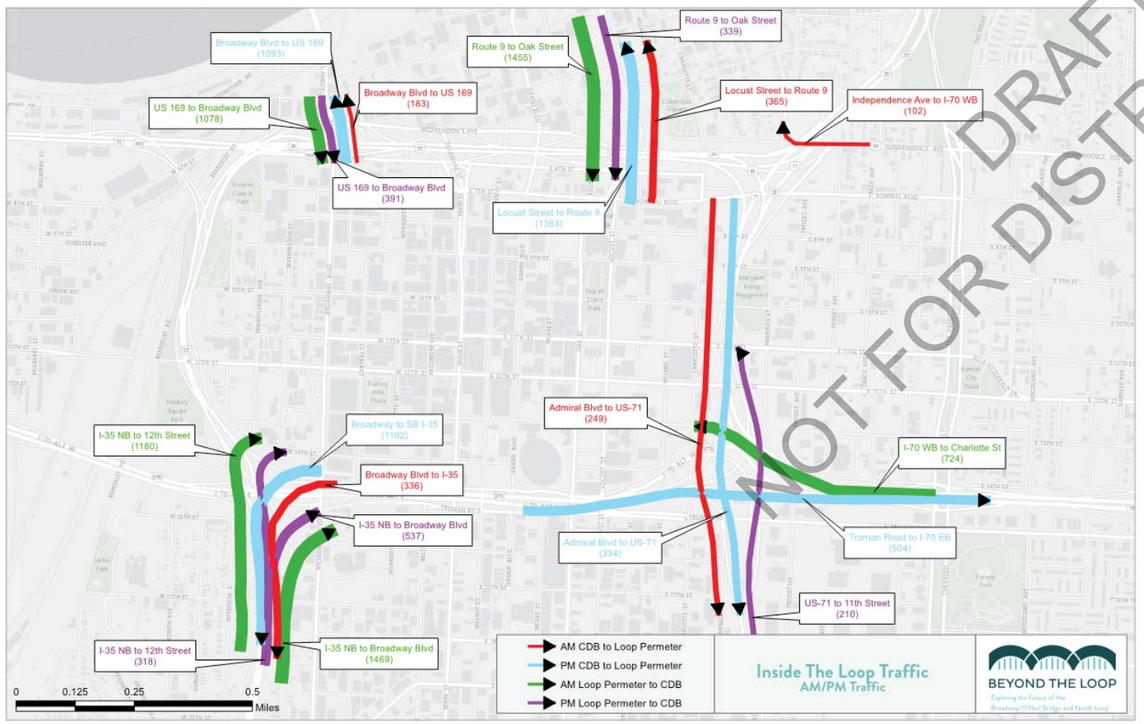


The five heaviest PM peak hour system-to-system routes in terms of vehicular volumes are:

- *Hwy 71 (SE Corner) to I-29 (NE Corner) – 1509 vehicles*
- *I-70 (SE Corner) to I-670 (SW Corner) – 1247 vehicles*
- *I-29 (NE Corner) to Hwy 71 (SE Corner) – 1115 vehicles*
- *I-35 (SW Corner) to I-29 (NE Corner) – 1084 vehicles*
- *I-35 (SW Corner) to I-70 (SE Corner) – 1034 vehicles*

PM Top 5 Loop System Movements





The figure shows the five highest-volume movements into and out of the Loop during the AM and PM peak hours.

The remainder of the O-D section is still in development.

SAFETY ASSESSMENT ANALYSIS

The safety assessment focused on understanding the magnitude and nature of the safety problems within the Study Area and relating crash causality to roadway geometrics and traffic operations. The analysis looked only at major roadways and omitted records for accidents occurring on local roads and streets.

Total Accidents

The analysis included the review of five years of accident reports (2010 to 2014) to assess trends in accident classification and accident severity. Within the Study Area there were a total of 5,898 reported crashes on the major roadways; 670 occurred on Kansas highways; and 5,228 on Missouri highways. Table 2.4 summarizes the reported crashes from 2010 to 2014 by severity.

Accident location maps were prepared to assist in identifying more specific areas with a high volume of incidents. The heat map in Figure 2.12 illustrates locations with increased incident frequencies and Figure 2.13 identifies the location of the injury only accidents. Six locations in or immediately adjacent to the downtown loop were identified with increased accident frequencies. These locations include:

- US-169 at the Downtown Airport Interchange
- US-169, I-70, and 5th Street Interchange
- North Side of the Loop
- East Side of the Loop
- I-35, I-670, and the Broadway Interchange
- I-70 Curve at Minnesota Avenue

Average Crash Rates

Crash rates are a common measure used when analyzing safety statistics for highways to gauge the overall safety performance of a roadway segment. Crash rates are calculated by totaling the number of incidents occurring per hundred million miles traveled over a specific segment length.

- Kansas — A two-year average crash rate was compiled for each major corridor segment in the Kansas portion of the Study Area. The data, Table 2.5, notes the segment of I-70 from Route 169 to the State Line exceeds the comparable statewide average for 6-lane urban freeway facilities in Kansas.
- Missouri — A three-year average crash rate was compiled for the Missouri portion of the study area. The data in Table X illustrates all four sides of the downtown loop exceed the comparable MoDOT Kansas City District average, and in some segments, are more than triple the rate.

Table 2.3 - Reported Crashes by Severity - 2010 to 2014

Accident Severity	Kansas	Missouri	Total
Fatal	7	20	27
Disabling	10	93	103
Minor Injury*	167	1,083	1,250
Property Damage Only	486	4,032	4,518
Totals	670	5,228	5,898

* Records for Kansas include the additional classification of possible injury. All accidents listed as possible injury have been transferred to minor injury for consistency with Missouri data.

Table 2.4 - Average Crash Rates, Kansas

Route	Location	2-Year Average Crash Rate	Comparable Crash Rate for Kansas Urban Freeways
I-670	I-70 to State Line	73	138
I-70	I-670 to US 169	81	138
I-70	US 169 to State Line	151	138

Table 2.5 - Average Crash Rates, Missouri

Route	Location	Direction of Travel	3-Year Average	Comparable Crash Rates for the Kansas City District
I-70	North Side of Loop	East	359	138
I-70	North Side of Loop	West	361	138
I-70	East Side of Loop	North	269	138
I-70	East Side of Loop	South	411	138
I-670	South Side of Loop	East	213	138
I-670	South Side of Loop	West	205	138
I-35	West Side of Loop	North	235	138
I-35	West Side of Loop	South	411	138
US 169	Broadway Extension	North	116	129
US 169	Broadway Extension	South	147	129
Route 9	Burlington Corridor	North	162	137
Route 9	Burlington Corridor	South	225	137

Figure 2.12 - Accident Density

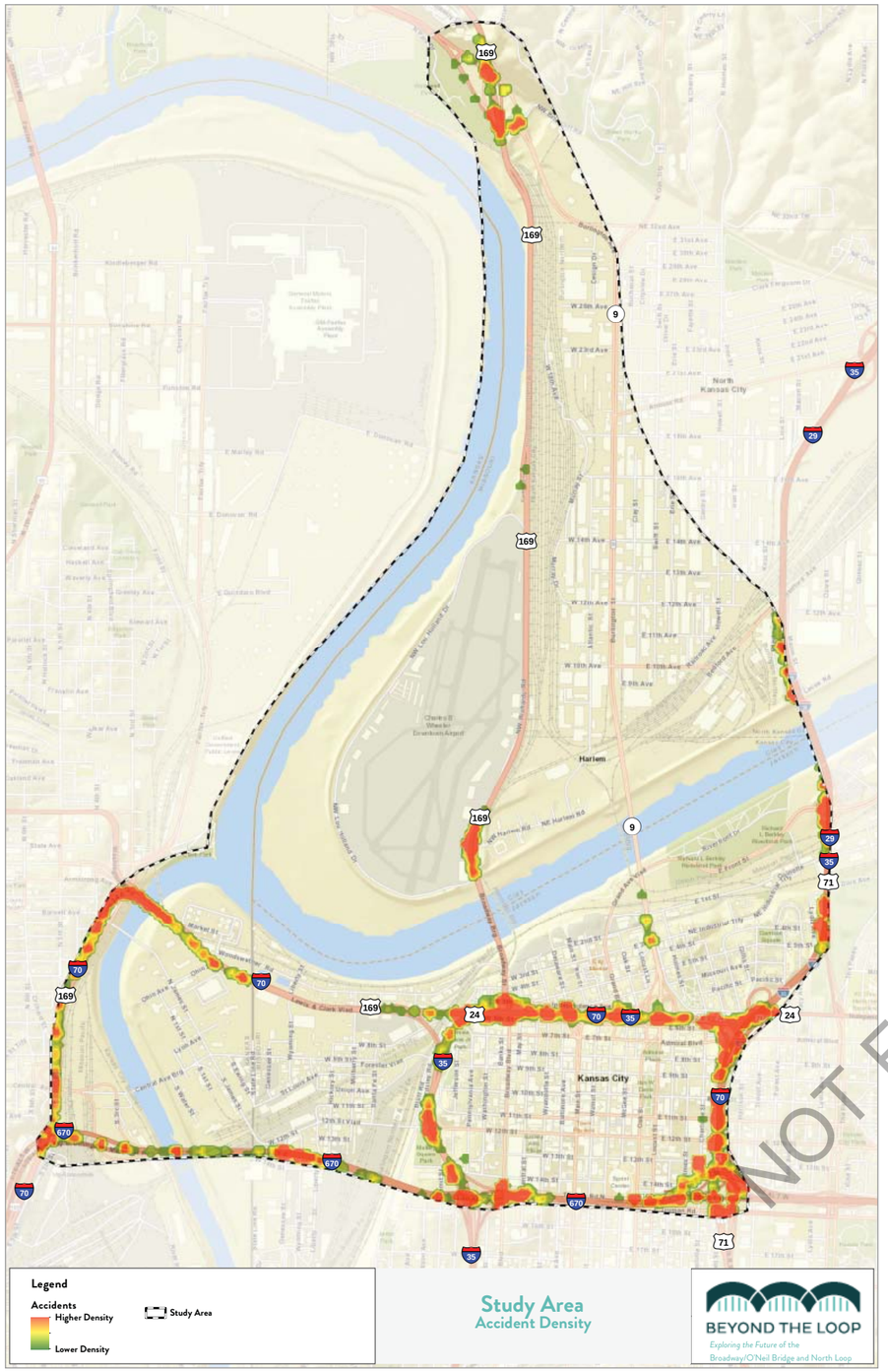
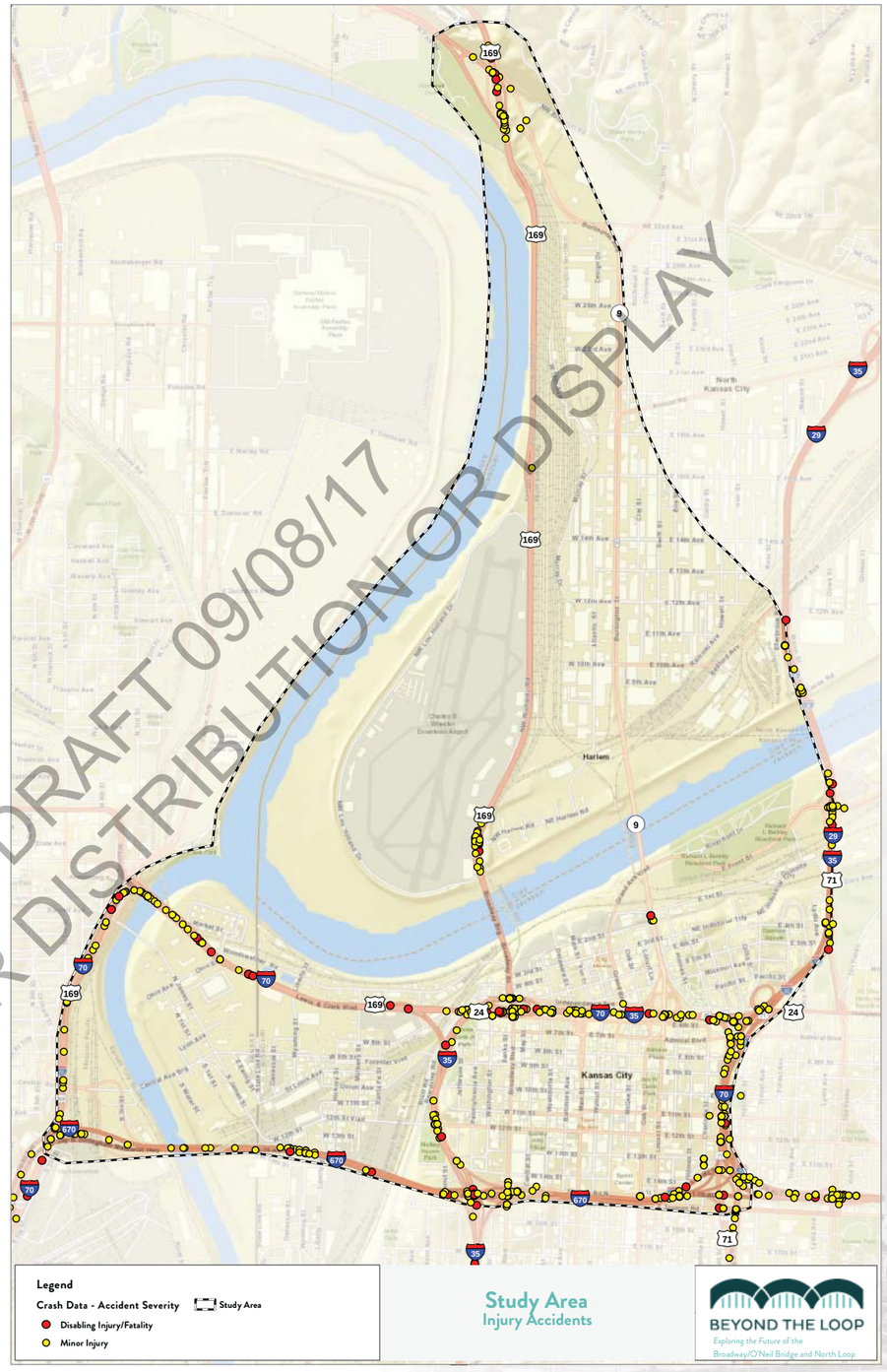


Figure 2.13 - Injury Accidents



Accident Causality

An accident classification breakdown was completed at each high accident location. The accident classification indicates the primary contributing cause to the incident as recorded by the policing agency. Rear-end, passing and changing lanes are the predominate accident classifications for each of the six locations. Out of control accidents, which include driving too fast for conditions and incidents related to weather was also frequently noted as a contributing factor. The large percentage of rear-end, passing, and lane changing accidents are often a result of higher congestion levels or deficient roadway geometrics such as poor sight lines, short merging areas, and high volumes of weaving movements.

Figure 2.14 - Accident Causality, Missouri and Kansas

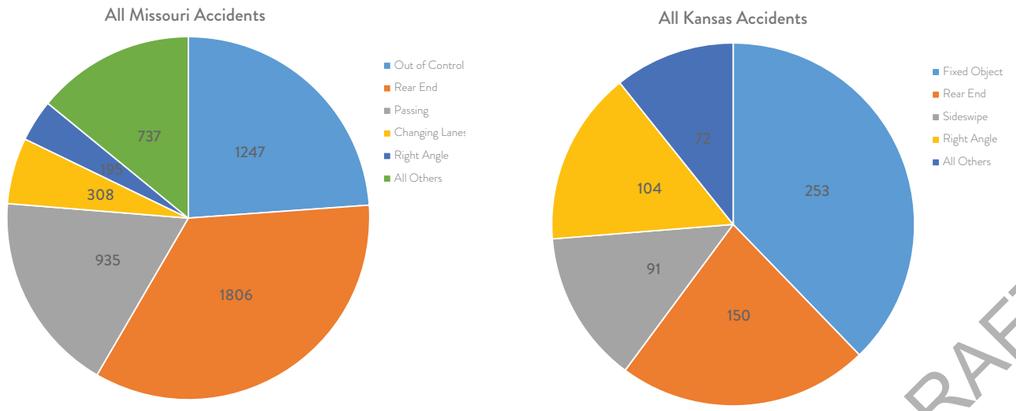
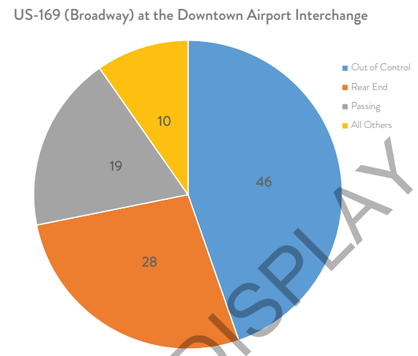
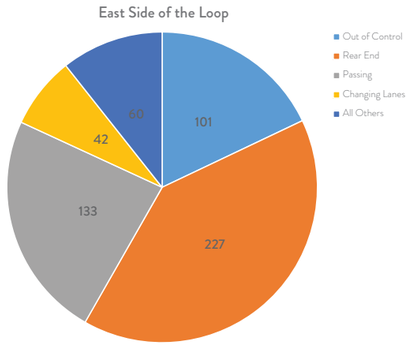
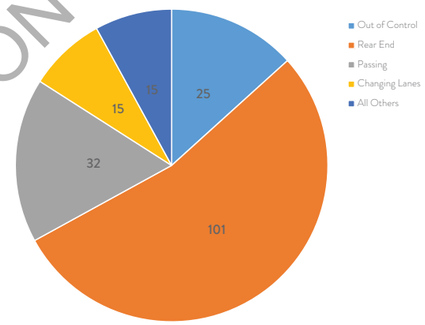
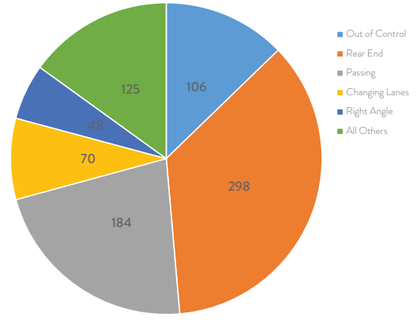


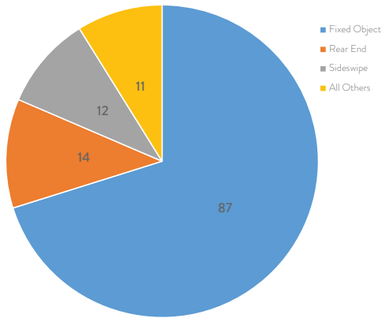
Figure 2.15 - Accident Causality, Top Six Locations

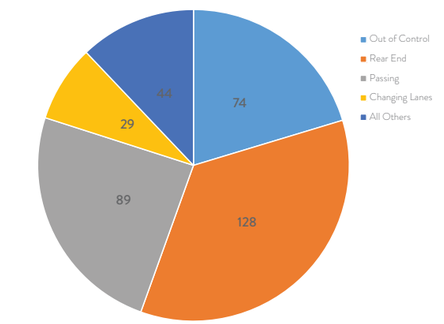












TRANSIT CONDITIONS

The study area traverses the heart of downtown Kansas City. Many transit lines run through the study area and the information that follows briefly summarizes these routes.

Local Bus Routes

Local Bus lines make local stops throughout their designated routes. KCATA offers variations of the routes as depicted in the figure during weekend periods. Downtown Kansas City is currently served by 42 KCATA and eight Johnson County Transit bus routes, designed primarly to transport workers into and out of downtown. With the development of new convention, sporting and cultural facilities, Power and Light District, and more people moving downtown, travel demands are changing. As a result, the KCATA recently completed a Downtown Service Improvement Concept Plan. Essentially the plan calls for reconfiguring downtown routes forming new Transit Emphasis Corridors, generally within the downtown loop, and developing new transit hubs to improve connections.

MAX Bus Routes

MAX lines developed by KCATA provide bus rapid transit (BRT) service in the region. BRT routes are priority routes and include passenger amenities such as zero entry boarding, wi-fi, and enhanced station stops. Main Street MAX provides north/south service through the heart of Kansas City originating at the River Market area, extending south to Waldo. Stops within the study area include Grand Avenue and 3rd Street in the River Market, Grand Avenue and 5th Street, Grand Avenue and 8th Street, and Grand and 9th Street. Park and ride facilities along with transfers to other KCATA services are available at the Grand Avenue and 3rd Street stop in the River Market. Note, KCATA is currently considering moving the Main Street MAX route to Grand Aveneue based on overlap with the KC Streetcar Main Street route.

Streetcar

KC Streetcar debuted in 2016 and provides fixed route transit services along a 2 mile north/south corridor extending from the River Market area to Crown Center. Stops include 3rd and Grand Avenue, 4th and Delaware Street, 5th and Walnut Street, 7th and Main Street, and 9th and Main Street. Park and ride facilities along with transfers to KCATA services are available at the Grand Avenue and 3rd Street stop in the River Market. A feasibility study was recently completed that examined the potential extension of the existing streetcar line from 3rd and Grand to the Riverfront. In addition, a team has been selected to study the potential extension of the existing streetcar line from Union Station to the Country Club Plaza/UMKC area.

Figure 2.16 -Study Area Transit Services

BICYCLE AND PEDESTRIAN FACILITIES AND OPERATIONS

Existing Bicycle Facilities

Numerous signed bike routes exist along the City of Kansas City roadway network. Bike routes crossing the north side of the downtown loop include Charlotte Street, Grand Boulevard and Wyandotte Street. Major connecting east/west oriented bike routes in the region include 3rd Street north of the downtown loop and 11th and 12th Streets south of the downtown loop.

Two multi-use trail segments are available allowing bicyclists to cross either the Kansas River or Missouri River. A barrier separated multi-use path is available on the Heart of America Bridge (MO Route 9) which crosses the Missouri River and the Riverfront Heritage Trail crosses the Kansas River as an attached pedestrian facility to the I-70 eastbound bridge.

The existing Buck O'Neil/Broadway Bridge is a highly desired bicycle route that is for the most part inaccessible under the current conditions. In fact, Figure X-X presents bicycle demand scores for the Missouri portion of the Study Area.

The City of Kansas City is in the process of updating the Bike KC plan. The goal for completion of the updated plan is March 2018.

Existing Pedestrian Facilities

Many of the surface streets within thestudy area have pedestrian facilities on one or both sides, with isolated gaps spread throughout. The City of Kansas City along with MoDOT are progressing with ADA transition plans and while many deficiencies have been addressed at curb cut locations, excessive cross slopes and width restrictions are present on nearly every segment of sidewalk. Pedestrian activated push buttons at signalized intersections are being modified to meet ADA requirements as part of the ADA transition planning process.

In addition to the previously mentioned Heart of America Bridge multi-use path and Riverfront Heritage Trail, there are five local streets that bridge the north side of the downtown loop, and one highway crossing. All five local street crossings have dedicated pedestrian access and connect into the City of Kansas City sidewalk system. The Grand Avenue crossing is the only local street, however, that has pedestrian accommodations exceeding four foot in width. The highway crossing, Missouri Route 9 (Oak Street), is not designed for pedestrian access and is configured as a higher speed roadway with a shoulder section.

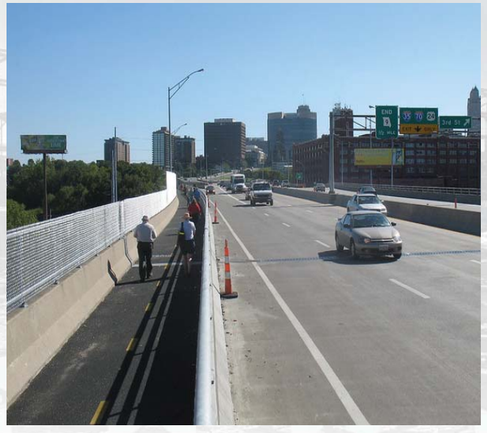
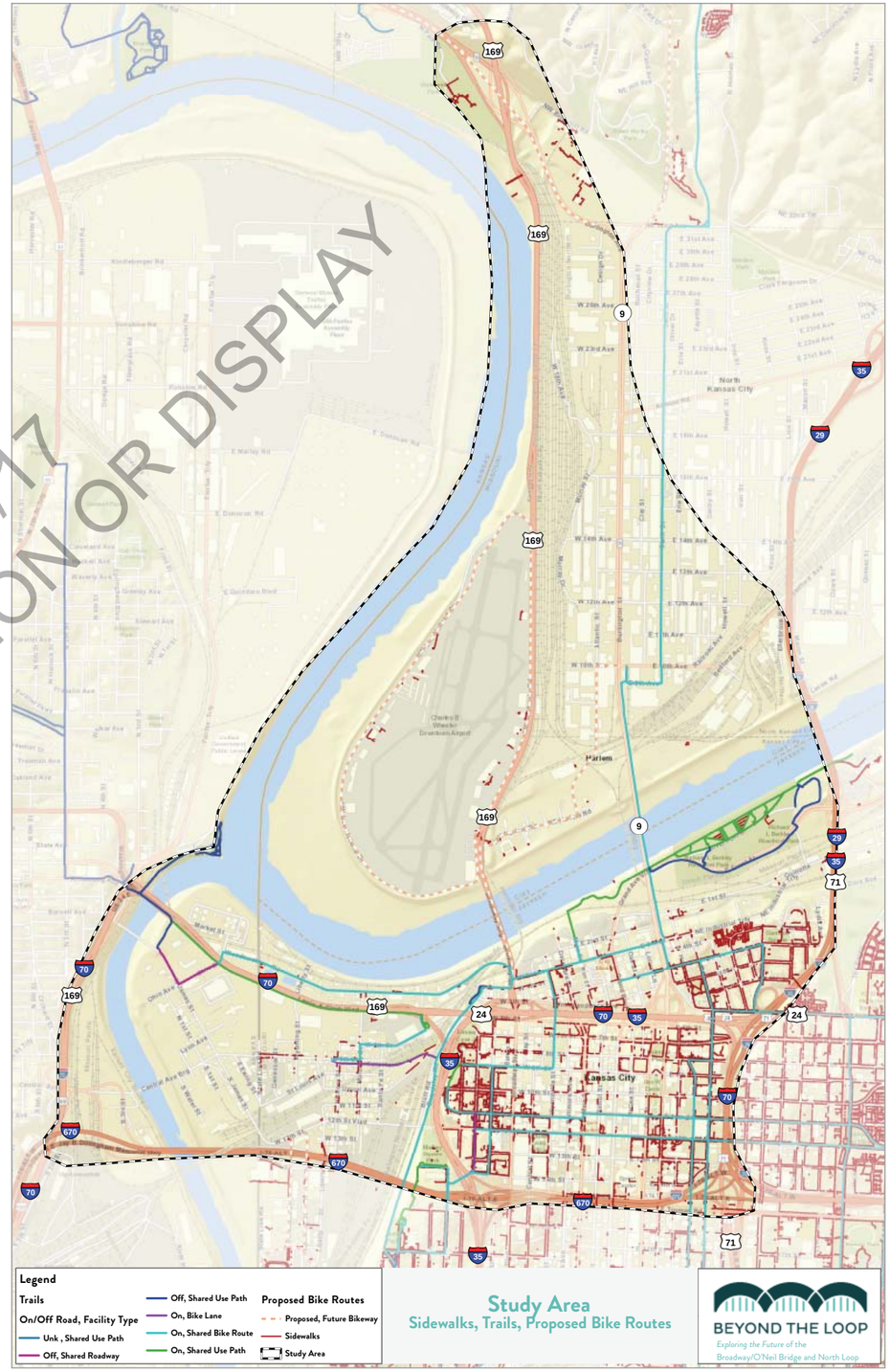


Figure 2.17 - Existing Bicycle and Pedestrian facilities

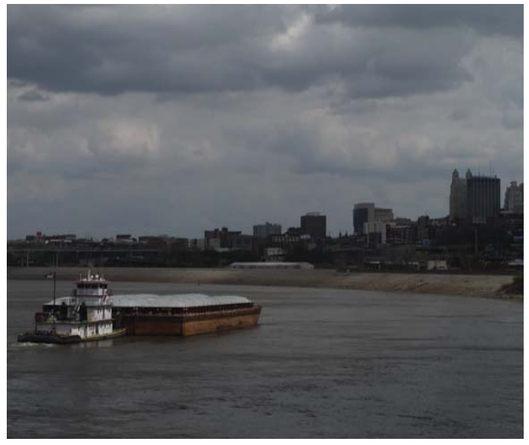


MISSOURI RIVER NAVIGATION

The Missouri River is classified as a navigable waterway. The Missouri River traffic within the navigational channel, located along the south bank of the river, is regulated and maintained by the United States Coast Guard (USCG) within the study area. In 1884, the modification of the Missouri River became a federal responsibility to facilitate navigation. In 1912, Congress authorized the stabilization of banks and deepening of the channel for a 6-foot-deep and 200-foot-wide channel benchmark. In 1945, the authorized channel depth and width benchmark for the Missouri River navigational channel was increased to 9-feet-deep and 300-feet-wide. The existing O'Neil Bridge has a 540 foot span between piers and a total of 500 feet dedicated to the navigational channel (Figure 2.18).

The navigational channel is used by commercial, recreational and other watercrafts. The navigation season length of the Missouri River varies by location and type of use. Recreational use (i.e. fishing) of the Missouri River, takes place throughout the entire year. Port of Kansas City - Woodswether Terminal (Port KC) is Kansas City's multimodal connection for waterborne, rail and interstate highway commerce. The normal navigational season length for PortKC from the Missouri River is 8 months long (March 28th to November 27th). In years of greater than normal water supply the navigation season is extended to December 7th. PortKC welcomed its first barge in August 2015, since its dormancy in 2007. PortKC is located at river mile 367.1 just upstream of the existing O'Neil Bridge.

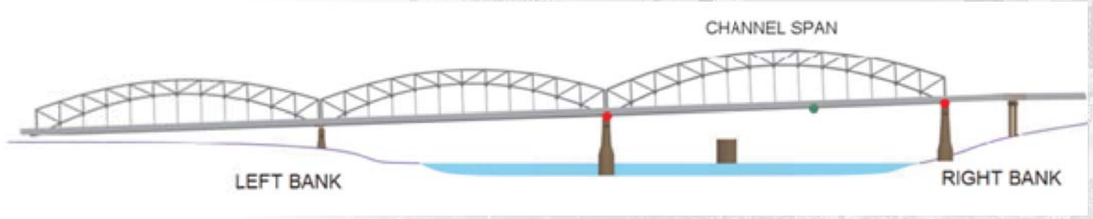
Port KC currently consists of facilities on approximately 9 acres upstream of the existing O'Neil Bridge capable of barge and truck loading, as well as the capacity to store 650,000-750,000 tons of materials. The facility is currently completing a design-build project that will accommodate additional storage with a projected increase of 4 barges/month for a total of 8 barges/month anticipated. Most, if not all, of these materials will be hauled from the facility via truck and add additional truck traffic within the Study Area. PortKC's goal is to move approximately 500,000 tons/year of materials by truck. PortKC has a Strategic Plan produced in 2010 that is getting ready to be updated.



Located just upstream of the existing O'Neil Bridge, PortKC has just begun shipping freight down the Missouri River. Any proposed improvement to the O'Neil Bridge will require compliance with USCG regulations on navigation span lengths and vertical clearances.

Water Body	Existing Condition
River Mile	366.2
Channel Span	540'
Navigation Channel	500'
Vertical Clearance	86.2'
CRP Stage	10'
CRP Elevation	716.7'
CRP Clearance	88.7'

Figure 2.18 - Existing Span Details for Existing O'Neil Bridge



RAILROADS

Four Class I Railroads, the largest class of railroad operators in the United States, operate within the study area. The Union Pacific (UP), and Burlington Northern Santa Fe (BNSF) both have extensive operations in the Kansas City region, with the Kansas City Southern (KCS) and Norfolk Southern (NS) also providing service.

Four bridges are in use to provide rail crossings of the two major rivers in the region. The UP operates two bridges crossing the Kansas River and the BNSF has two facilities crossing the Missouri River. Both BNSF Missouri River crossings are nearby and parallel either the Route 169 Buck O'Neil Bridge or the Route 9 Heart of America Bridge.

AIRSPACE

The Charles B. Wheeler Downtown Airport is a city owned, public use airport serving Kansas City, Missouri. The facility is included in the National Plan of Integrated Airport Systems and is categorized as a general aviation reliever airport.

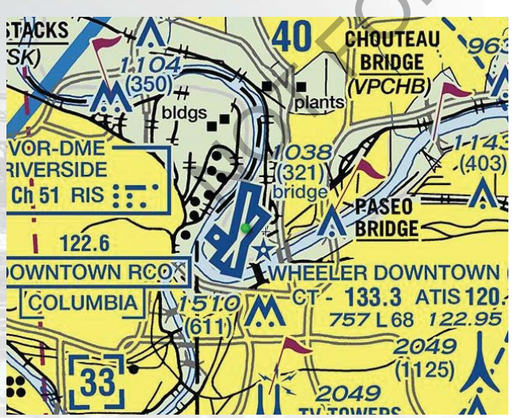
The airport replaced Richards Field as Kansas City's main airport and was dedicated in 1927 by Charles Lindbergh and was soon renamed Kansas City Municipal Airport. The airport was built in the Missouri River bottoms next to the rail tracks at the Hannibal Bridge. At the time air travel was considered to be handled in conjunction with rail traffic.

The airport had limited area for expansion and airplanes had to avoid the 200-foot Quality Hill and Downtown Kansas City skyline south of the south end of the main runway. In the early 1960s an FAA memo called it "the most dangerous major airport in the country" an urged that no further federal funds be spent on it. Kansas City replaced the airport in 1972 with Kansas City International (KCI) Airport.

The downtown airport has been renamed for Charles Wheeler who was mayor when KCI opened. Despite concerns about the airport being unsafe, Air Force One frequently uses it during Presidential visits. Today the airport is used for corporate and recreational aviation. The terminal building today houses VML, a global advertising and marketing agency.

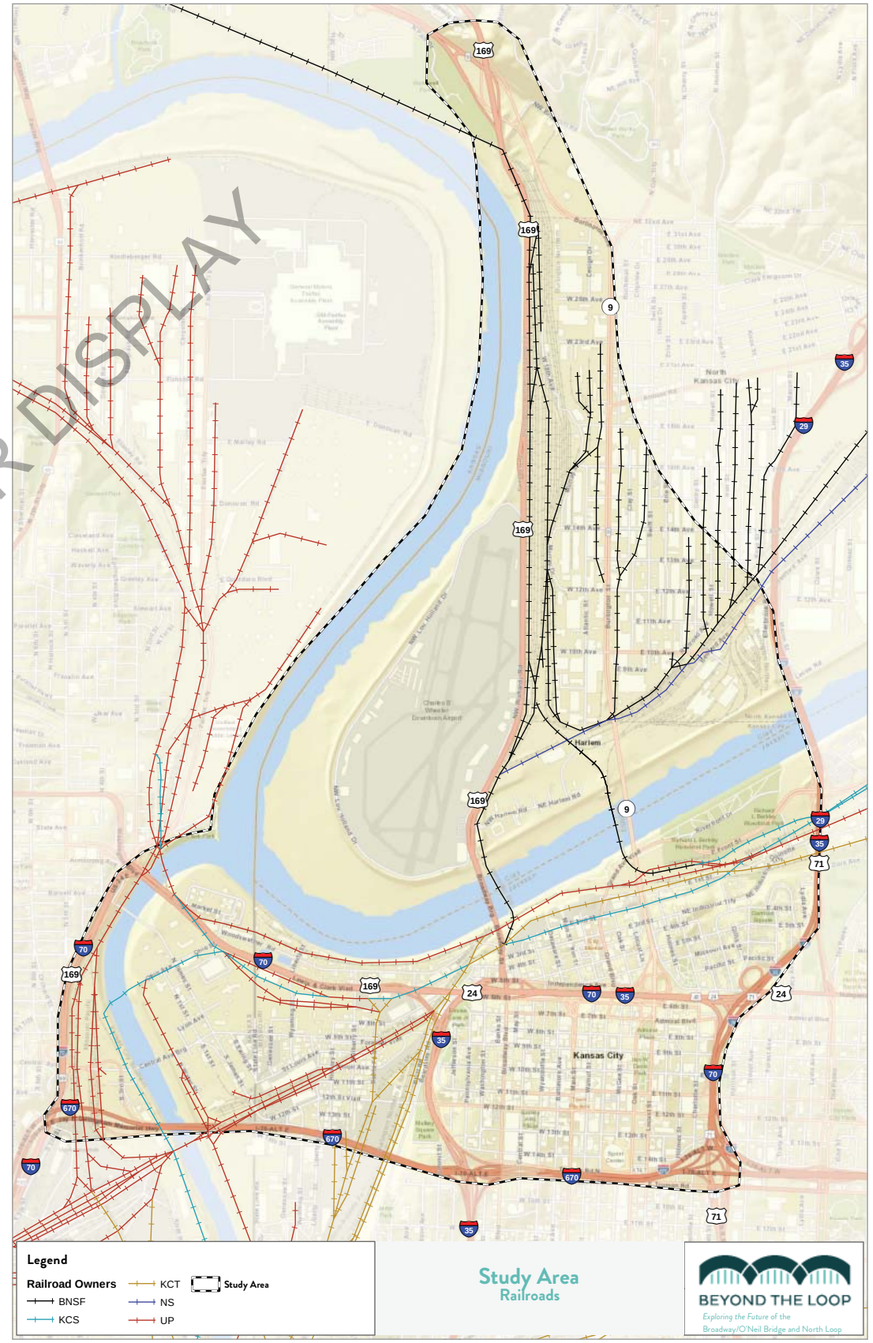
The Downtown Airport covers an area of 695 acres at an elevation of 757 above mean sea level. It has two runways: 1/19 is 6,827 by 150 feet with a concrete surface and an Engineer Materials Arrestor System at both ends. 3/21 is 5,050 by 100 feet with an asphalt surface. For a 12-month period ending September 30, 2011, the airport had 67,793 aircraft operations, an average of 185 per day.

Given the proximity of the study area to the Downtown Airport, any improvement strategy will require formal notice and review for airspace considerations under Federal Aviation Regulation (FAR) Part 77, Objects Affecting Navigable Airspace.



The proximity of the existing O'Neil Bridge to the downtown airport could limit the potential improvement options available as any proposed strategy will need to comply with FAA requirements for safe airport operations.

Figure 2.19 -Railroads



UTILITIES

The study area contains numerous utilities including electrical distribution, electrical transmission, highway and street lighting, private and public communication facilities, gas, chilled water, sanitary sewer, storm sewer, and water. The project team obtained utility information from previous projects conducted in the study area, City of Kansas City Public Works Department including the Capital Projects Office, City of Kansas City Water Department, and providers for electrical and communication services. MoDOT facilities including communication and lighting services were obtained from existing plans and previously conducted surveys.

Based on information available the project team developed the following listing of utilities in the study area. This listing is not intended to address every known utility within the study area and focuses on larger facilities that could impact the evaluation of potential strategies.

US-169 Northbound

- KCP&L has a 161kv transmission line and a 13.2 kv distribution line running parallel to and near the south bank of the Missouri River.

Northwest corner of the downtown loop and Route 169

- KC Water has an underground 90-inch diameter water line beginning west of I-35 and 12th Street, running under the northwest corner of the downtown loop and Route 169 before heading east along the Missouri River. The water line crosses under the Missouri river west of Route 9.

Interstate Facilities

- KDOT and MoDOT have fiber optic facilities within the right-of-way along all four legs of the downtown loop and the approaching interstate routes. Additionally, continuous lighting is in place along all the interstate roadways in both Kansas and Missouri.

North Side of the Downtown Loop

- KCP&L has a 13.2 kv distribution underground electric line crossings west of Walnut Street and east of Route 9.
- MGE has a 16-inch diameter underground gas line east of Walnut Street.
- Kansas City Water has five underground water line crossings of the north side of loop ranging from 4 to 20 inches in diameter.
- Veoila Energy has a 24 inch underground chilled water line crossing near Delaware Street and a 14 inch underground chilled water line crossing near Grand Avenue.
- Kansas City Public Works has 8 underground sanitary storm sewer facilities crossing the north side of the downtown loop ranging from 15-inches to 78-inches in diameter.
- Kansas City has an underground fiber optic line and conduit crossing I-70 at Charlotte.

East Side of the Downtown Loop

- Kansas City has an underground fiber optic line running along the west side of I-70.
- Kansas City has an underground fiber optic line and conduit crossing I-70 at 12th Street.

West Side of the Downtown Loop

- Kansas City Public Works has a 48-inch underground sanitary sewer line within the I-35 right of way from 12th Street north to St. Louis Avenue.
- Kansas City Public Works has a 36-inch underground sanitary sewer line within the I-35 right of way from St. Louis Avenue north to the I-35/I-70 interchange.
- KCP&L has a major overhead transmission line originating near the Missouri River and heads south crossing I-70 overhead slightly west of the interchange with I-35. The line continues south near the western right of way limits for I-35 before leaving the study area.

South Side of the Downtown Loop

- Kansas City Water has two underground water line crossings of the south side of the downtown loop, both near Baltimore Street.
- KCP&L has two -13.2 kv electrical line crossings of the south side of the downtown loop, one at Main Street and the other just east of McGee Street.
- MGE has a 20-inch diameter encased underground gas line crossing at Walnut Street.

Northwest corner of the study area (I-70 Curve at Minnesota)

- Kansas City Kansas Board of Public Utilities (BPU) has a 20-inch underground water line crossing under the I-70 interchange complex.
- Kansas Gas Service has a 6-inch underground high-pressure line crossing under the I-70 interchange complex.

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Chapter 3:
ENVIRONMENTAL OVERVIEW

This chapter of the Planning and Environmental Linkages (PEL) Study provides an overview and description of the existing environmental conditions known to exist with the proposed Study Area, including the social, natural, and cultural environment. The environmental conditions identified in this chapter will be part of the screening criteria established to review the relative merits of the proposed improvement strategies. The environmental conditions will also be carried forward in subsequent National Environmental Policy Act (NEPA) studies to serve as the Affected Environment chapter.

ENVIRONMENTAL OVERVIEW

The proposed improvement strategies identified during the PEL Study will be evaluated relative to their impacts on the existing environment. The existing environment is traditionally discussed in three distinct categories: the social environment, the natural/man-made environment, and the cultural environment. Within each of these three categories, there are specific resources that have been identified.

Social Environment

The social environment includes the resources specific to the people that live and work within the Study Area including characteristics related to:

- **Population** — How many people live in the Study Area and is that number increasing or decreasing?
- **Race and Ethnicity** — What is the demographic makeup of the population?
- **Income and Employment** — What are the income levels and how many people work in the area?
- **Environmental Justice Populations** — How many people are considered economically or socially disadvantaged?

Natural Environment

The natural environment includes the resources specific to the plants and animals, as well as natural and some man-made features within the Study Area:

- **Floodways and Floodplains** — Where is the existing floodway for the Missouri and Kansas Rivers and how far do their floodplains extend into the Study Area?
- **Flood Protection Levees** — How well does the existing flood protection system work?
- **Water Quality** — What is the quality of the two rivers and corresponding drainage basins?
- **River Navigation** — What is required to maintain the existing navigation channel through the region?

- **Natural Habitat and Threatened and Endangered Species** — Is there habitat for any of the known species that have been classified as threatened or endangered?
- **Parks and Recreational Resources** — Where are the parks and recreational resources located and what activities are occurring in those parks?
- **Hazardous Materials Sites** — Where are the known locations of potentially contaminated sites?
- **Air Quality** — What is the status of current air quality improvement initiatives and compliance with federal and state requirements?
- **Noise** — Where are there existing noise concerns and where are the sensitive noise locations?
- **Mines and Caves** — Are there mines and caves underlying the Study Area that could create potential subsidence or surface collapse issues?

Cultural Environment

The cultural environment includes the resources related to the history of the region, including existing historic properties and districts, as well as prehistoric sites.

- **Historic Resources** — Are there existing structures that have been determined to be of value for their historic relevance or contribution to the region's history?
- **Prehistoric Resources** — Are there archaeological resources related to the history of the community?

RESOURCE AGENCY COORDINATION

There are various state and federal agencies that are responsible for the preservation of each of these environmental resources. The study team conducted a formal resource agency coordination meeting on February 28, 2017 to provide these agencies an opportunity to learn about the project and to provide the study team important input as to the environmental resources in the Study Area. The various resource agencies are an integral part of the PEL process and were coordinated with throughout the decision-making process.

HOUSEHOLDS, EMPLOYMENT, AND DEMOGRAPHIC CHARACTERISTICS

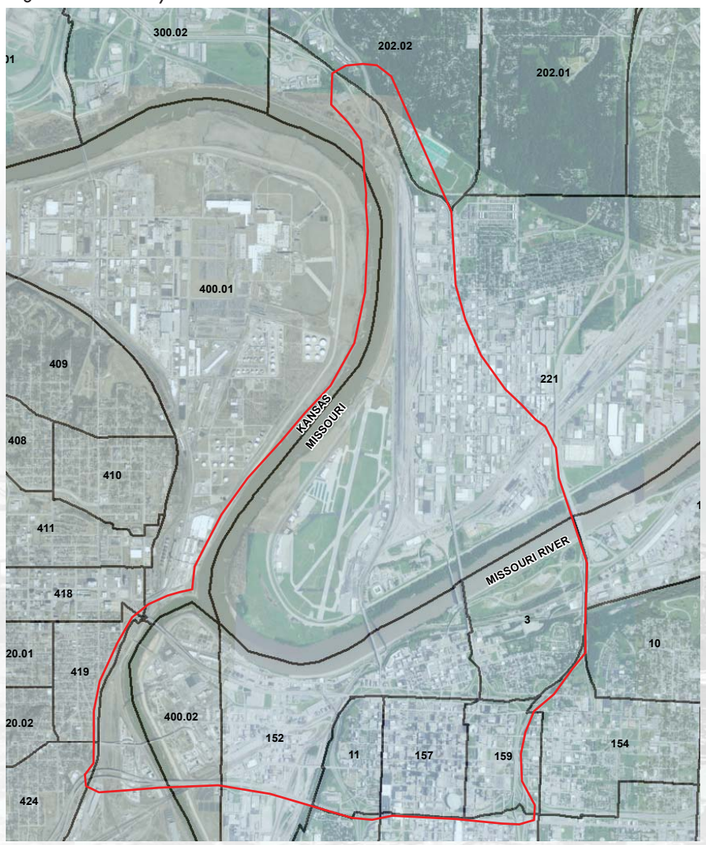
The project Study Area is located in an area that is comprised primarily of industrial and commercial uses, with a growing residential population. Demographic data for the residential population within the greater project vicinity is presented below, including data on population, race and ethnicity, aged and employment and income.

Population

Data from the U.S. Census Bureau 2000 Census, 2010 Census, American Community Survey (ACS) data for 2015 and 2011-2015 five year estimates and Mid-America Regional Council (MARC) population projections was obtained in order to characterize demographic trends in the Study Area. Seven census tracts are located within the Study Area (Figure 3.1). In some cases a large portion of the census tract may be located outside of the Study Area, however, based on the level of analysis for the PEL study the entire tract has been included for discussion purposes.

Between 2000 and 2015, the population of Missouri and the City of Kansas City, Missouri grew at a similar rate of between almost 8 and 9 percent. The Kansas City Metropolitan Area grew at a faster rate over the 15 year period, at over 17 percent. Clay County increased by almost 28 percent during this time, while Jackson (5%) and Wyandotte (3.5%) counties grew at more modest rates. Over this same time, population change in the Study Area census tracts varied greatly from a loss of 11 percent to growth of almost 300 percent. The Study Area continues to see a large influx of people wanting to live in a more urbanized environment, a common trend across the country.

Figure 3.1 - Study Area Census Tracts



According to MARC population projections, growth is expected in the Study Area through 2040. All of the tracts within the Study Area are projected to grow over the 30-year period. Several of the tracts in Jackson County which include the River Market area and Downtown Kansas City, MO are expected to nearly double to almost triple in size during this period. While those in Wyandotte County are anticipating a stable population. The number of households are expected to experience similar rates of growth. The rate of household growth compared to population growth suggests that many of the new households being established have fewer individuals per household than was previously the case.

The Study Area continues to see a large influx of people looking to live in a more urbanized environment. The West Bottoms (152) and the Downtown core (157) are expected to see the largest percent increase in population.

Table 3.1 - Population and Household Growth in the Study Area

	Population 2010	Population 2040*	Percent Change 2010-2040	Households 2010	Households 2040	Percent Change 2010-2040
Census Tract 202.02 (Clay)	3,685	5,328	+44.5%	1,665	2,437	+46.4%
Census Tract 221 (Clay)	4,283	5,843	+36.4%	2,416	3,162	+30.9%
Census Tract 3 (Jackson)	1,393	1,784	+28.1%	638	1,020	+59.9%
Census Tract 11 (Jackson)	1,709	2,869	+67.9%	1,087	2,132	+96.1%
Census Tract 152 (Jackson)	1,727	5,745	+232.7%	1,015	1,344	+32.4%
Census Tract 157 (Jackson)	1,886	5,465	+189.8%	1,418	4,704	+231.7%
Census Tract 159 (Jackson)	1,683	3,330	+97.9%	567	2,009	+254.3%
Census Tract 400.02 (Wyandotte)	3	3	0.0%	Not available	Not available	Not available
Census Tract 425.01 (Wyandotte)	61	61	0.0%	Not available	Not available	Not available
Total	15,430	30,423	+97.2	8,806	16,806	+90.8%

*Source: 2040 data based on MARC Population Projections

Race and Ethnicity

Table 3.2 includes data on race and ethnicity for the states of Missouri and Kansas, Study Area census tracts, the Metropolitan Area, each County, as well as the cities of Kansas City, Missouri and Kansas City, Kansas. The data was obtained from the U.S. Census Bureau, 2015 and 2011-15 ACS 5-Year Estimates, which provides an estimate for the year 2015. Census Tracts 3 and 159, both located south of the Missouri River in Kansas City, MO, reflect populations where the number of minority individuals is over 50 percent. The cities of Kansas City, MO and Kansas City, KS have minority populations of around 40 percent. Clay County and Census Tracts 202.02 and 221 fall below the State of Missouri and Kansas City Metropolitan area minority population averages at 14, 11 and 16 percent respectively.

Population over 65 (Aged)

One portion of the population to look at includes those individuals over 65. The Kansas City Metropolitan area population over 65 is a little over 13 percent. The portion of the Study Area north of the river averages around 18 percent and the tracts south of the river average about 6.5 percent. Although Census Tract 3 is over 15 percent and tract 11 is around 11 percent, the other three tracts are each around 2 percent of the population that are over the age of 65.

Table 3.2 - Percent Minority Population in Study Area

	Total Population	White Alone	Black or African American	American Indian	Asian	Native Hawaiian or Pacific Islander	Hispanic	Total Minority
Missouri	6,083,672	79.9%	11.6%	0.4%	1.9%	0.1%	4.0%	20.1%
Kansas City Metro Area	2,088,269	78.8%	12.5%	0.4%	2.8%	0.1%	8.9%	21.2%
Clay County, MO	235,637	86.0%	5.7%	0.9%	2.5%	0.0%	6.7%	14.0%
Census Tract 202.02*	3,706	88.7%	1.1%	0.0%	6.4%	0.0%	10.0%	11.3%
Census Tract 221*	4,441	83.6%	6.2%	0.0%	4.6%	0.0%	10.5%	16.4%
Kansas City, MO	475,361	59.8%	29.7%	0.3%	2.9%	0.1%	9.7%	40.2%
Jackson County, MO	687,623	66.8%	23.8%	0.3%	1.7%	0.3%	8.9%	33.2%
Census Tract 3*	1,600	48.5%	37.8%	0.2%	10.1%	0.0%	3.2%	51.5%
Census Tract 11*	1,679	67.7%	22.3%	0.0%	1.3%	1.2%	9.0%	32.3%
Census Tract 152*	1,964	76.5%	12.5%	4.8%	2.2%	0.0%	5.0%	23.5%
Census Tract 157*	2,286	76.2%	15.4%	0.8%	3.2%	0.7%	3.9%	23.8%
Census Tract 159*	2,106	46.3%	38.0%	0.2%	4.4%	2.6%	7.3%	53.7%
Kansas	2,911,641	84.7%	5.9%	0.9%	2.9%	0.1%	11.6%	15.3%
Kansas City, KS	151,261	59.5%	24.0%	0.4%	4.4%	0.0%	29.3%	40.5%
Wyandotte County, KS	163,369	61.2%	23.2%	0.4%	4.1%	0.0%	27.7%	38.8%

Source: U.S. Census Bureau, 2015 and 2011-15 ACS 5-Year Estimates.

Income and Employment

Based on the U.S. Census Bureau's 2015 ACS and 2011-15 ACS 5-Year Estimates, the percent of the civilian labor force that is unemployed within the Study Area census tracts ranges from two percent to 14 percent (Table 3.3). The highest percentage of unemployed civilian workers is within Census Tracts 3 and 159 at 14 and 13 percent respectively. These tracts also have the highest percent of the population below the poverty level at 44 and 35 percent. The lowest unemployment numbers are within Census Tract 157, which is Downtown Kansas City, MO, at 2 percent and Census Tract 202.02, which is in Kansas City, MO north of the Missouri River, at 3 percent. The lowest percentages of population below the poverty level are in Clay County, North Kansas City, MO and Census Tract 202.02 all of which are around seven percent. The States of Kansas and Missouri are at approximately 13 and 14 percent of the population below the poverty level. The City of Kansas City, MO is near 18 percent of the population below the poverty level.

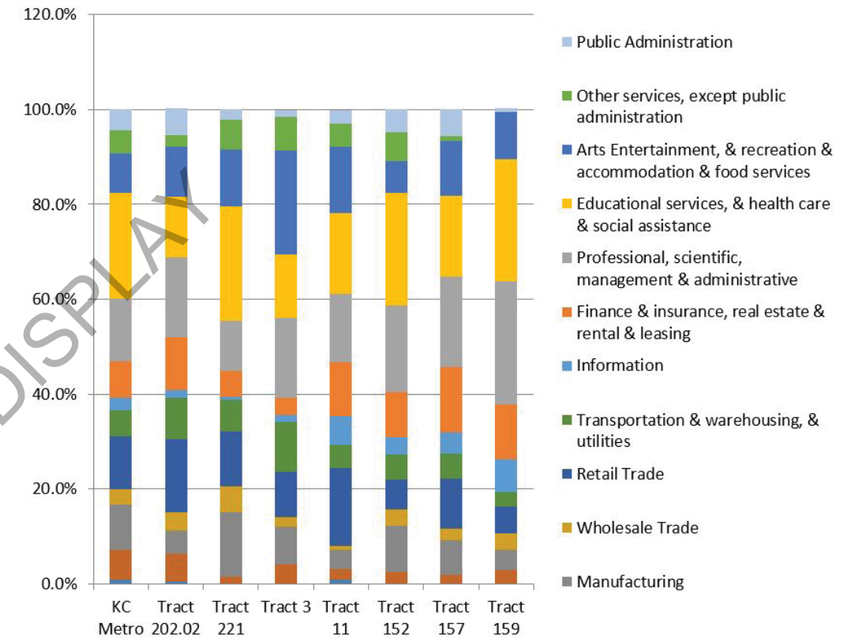
The most common employment categories within the Study Area include: Retail Trade; Transportation, & Warehousing & Utilities; Professional, Scientific, Management & Administrative; and Educational Services & Health Care & Social Assistance (Figure 3.2). The Downtown portion of the Study Area sees the highest percentages in: Professional, Scientific, Management & Administrative and Arts Entertainment & Recreation & Accommodation & Food Services. The Kansas City metropolitan area only has a little over two percent employed in the Information industry, however Census Tract 11 is at over six percent. The individuals within the Study Area appear to be living near their chosen employment industry.

Table 3.3 - Economic Indicators, 2015

	Civilian Labor Force	Percent Civilian Unemployed	Median Household Income	Percent of Population Below Poverty
Missouri	3,042,538	5.3%	$50,238	14.8%
Kansas City Metropolitan Area	1,099,917	4.4%	$60,502	11.8%
City of North Kansas City, MO	2,911	9.9%	$38,930	7.6%
Clay County, MO	128,235	4.4%	$65,090	7.3%
Census Tract 202.02*	2,070	3.6%	$76,693	7.1%
Census Tract 221*	3,051	9.4%	$38,474	8.6%
City of Kansas City, MO	253,776	5.2%	$50,259	17.9%
Jackson County, MO	355,072	5.0%	$48,212	17.8%
Census Tract 3*	735	14.4%	$25,167	44.5%
Census Tract 11*	1.299	9.3%	$35,563	21.1%
Census Tract 152*	1,480	4.2%	$44,031	16.2%
Census Tract 157*	1,904	2.2%	$56,063	9.9%
Census Tract 159*	735	13.1%	$45,346	34.9%
Kansas	1,486,201	4.7%	$53,906	13.0%
City of Kansas City, KS	76,043	7.0%	$41,255	22.2%
Wyandotte County, KS	81,477	7.1%	$41,800	21.8%

Source: ACS Profile Report for 2015, *2011-2015 ACS 5-Year Estimate which provides an estimate for 2015

Figure 3.2 - Employment by Industry, 2015



ENVIRONMENTAL JUSTICE POPULATIONS

Title VI of the 1964 Civil Rights Act seeks to ensure that all groups and individuals have the right to access and participate in the transportation decision-making process.

Executive Order 12898, issued in 1994, directs federal agencies to take steps to ensure that minority or low-income neighborhoods are not subjected to disproportionate project impacts. Disproportionate adverse effects are those either mainly affecting a minority and/or low-income population or that the minority and/or low income population will bear more of the transportation impact burden and are recognizably more severe or of greater significance than the adverse effect that the non-minority and/or non-low-income population will bear.

Environmental justice seeks to:

- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations.
- Ensure full and fair treatment of all people and their involvement in the transportation decision-making process regardless of race, color, national origin, age, or income.
- Prevent the denial of, reduction in, or significant delay in benefits received by minority and low-income populations.

Environmental justice populations reacher higher numbers in a couple of the tracts within the Study Area. As discussed previously and illustrated by Figures 3.3 and 3.4, Tracts 3 and 159 reach over 50 percent for minority populations and have higher percentages of those below the poverty level and have higher unemployment. These two tracts also have higher populations over 65.

Individuals living in the Study Area will have an opportunity for input through public involvement activities. These activities will seek to gather input about issues affecting residents such as connectivity, access, neighborhood cohesion, property impacts, noise and air quality which can disproportionately affect the populations mentioned above.

Figure 3.3 - Environmental Justice Populations by Census Tract

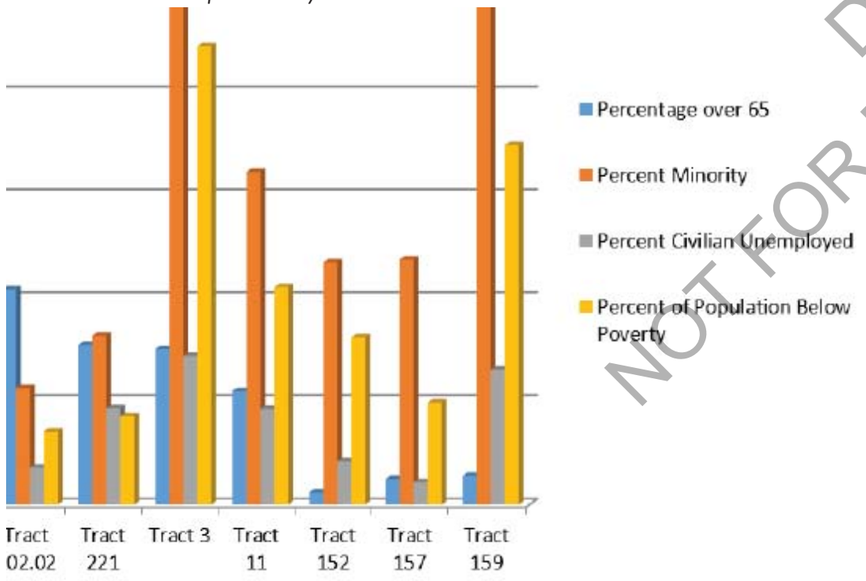
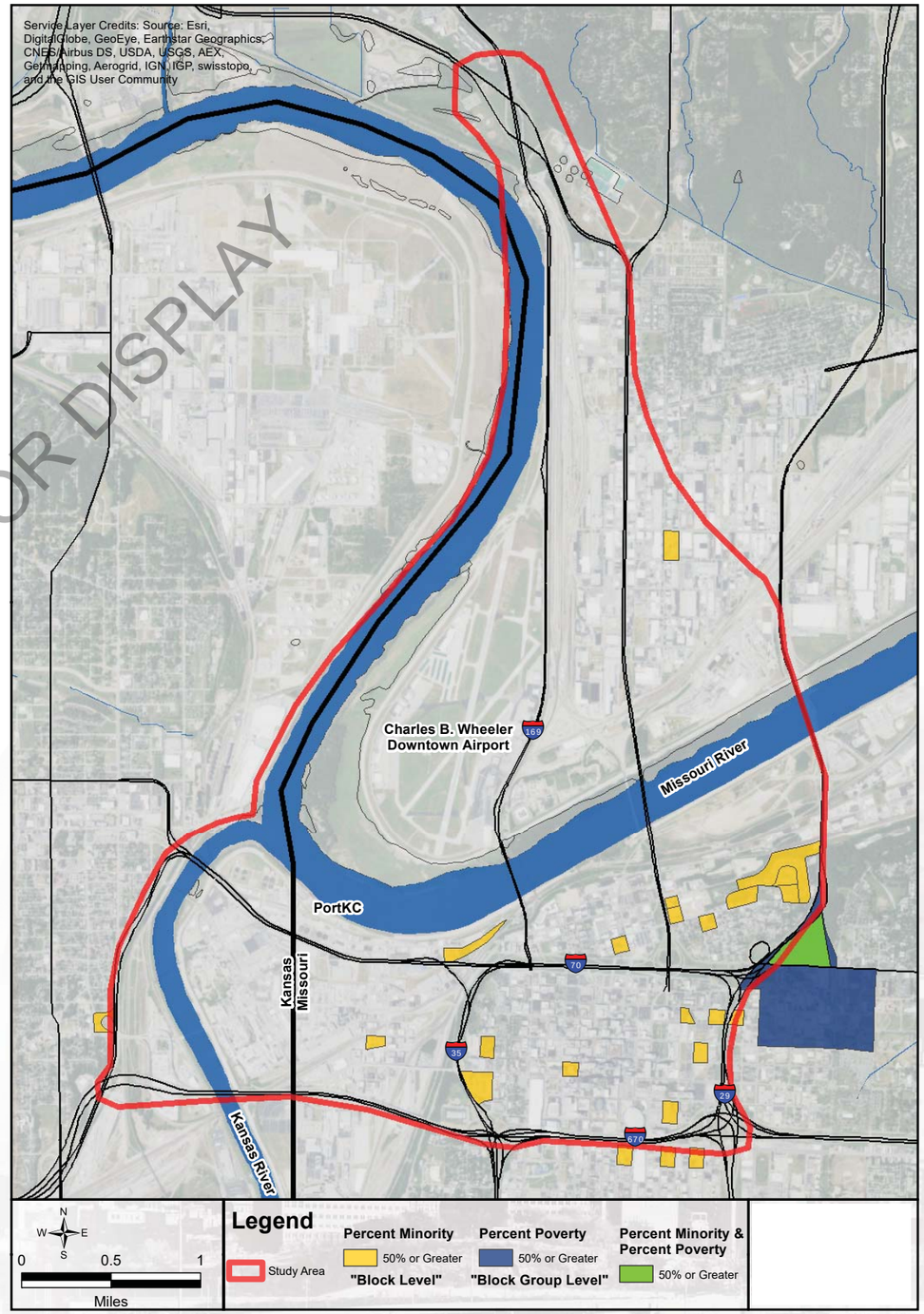


Figure 3.4 - Environmental Justice Populations by Census Tract

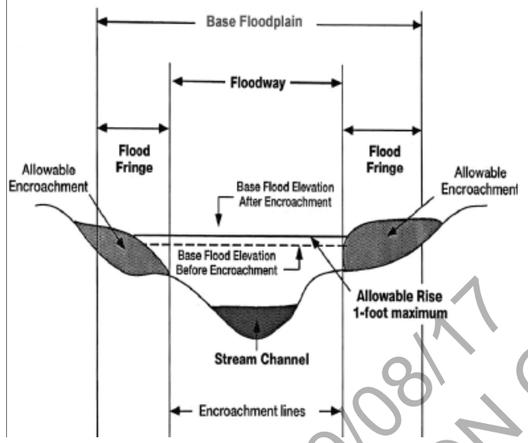


Several locations within the Study Area contain a higher than average percentage of minority and low income populations. These groups have special protection under the Environmental Justice provisions.

FLOODWAYS & FLOODPLAINS

Floodplains are the low lands adjoining the channel of a river, stream, or watercourse, or adjoining the shore of an ocean, lake, or other water body of standing water, that have been or may be inundated with flood water. Executive Order 11988 – Floodplain Management, FHWA policy and procedures in 23 CFR 650, and other federal floodplain management guidelines, direct agencies to evaluate floodplain impacts for proposed actions. Floodplains can be described by the frequency of flooding that occurs. With Executive Order 11988, the base flood was formally adopted as a standard for use by all agencies (Figure 3.5) illustrates a typical floodplain diagram.

Figure 3.5 - Typical Floodplain Diagram



The National Flood Insurance Program (NFIP) uses the base flood as the standard for floodplain management and to determine the need for flood insurance. When available, NFIP flood hazard boundary maps and flood insurance studies for the Study Area are used to determine the limits of the base floodplain and the extent of encroachment from an action such as building a structure, including highways, within the limits of the base floodplain.

Regulated Floodway

The regulatory floodway is the area of a stream or river channel that must be kept open to convey floodwaters from the base flood. Federal Emergency Management Agency (FEMA) restrictions do not allow projects to cause any rise in the regulatory floodway and no more than a one-foot cumulative rise may result from all projects in the base floodplain. The regulated floodway, along with the floodplain, have been illustrated in Figure 3.6 to the right.

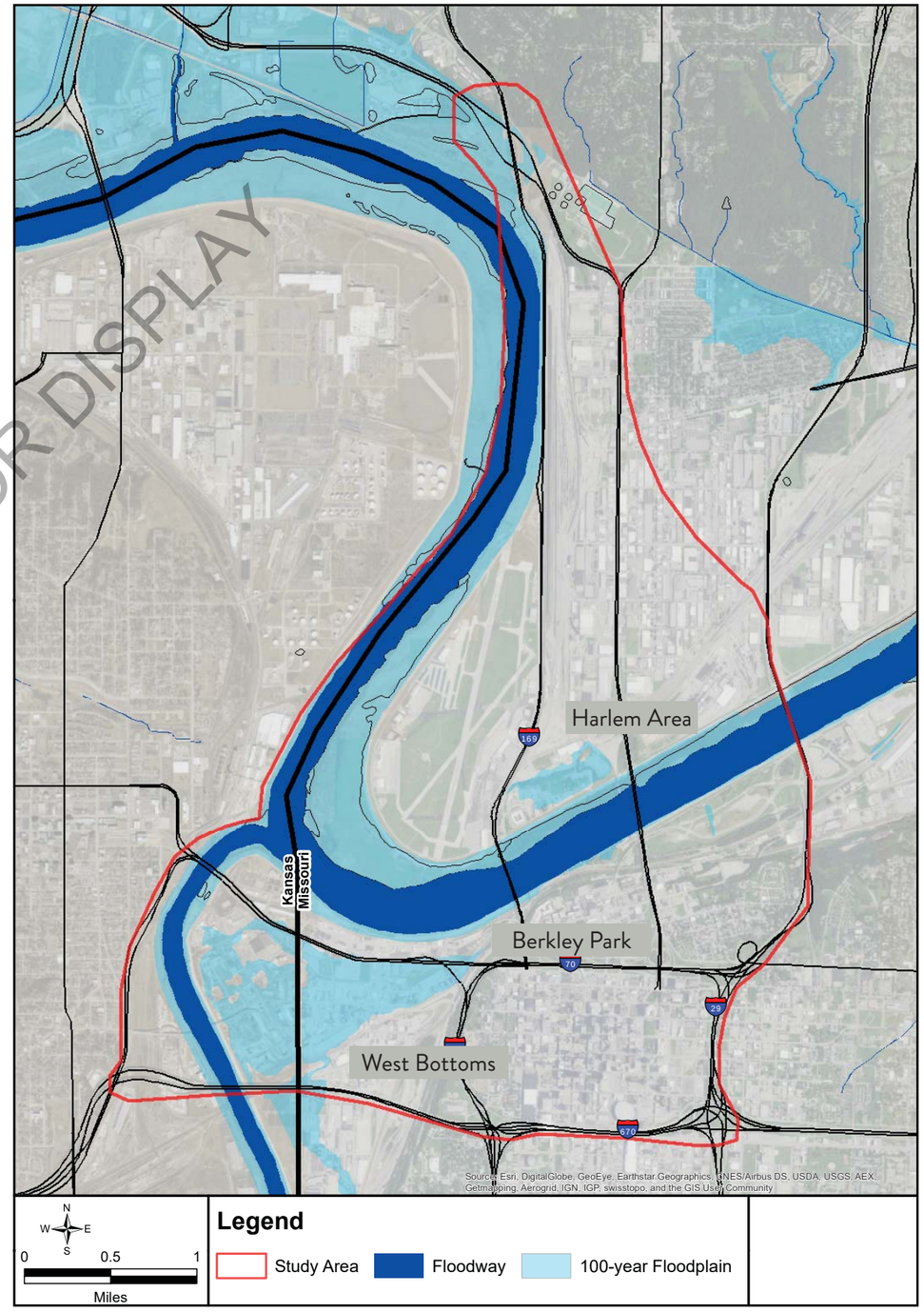
Regulated Floodplain

The project team identified potential floodplains by investigating the FEMA National Flood Hazard Layer in ArcGIS for the designated Study Area. For reference, Zone AE refers to areas of 100-year shallow flooding where depths are undetermined but the BFE (Base Flood Elevation) has been determined. Zone AH are areas of 100-year shallow flooding where depths are between 1-3 feet; the BFE has been determined, but no flood hazard factors have been determined. In addition to the areas along the Kansas and Missouri Rivers FEMA has designated the following zones in the specified areas:

- *Zone AE and Zone AH in the Historic West Bottoms District* — The Historic West Bottoms District, within Missouri, includes two locations where shallow flooding occurs with varying depths of 1-3 feet. This includes lower elevation areas that develop ponding during a 100-year flood event. The West Bottoms District that is in Kansas has shallow flooding where depths are undetermined.
- *Zone AE in the Historic Harlem District* — The Historic Harlem District, north of the Missouri River, includes a 38.2 acre shallow floodplain, with depth ranges that are undetermined.
- *Zone AH in the Richard L. Berkley Riverfront Park* — The Richard L. Berkley Riverfront Park includes a 1.86 acre shallow floodplain, with varying depths of 1-3 feet. This includes lower elevation areas that develop ponding during a 100-year flood event.

The Missouri State Emergency Management Agency (SEMA) issues floodplain development permits for projects undertaken by the State of Missouri. The Kansas Department of Agriculture/Division of Water Resources (KDA/DWR) issues permits for projects in the state of Kansas. For projects proposed within regulatory floodways, a "no-rise" certificate would be required before a permit is issued.

Figure 3.6 - Floodway and Floodplains



The majority of floodways and floodplains are associated with the Missouri and Kansas Rivers and immediately adjacent areas.

FLOOD PROTECTION LEVEES

Flood Protection Regulations

Through the Civil Works program the U.S. Army Corps of Engineers (USACE) serves the public by providing the Nation with management of the Nation's water resources. As a result, USACE, in partnership with stakeholders, has constructed many Civil Works projects across the Nation's landscape. Given the widespread location of these projects, many embedded within communities, over time there may be a need for others outside of USACE to alter or occupy these projects and their associated lands. Two existing regulations exist that govern the USACE in their mission to protect the Nation's water resources:

- *Section 408* — Because these projects are in place for the benefit of the public, USACE ensures that any alteration proposed will not be injurious to the public interest and will not affect the USACE project's ability to meet it authorized purpose. USACE accomplishes this through the authority of Section 408 and its associated procedures. (Note: as of the date of this report the USACE has recently launched an effort to update and improve the Section 408 process.)
- *Section 14* — Section 14 of the River and Harbors Act of 1899, as amended, and codified in 33 USC 408 (Section 408) provides that the Secretary of the Army may, upon the recommendation of the Chief of Engineers, grant permission to other entities for the permanent or temporary alteration or use of any USACE Civil Works project.

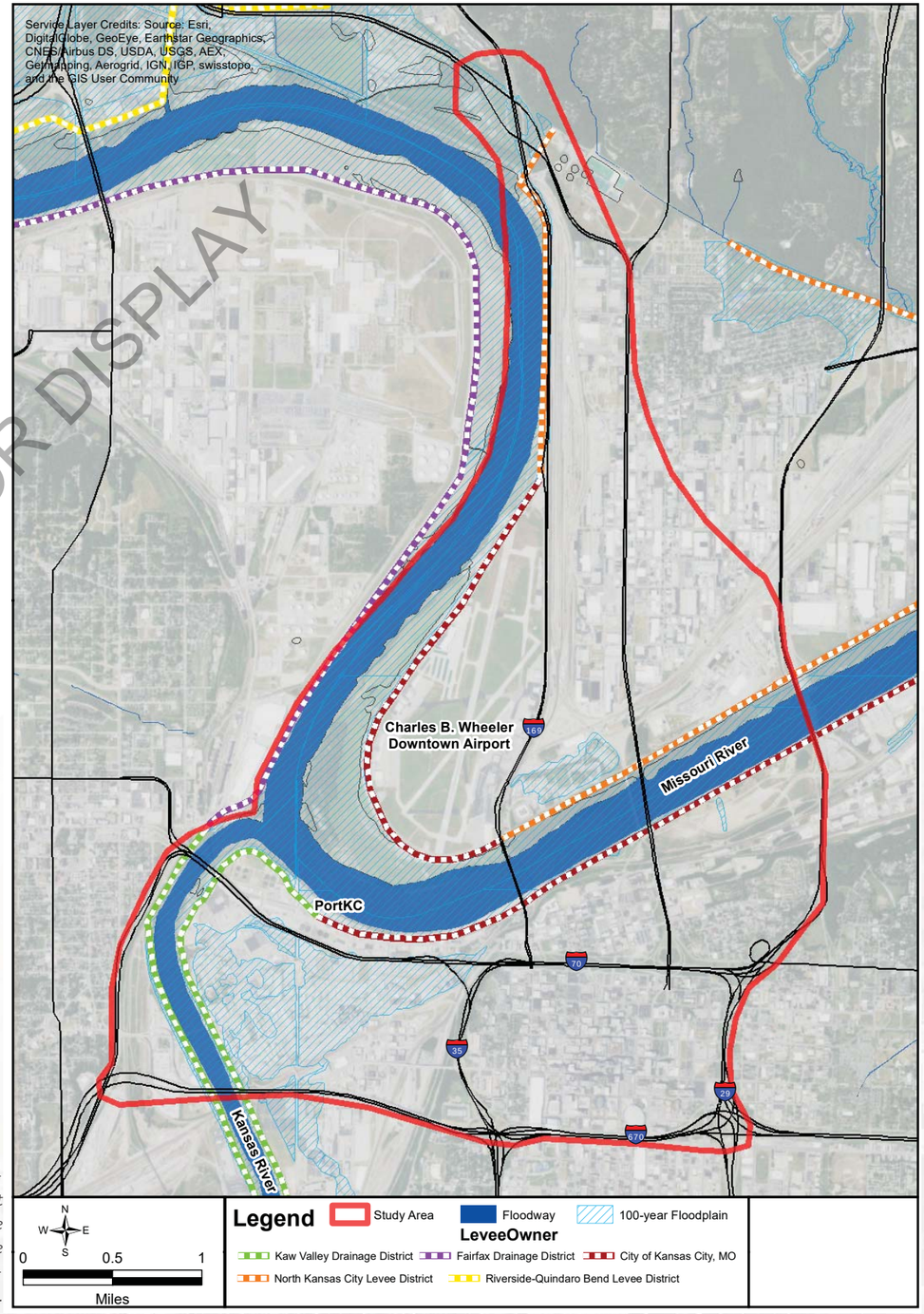
Study Area Levees

The existing levees in the Kansas City flood risk management system are maintained by the levee's sponsor. Each sponsor is responsible for the operation, maintenance, repair, rehabilitation and replacement of their structure and to meet inspection requirements conducted by the USACE.

Local sponsors are responsible for controlling all construction which occurs within the critical area. The USACE provides engineering review to ensure that any work within or near the flood control unit does not reduce the level of protection and to assure the continued integrity of the flood control system. The critical area is predominately the area from 300 feet riverward to 500 feet landward of a flood control project centerline. Occasionally the critical area extends beyond 500 feet if the flood control project is impacted.

Levees are present along both sides of the Missouri River channel within the Study Area (Figure 3.7). The levee along the east bank of the Missouri River and North of the Downtown Airport is sponsored by the North Kansas City Levee District. The North Kansas City Levee District also sponsors the levee on the north bank of the Missouri River east of US-169. The levee along the west bank of the Missouri River is sponsored by the Fairfax Drainage District. The levee along the Downtown Airport bank of the Missouri River is sponsored by the City of Kansas City, Missouri. The City of Kansas City, Missouri also sponsors the levee on the south bank of the Missouri River east of PortKC. The levee along the Kansas River to the confluence with the Missouri River is sponsored by the Kaw Valley Drainage District.

Figure 3.7 - Flood Protection Levees



Both the Missouri and Kansas Rivers are protected by an existing levee system. Any encroachment into either river will require coordination with the US Army Corps of Engineers to ensure the same level of flood protection and to ensure the continued integrity of the overall system.

WATER QUALITY

Water quality is defined for a particular water body by comparing the biological, chemical, and physical characteristics of water in accordance with a set of standards. The EPA sets water quality standards based on the use of a particular body of water. Example uses include drinking, swimming, and the protection of aquatic life and habitat. The Clean Water Act (CWA), under section 303(d), requires every governing body of land to identify waters not meeting water quality standards and those in which adequate mitigation of pollution has not been required. Water quality standards were enacted to fortify bodies of water that would benefit from continuous usage by humans (swimming and drinking), aquatic life, livestock, and wildlife.

If any proposed work is to be done in a water quality feature in the Study Area, such as the Missouri River, coordination with the USACE, Missouri Department of Naural Resources (MDNR) or Kansas Department of Health and Environmentl (KDHE) Water Divisions will be necessary. Any project that has the potential to result in discharge of fill or dredged material into a jurisdictional water of the United States may require a Section 404 permit from the USACE and Section 401 Certification from MDNR.

Surface Waters

Surface water resources within the Study Area include the Missouri River and Kansas River. The MDNR and KDHE define water use classifications for water resources in their respective States. The Study Area is located within the Independence-Sugar (10240011) and Lower Missouri-Crooked (10300101) Hydrologic Units. Table 3.4 describes water bodies within the Study Area and their use classifications.

- *Missouri River* — The Missouri River is a Class P Stream, which is defined as streams that maintain permanent flow even in drought periods. The unnamed tributaries in the Study Area are Class C streams, which are defined as steams that may cease to flow in dry periods, but maintain permanent pools which support aquatic life. The Missouri River is listed as an impaired water body on the Missouri 2016 303(d) list. The impaired portion of Missouri River that falls within the Study Area extends from the north of Atchison County to the east of Jackson County. The cause of water body impairment originates from the pollutant Escherichia coli (W) which affects the rivers use for human skin contact, ingestion, and secondary contact.
- *Kansas River* — The Kansas River is listed as an impaired water body on the Kansas 2016 303(d) list. The impaired portion of the Kansas River that falls within the Study Area extends from the east of Wyandotte County to west of Johnson and Leavenworth counties. The cause of water body impairment originates from Total Suspended Solids (TSS) which is associated with higher levels of disease-causing microorganisms harmful to humans and the reduced ability to absorb light through the water for aquatic life.

Wells

There are over 900 wells within the Study Area, of which about 400 are abandoned, and about 500 are monitoring wells used to monitor for a variety of parameters. Wells can also act as conduits of pollutants to groundwater resources.

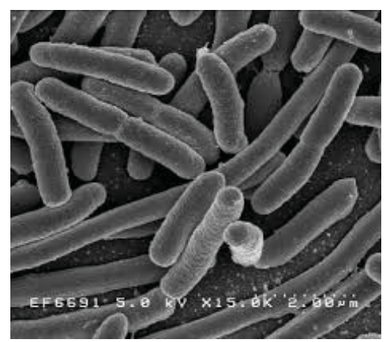
Other

There are no known waters designated for Cold Water Habitat, Outstanding National Resource Waters, Outstanding State Resource Waters, biocriteria reference locations, or losing streams within the Study Area.

Table 3.4 - Water Body Classification and Impairment

Water Body	Use Classification	Impairment
Missouri River	Protection and propagation of fish, shellfish and wildlife – warm water habitat (WWH) Human health protection (HHP) Irrigation (IRR) Livestock and wildlife protection (LWP) Secondary contact recreation (SCR) Whole body contact recreation (WBC-B) Industrial (IND) Drinking Water Supply (DWS)	Escherichia coli (W)
Kansas River	Domestic water supply use (DS) Food procurement use (FP) Groundwater recharge (GR) Industrial water supply use (IW) Irrigation use (IR) Livestock watering use (LW)	Total Suspended Solids (TSS)
Wells	Abandoned (400) Monitoring (500)	Unknown
Other	None	None

The cause of the Kansas River impairment originates from Total Suspended Solids (TSS) which is associated with higher levels of disease-causing microorganisms harmful to humans and the reduced ability to absorb light through the water for aquatic life.



The cause of the Missouri River impairment originates from the pollutant Escherichia coli (W) which affects the rivers use for human skin contact, ingestion, and secondary contact.

MINES AND CAVES

The uppermost bedrock in the northern and southern portions of the Study Area consists of shale, limestone and sandstone of the Pennsylvanian-aged Kansas City Group. The central portion of the Study Area is underlain by alluvium of the Missouri and Kansas Rivers. The Study Area does not lie in a karst setting. There are no recorded sinkholes or losing stream segments in the vicinity of the Study Area.

The Study Area does not lie within a former mining district and there are no recorded mines or caves within the Study Area. The Briarcliff West underground limestone quarry lies close to and may extend under the northern end of the Study Area. With the exception of the northern most area, there is no likely collapse potential due to former mining activities in the area.

However, it should be noted that there are a number of utility tunnels underlying the Study Area including the former West Bottoms streetcar tunnel, trans-Missouri River water tunnel, as well as others.

The likelihood of either old mines or naturally occuring caves or losing streams are low in the Study Area. The one exception are utility tunnels. Pictured to the right is the existing tunnel constructed for the original streetcar system underneath downtown Kansas City.

WETLANDS AND WATERS OF THE US

Wetland resources are protected under Section 404 of the CWA (33 US Code [USC] 1344) and Executive Order 11990 Protection of Wetlands (Environmental Protection Agency (EPA), 1977). The following wetland analysis describes the inventory of wetlands and other open waters within the Study Area. This analysis was performed using GIS and National Wetland Inventory (NWI) mapping data.

National Wetland Inventory mapped wetlands may or may not qualify as USACE jurisdictional wetlands when wetland determinations are performed following the methods of the 1987 Corps of Engineers Wetlands Delineation Manual and supplements. Wetlands may have developed in other low lying or wet areas not shown on NWI maps. Section 404 of the Clean Water Act (CWA) prohibits the discharge of dredged or fill material (i.e., rock, sand, soil, construction materials) into waters of the United States without a permit from the USACE and mitigation may be required.

The majority of wetlands identified within the Study Area are riverine wetlands with most occurring in a narrow fringe along the Missouri and Kansas Rivers. Wetlands within the Study Area are Illustrated on Figure 3.8 and described in Table 3.5 on the next page.

While the Study Area is mostly urbanized, there are scattered areas close to the Missouri and Kansas Rivers that contain existing wetland resources.

Figure 3.8 - Existing Wetlands in the Study Area

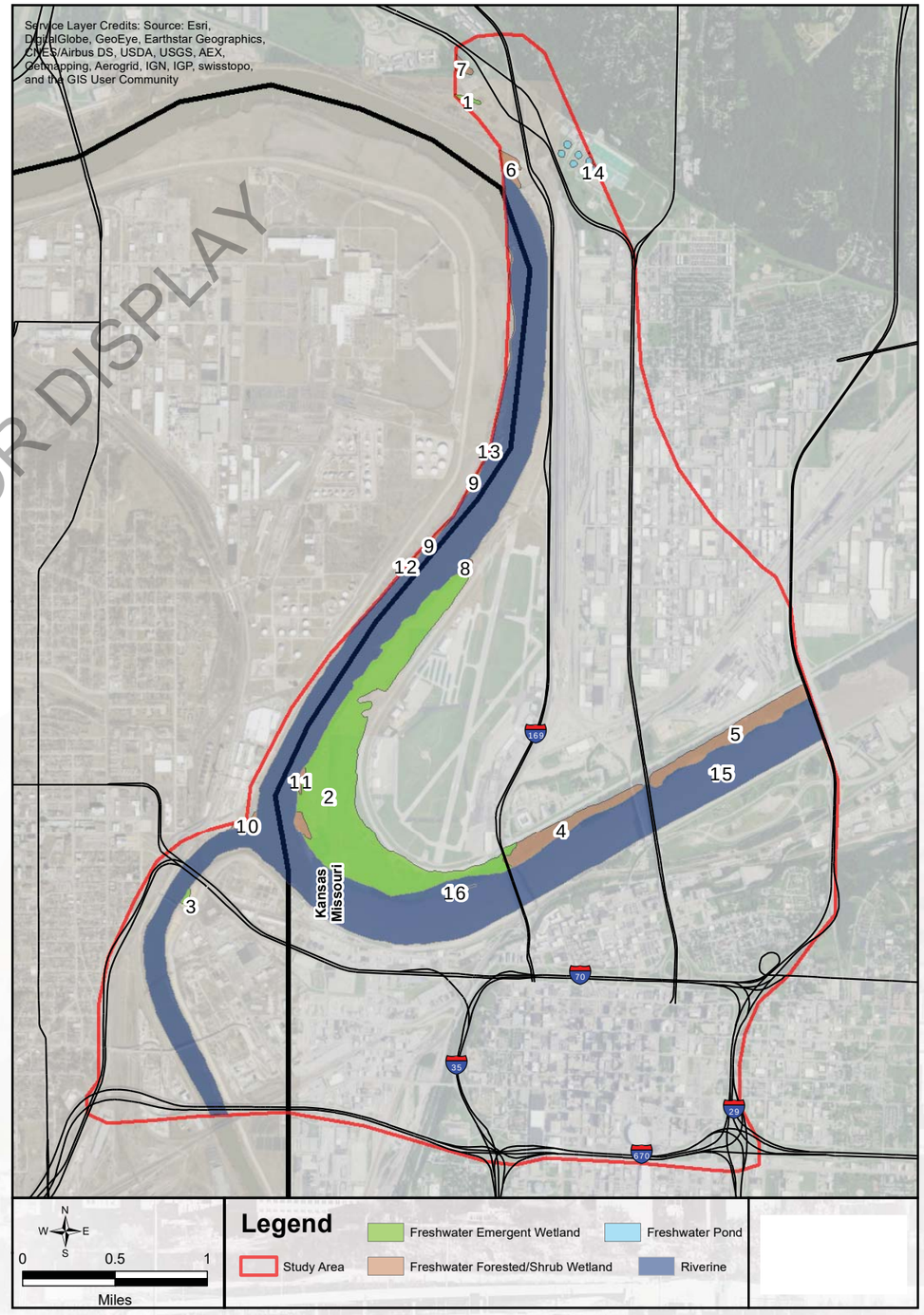


Table 3.5 - Existing Wetland Resources

Wetland Number	Description & Location	NWI Map Classification	Wetland Type	Approximate Wetland Area within Study Area (acres)
1	NWI mapped palustrine emergent wetland, persistent vegetation year round, temporarily flooded, north side in the area of influence inundated with fresh marsh.	PEM1A	PEM	1.05
2	NWI mapped palustrine emergent wetland, persistent vegetation year round, temporarily flooded, South of the Charles B. Wheeler Downtown Airport.	PEM1A	PEM	177.89
3	NWI mapped palustrine emergent wetland, persistent vegetation year round, seasonally flooded, Near the Kansas River confluence with the Missouri River.	PEM1C	PEM	1.12
4	NWI mapped palustrine forested wetland, broad-leaved deciduous vegetation, temporarily flooded, between US Highway 169 and State Route 9, North of the Missouri River	PFO1A	PFO	21.24
5	NWI mapped palustrine forested wetland, broad-leaved deciduous vegetation, temporarily flooded, between State Route 9 and Interstate Highway 29, North of the Missouri River	PFO1A	PFO	27.44
6	NWI mapped palustrine forested wetland, broad-leaved deciduous vegetation, temporarily flooded, North neck of the area of influence, West of US Highway 169, North of the Missouri River.	PFO1A	PFO	4.50
7	NWI mapped palustrine forested wetland, broad-leaved deciduous vegetation, temporarily flooded, North neck of the area of influence, South of State Route 9, North of the Missouri River.	PFO1A	PFO	2.01
8	NWI mapped palustrine forested wetland, broad-leaved deciduous vegetation, seasonally flooded, North of the Charles B. Wheeler Downtown Airport, West of the US Highway 169, East of the Missouri River.	PFO1C	PFO	0.97
9	NWI mapped palustrine forested wetland, seasonally flooded, North of the Charles B. Wheeler Downtown Airport, West of the Missouri River.	PFOC	PFO	3.79
10	NWI mapped palustrine forested wetland, seasonally flooded, confluence area of the Kansas River and Missouri River.	PFOC	PFO	2.39
11	NWI mapped palustrine scrub-shrub wetland, broad-leaved deciduous vegetation, seasonally flooded, South of Charles B. Wheeler Downtown Airport on the North edge of the Missouri River.	PSS1C	PSS	4.21
12	NWI mapped palustrine scrub-shrub wetland, seasonally flooded, North of the Charles B. Wheeler Downtown Airport, West of the Missouri River.	PSSC	PSS	0.16
13	NWI mapped palustrine unconsolidated bottom wetland, permanently flooded, freshwater pond, North of the Charles B. Wheeler Downtown Airport, West of the Missouri River.	PUBH	PUB	0.0001
14	NWI mapped palustrine unconsolidated bottom wetland, artificially flooded, freshwater pond at Kansas City Water Works, recently excavated, North neck of the area of influence, East of the Missouri River.	PUBKx	PUB	2.79
15	NWI mapped riverine wetland, low gradient, no tidal influence, lower perennial, unconsolidated bottom, permanently flooded, Kansas River and Missouri River.	R2UBH	R	679.24
16	NWI mapped riverine wetland, low gradient, no tidal influence, lower perennial, unconsolidated shore, seasonally flooded, West of US Highway 169 and South of Charles B. Wheeler Downtown Airport.	R2USC	R	1.47

HISTORIC RESOURCES

In the Study Area, there are more than 100 single sites and districts listed in the National Register of Historic Places. These significant assets include commercial, industrial, archaeological, parks and boulevards, and transportation-related resources throughout the Kansas City downtown neighborhoods and portions north of the Missouri River such as Harlem and North Kansas City. In addition, there are several historic assets located in the Study Area that are listed in the Kansas City Register of Historic Places and those that appear to retain integrity and therefore significance. Furthermore, historic assets located in the within a one mile radius or ring of the Study Area, such as Kansas City, Kansas, the Fairfax Industrial District and Strawberry Hill, were also identified. These include, but are not limited to, National Register and Kansas State Register of Historic Places (Figure 3.10).

In order to assess the current status of National Register of Historic Places (NRHP) nominations and studies that include historical assets within the Study Area, records were gleaned from the following repositories:

- Historic Preservation Commission, City of Kansas City, MO
- State Historic Preservation Office, Jefferson City, MO
- State Historic Preservation Office, Topeka, KS
- State Historical Society of Missouri-Kansas City, Kansas City, MO
- National Archives Records Administration II (NARA), College Park, MD
- Historic American Buildings Survey (HABS) and the Historic American Engineering Record (HAER) archives, National Park Service, Department of the Interior
- Linda Hall Library, Kansas City, MO
- Special Collections, Missouri Valley Room, Kansas City Public Library, Kansas City, MO
- North Kansas City Public Library, North Kansas City, MO
- Architectural & Historical Research, LLC, Kansas City, MO
- Mid-Continent Library, Jackson County, MO
- Wyandotte County Historical Society, Wyandotte County, KS

Area of Potential Effects

Within the Study Area, the following neighborhoods have been identified and contain single sites and districts listed in the NRHP and/or historic assets that retain integrity and therefore significance. The following are general boundaries for these districts:*

- Central Business District — The Central Business District of Kansas City was surveyed for historically and culturally significant properties. It included a 0.9 square mile area extending from 6th Street on the north to 15th Street on the south, and from Troost on the east to Jefferson on the west.
- West Bottoms — Known as the Central Industrial District, the CID or West Bottoms includes approximately 500 acres of land and is bounded on the north by the Missouri River, the west by State Line Road to 25th Street; 25th Street to Allen Avenue to Beardsley; Beardsley to the 12th Street Trafficway Viaduct; 12th Street east to Southwest Trafficway then to Pennsylvania Avenue Exit back to the POB. Also included in this area is Port KC, bounded by State Line on the west, the Missouri River on the north, the Lewis and Clark Viaduct on the south and the Woodswether Bridge on the south. This area is known historically as the Woodswether Industrial Area. Kansas City's Port Improvement District is included within this area.
- River Market — This area includes two historic districts: Old Town and the Town of Kansas Archaeological Site. Old Town is bounded on the north by 2nd Street, on the south by Independence Avenue/Boulevard, on the east by Oak Street and on the west by Wyandotte and Delaware. There are roughly 20 square blocks within the Old Town Historic District. It is important to note that the Town of Kansas is located within the Old Town District and is sited between the river's edge, Second Street, Grand Boulevard and west of the Broadway Bridge.
- Columbus Park — Encompassing approximately 170 acres, Columbus Park is bounded on the north by Front Street, the west by Locust Street, the south by Independence Avenue/Boulevard and on the east by the North Midtown Freeway.
- River Front — This area is generally bounded by the Missouri River on the north, Columbus Park and the railroad tracks on the south, the Heart of America Bridge on the west and the Christopher S. Bond Bridge on the east.
- North Kansas City — This area is generally bounded by the area north of the Missouri River, east of MO Highway 169, west to the Heart of America Bridge and on the north at the intersection of MO Highway 9 and 169.
- Downtown Airport — The Downtown Airport loop is located north of the Missouri River and bounded on the east by MO Highway 169, on the west by the levee and NW Lou Holland Drive.
- Harlem — The boundary for Harlem encompasses the area east of MO 169, north of the North Kansas City Levee, west of the Christopher S. Bond Bridge and south of the BNSF Rail Corridor and the North Kansas City limits.

Historic assets located immediately outside of the Study Area have also been examined. The following neighborhoods have been identified and contain single sites and districts listed in the NRHP and/or historic assets that retain integrity and therefore significance:

- Kansas City, Kansas — Encompasses several key neighborhoods within the Study Area to include Strawberry Hill, and Fairfax. The Lewis and Clark Historic Park, the Kaw Point Riverfront Park, and Kaw River Industrial District (west of the Kaw River) are cultural resources also located in this area. The Huron Cemetery recently was listed as a National Historic Landmark.

*The above district names are based on popular identification, as well as official districts so named by local and state agencies.

Figure 3.9 - Location of National Register of Historic Places, Districts and Individual Landmarks

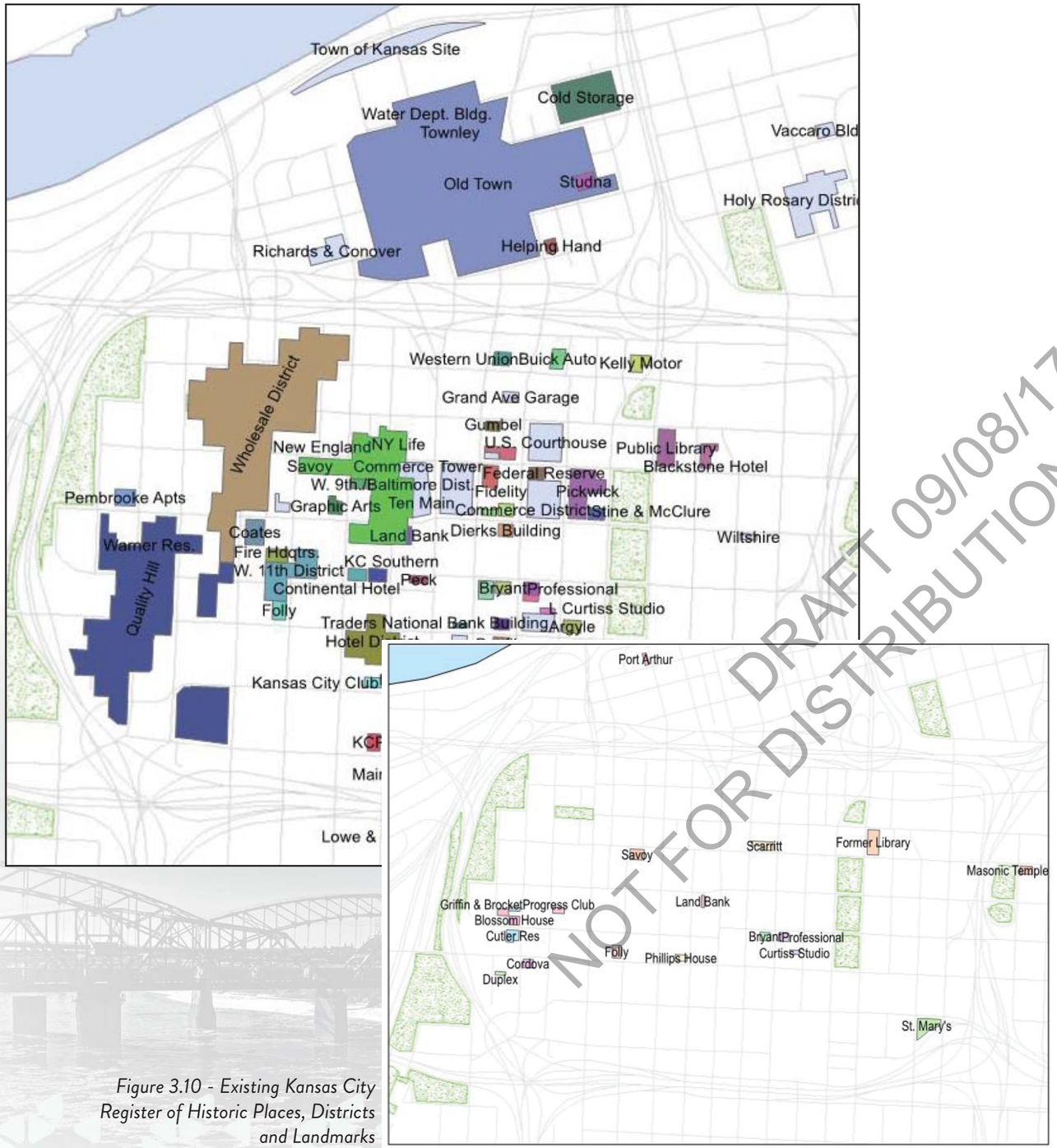
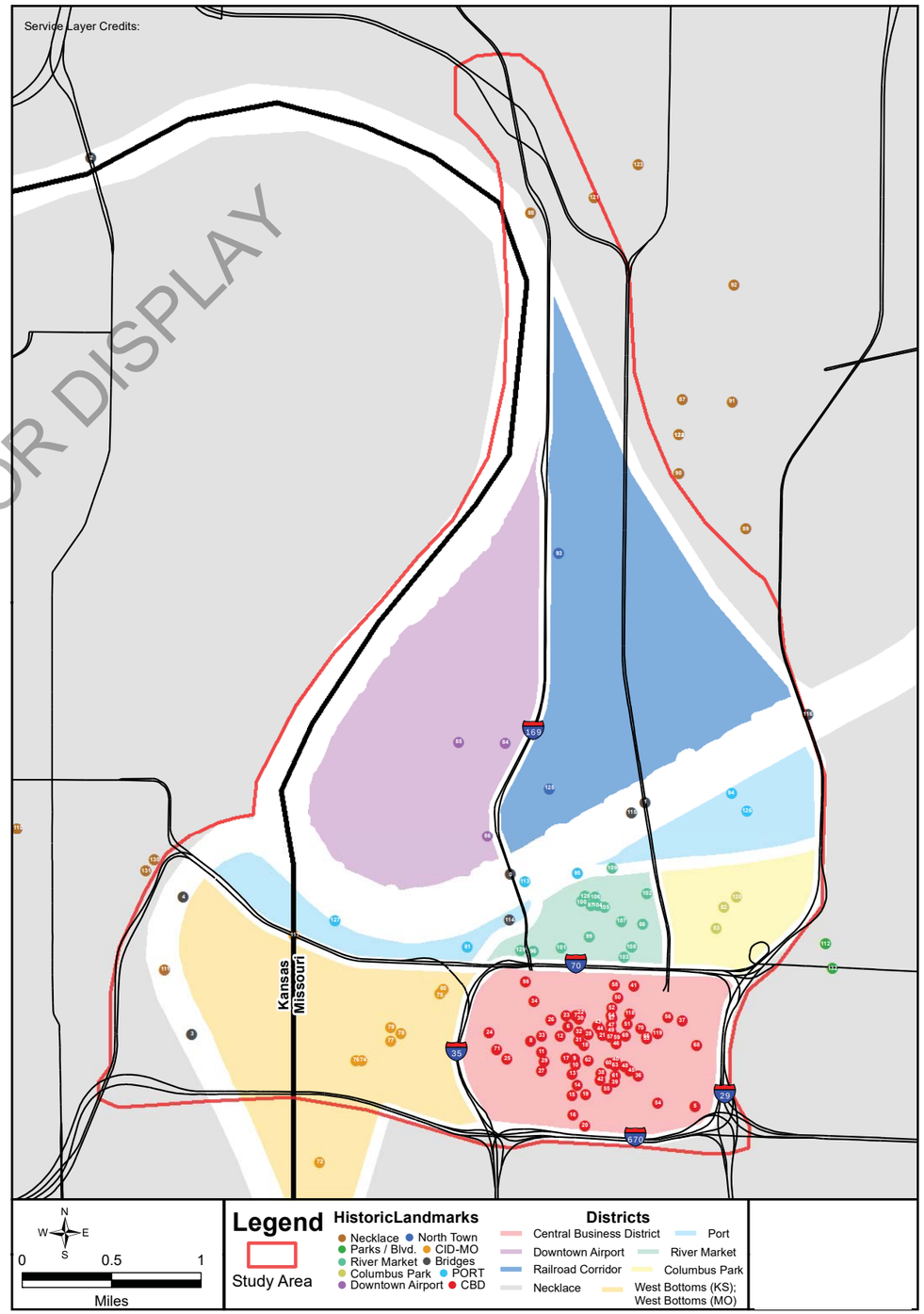


Figure 3.10 - Existing Kansas City Register of Historic Places, Districts and Landmarks

Figure 3.11 - Historic Properties within the Study Area



POTENTIAL OR RECOGNIZED HAZARDOUS MATERIALS SITES

A hazardous material screening was conducted for the Study Area. The purpose of the screening was to identify major sites that are contaminated, or potentially contaminated with hazardous materials or waste that would have a high potential to impact the location of a transportation facility. Particular attention was given to the location of landfills, Superfund-level sites, and sites with documented contamination issues. Lesser sites such as service stations (underground storage tanks) and generators of regulated materials were not included in the screening. For the purposes of this screening, hazardous wastes and materials are defined as products or wastes regulated by the USEPA, MDNR, or KDHE.

EDR Database Search

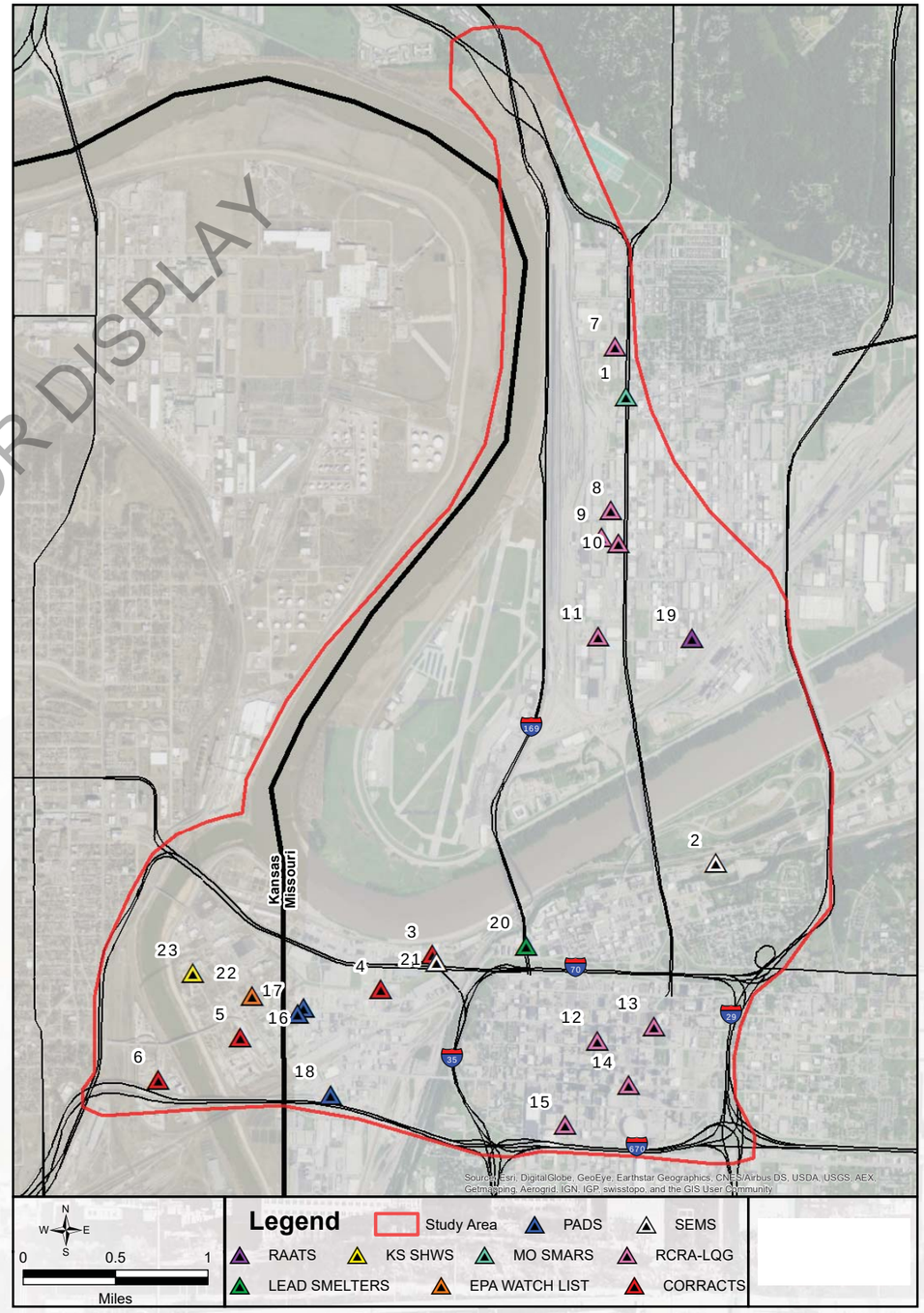
There is no single comprehensive source of information available that identifies all known or potential sources of environmental contamination within the Study Area. Therefore, to identify and evaluate sites that may potentially contain hazardous materials, petroleum products, or other sources of contamination, a federal and state government database search was conducted by Environmental Data Resources, Inc. (EDR), dated November 29, 2016. The database search included close to 100 different environmental databases including sites identified or evaluated as federal or state Superfund sites; facilities that generate, store, treat or dispose of hazardous wastes; solid waste landfills; facilities that have active, closed, or leaking aboveground storage tanks (ASTs) or underground storage tanks (USTs); sites actively undergoing cleanup; spills involving potentially hazardous materials; and a number of other activities that might be an indicator of a hazardous condition.

Known Sites

In all, 23 sites were identified in the Study Area as having the high potential to impact the location of transportation improvements. High impact is defined as a site that would require extensive time and cost to assess and remediate. Some of the sites are large, working industrial plants which are in the Study Area and are not included for regulatory reasons, but assumed to be avoided for other reasons. A summary of the sites are included in Table 3.6 on the next page and identified on Figure 3.12.

A more detailed hazardous materials initial site assessment would be needed as part of any future project development. The purpose of conducting a more detailed hazardous materials assessment is to gather additional information needed to plan for known and potential hazardous materials issues. During the planning and design process, this information can be used to identify avoidance options, when possible, and to assist with the development of specific materials management or mitigation measures. Properties to be acquired may also require individual site assessments as part of the right-of-way acquisition process.

Figure 3.12 - Location of Potential Hazardous Materials/Waste Sites



The Study Area contains 23 known locations of hazardous material sites that were determined to have a high probability of increasing time and cost if affected by the proposed solutions. These sites do not include hundreds of other lower probability sites also located within the Study Area.

Table 3.6 - Summary of Potential or Recognized Hazardous Materials/Waste Sites

No.	Site Name	Location
1	North Kansas City Ammonia	West of 19th Avenue North Kansas City, MO 64116
2	Kansas City Coal Gas	E. 1st St. & Campbell St., E. 3rd Kansas City, MO 64106
3	City Environmental Inc.	901 Woodswether Rd. Kansas City, MO 64105
4	Solvent Recovery, LLC	716 Mulberry Kansas City, MO 64101
5	Midwest Industrial Services, Inc.	100 S. 1st St.(A) Kansas City, KS 66118
6	PBI Gordon Corp	300 S 3rd St. Kansas City, KS 66118
7	Tnemec Company, Inc.	123 W. 23rd Avenue North Kansas City, MO 64116
8	Fujifilm North America Corp.	20 W. 14th Avenue North Kansas City, MO 64116
9	PAS Technologies, Inc.	1234 Atlantic Avenue North Kansas City, MO 64116
10	Holland Nameplate, Inc.	1300 Burlington Street North Kansas City, MO 64116
11	Flint Ink NA	104 W. 10th Avenue North Kansas City, MO 64116
12	CVS Pharmacy #8592	921 Main Street Kansas City, MO 64105
13	Charles Evans Whittaker US Federal Courthouse	400 E. 9th Street Kansas City, MO 64106
14	AZZ Galvanizing Service	700 E. 12th Street Kansas City, MO 64123
15	KCPL Building	106 W. 14th Street Kansas City, MO 64105
16	Clean Harbors PPM LLC	1629 W. 9th Street Kansas City, MO 64101
17	Safety-Kleen (PPM) Inc.	806 Genesee Kansas City, MO 64101
18	Environmental International, Inc.	1220 Wyoming Kansas City, MO 64102
19	Ensley Tool Co.	420 E. 10th Avenue North Kansas City, MO 64116
20	Shostak Metal Corp.	303 Broadway Kansas City, MO 64102
21	Studer Container Service	520 Madison Avenue Kansas City, MO 64105
22	KC Freightliner Body Shop	11 N. James Kansas City, KS 66118
23	Galamba Metals, Inc.	2nd & Riverview Kansas City, KS 66118

NATURAL HABITAT AND THREATENED AND ENDANGERED SPECIES

The majority of the Study Area is comprised of urban built-up land. The most dominant vegetative natural communities occurring, although few, are the remnant upland and riparian forests (wooded areas along waterways). Grassed areas are predominantly composed of maintained cool-season grasses in residential and commercial/industrial areas. Wildlife, although not abundant, does exist, and potential habitat for threatened and endangered species exists.

There are no state identified Conservation Opportunity Areas or designated Natural Areas within the Study Area. However, through reviews of the MARC Natural Resources Inventory (Figure 3.13) there are both Forest Restoration Priorities and Forest Conservation Areas within the Study Area.

Federal Threatened and Endangered Species

Under the U.S. Endangered Species Act (ESA), the U.S. Fish and Wildlife Service (USFWS) has primary responsibility in the protection of federally endangered and threatened species and designation of critical habitat areas for these species. Endangered species are those that are in danger of extinction throughout all or a significant portion of their range, and threatened species are those that are likely to become endangered within the foreseeable future.

State Listed Species

In Missouri, all federally endangered and threatened plants and animals are protected by the ESA and the Missouri State Endangered Law. The Missouri Department of Conservation (MDC) determines species status in Missouri under constitutional authority (3CSR10-4.111 Endangered Species). Species that are listed in the Wildlife Code under 3CSR10-4.111 are protected. Annually, the MDC publishes the Missouri Species of Conservation Concern Checklist. Some of the plants and animals in the checklist also appear in the Wildlife Code and are afforded special legal protection. It should be noted that all species in the State of Missouri are protected as biological diversity elements unless a legal harvest method is described in the Wildlife Code.

State and federally listed species are protected in Kansas as designated by the Kansas Nongame and Endangered Species Conservation Act of 1975. The act places the responsibility for identifying and undertaking appropriate conservation measures for listed species directly upon the Department of Wildlife, Parks and Tourism (KDWP&T) through statutes and regulations. Regulations require the department to issue special action permits for activities that affect species listed as threatened and endangered in Kansas. Department personnel conduct environmental reviews of these proposed activities, and if necessary issue action permits with special conditions that help offset negative effects to listed species and critical habitats.

Protected Species Potentially in Study Area

The project team obtained inventory details about the resources, such as protection status and presence of species, by accessing the MDC's Natural Heritage Review, the MDC's Missouri Fish and Wildlife System, the KDWPT Threatened and Endangered Species List, and the USFWS Information Planning and Conservation System (IPaC) websites in January and February, 2017. Research centered on using the most current version of information available online.

Table 3.7 identifies the information obtained from the websites for those species that are listed as federally endangered, threatened, or candidate, and state-endangered within the Study Area. The protected species identified have only been known to occur within the counties included within the Study Area boundaries and as a result, a more detailed habitat assessment would be needed as part of any future project development. The purpose of conducting a more detailed habitat assessment is to gather additional information needed to plan for known and potential protected species issues. During the planning and design process, this information can be used to identify avoidance options, when possible, and to assist with the development of specific minimization or mitigation measures.

Figure 3.13 - Natural Resource Inventory - Forested Restoration and Conservation Priority Areas

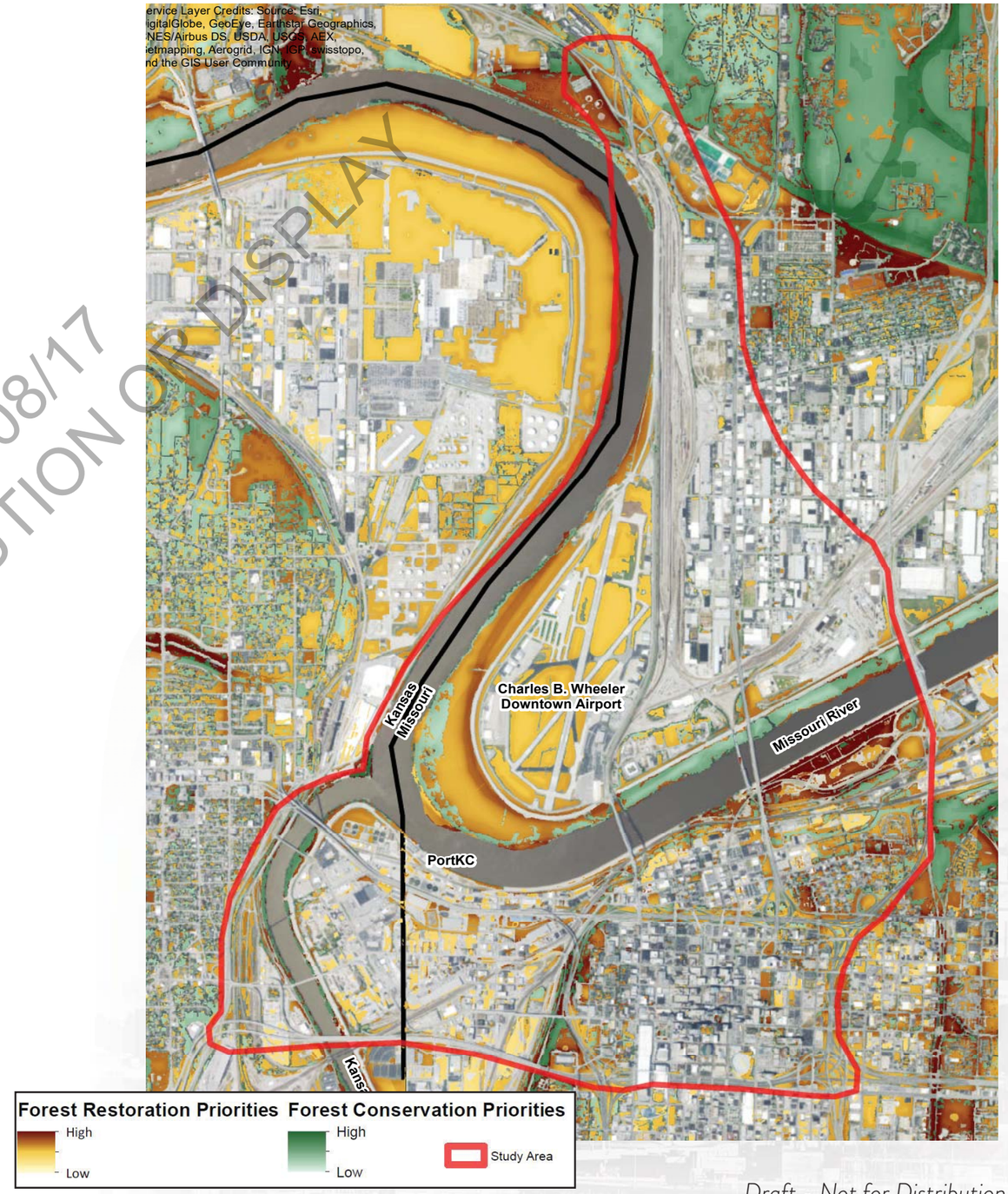


Table 3.7 - Protected Species Potentially Occurring Within the Study Area

Common Name	Scientific Name	Federal Listing	MO Listing	KS Listing
Fishes				
Pallid Sturgeon	Scaphirhynchus albus	E	SE	SE
Sturgeon Chub	Macrhybopsis gelida	C		ST
Shoal Chub	Macrhybopsis hyostoma	NL		ST
Sicklefin Chub	Macrhybopsis meeki	C		SE
Western Silvery Minnow	Hybognathus argyritis	NL		ST
Plains Minnow	Hybognathus placitus	NL		ST
Flathead Chub	Platygobio gracilis	NL		ST
Silver Chub	Macrhybopsis storeriana	NL		SE
Mammals				
Gray Bat	Myotis grisescens	E		
Indiana Bat	Myotis sodalis	E		
Northern Long-Eared Bat	Myotis septentrionalis	T		
Black-tailed Jackrabbit	Lepus californicus melanotis	NL	SE	
Plains Spotted Skunk	Spilogale Putorius	NL	SE	
Eastern Spotted Skunk	Spilogale putorius	NL		ST
Birds				
American Bittern	Botaurus lentiginosus	NL	SE	
Snowy Egret	Egretta thula thula	NL	SE	
Peregrine Falcon	Falco peregrinus tundrius	NL	SE	
Northern Harrier	Circus cyaneus	NL	SE	
Interior Least Tern	Sternula antillarum athalassos	NL	SE	
Least Tern	Sterna antillarum	E		SE
Snowy Plover	Charadrius nivosus	NL		ST
Reptiles				
Western Massasauga	Sistrurus Catenatus Tergeminus	NL	SE	
Amphibians				
Yellow Mud Turtle	Kinosternon flavescens flavascens	NL	SE	
Insect				
American Burying Beetle	Nicrophorus americanus	E		SE

E: Federally Endangered; T: Federally Threatened; C: Federal Candidate Species; NL: Not Listed
SE: State Endangered; ST: State Threatened

The Pallid Sturgeon is an Federally-listed Endangered species endemic to the waters of the Missouri and lower Mississippi Rivers. Both the Kit Bond and Fairfax Bridges included mitigation strategies during construction for this species.

*Two Federally Endangered bat species, the **Gray and Indiana Bat**, as well as the Federally Threatened **Northern Long-Eared Bat** are potentially located in or near the Study Area. Bats typically rely on dark spaces such as caves, mines, underneath tree bark, or abandoned structures to live. The Norhern Long-Eared Bat, for example, is known to prefer living underneath bridges.*

*The **Least Tern** is a species of bird that is Federally listed as Endangered. The bird breeds in North America and northern South America and is found nesting on sandy beaches along the southern coast of the United States and up major river systems far into the interior of the continent.*

*The **American Burying Beetle** is a critically endangered species endemic to North America. The beetle is a carrion beetle meaning they rely on small, dead animals for sustenance. Historically, the beetle has lived in Kansas but is not currently known to be present.*

The Migratory Bird Treaty Act (MBTA) protects all migratory birds including colonial nesting sites formed on bridges or in nearby trees by certain species. Transportation projects that affect bridges during migratory bird breeding season are assessed for impact to migratory bird species such as swallows that may use the bridge as a nesting site.

The Study Area is within the geographic range of nesting Bald Eagles. Bald Eagles (Haliaeetus leucocephalus) may nest near streams and water bodies, like the Missouri and Kansas Rivers. While no longer listed as endangered, eagles continue to be protected by the federal government under the Bald and Golden Eagle Protection Act.

PARKS AND RECREATIONAL RESOURCES

Parks and recreation resources are important community facilities that warrant consideration during federally funded projects. These resources include parks, trails, and open space areas that offer opportunities for recreation, including both passive and active activities.

Existing Regulatory Requirements

The following federal statutes regulate how a proposed transportation improvement can impact a park or recreational facility:

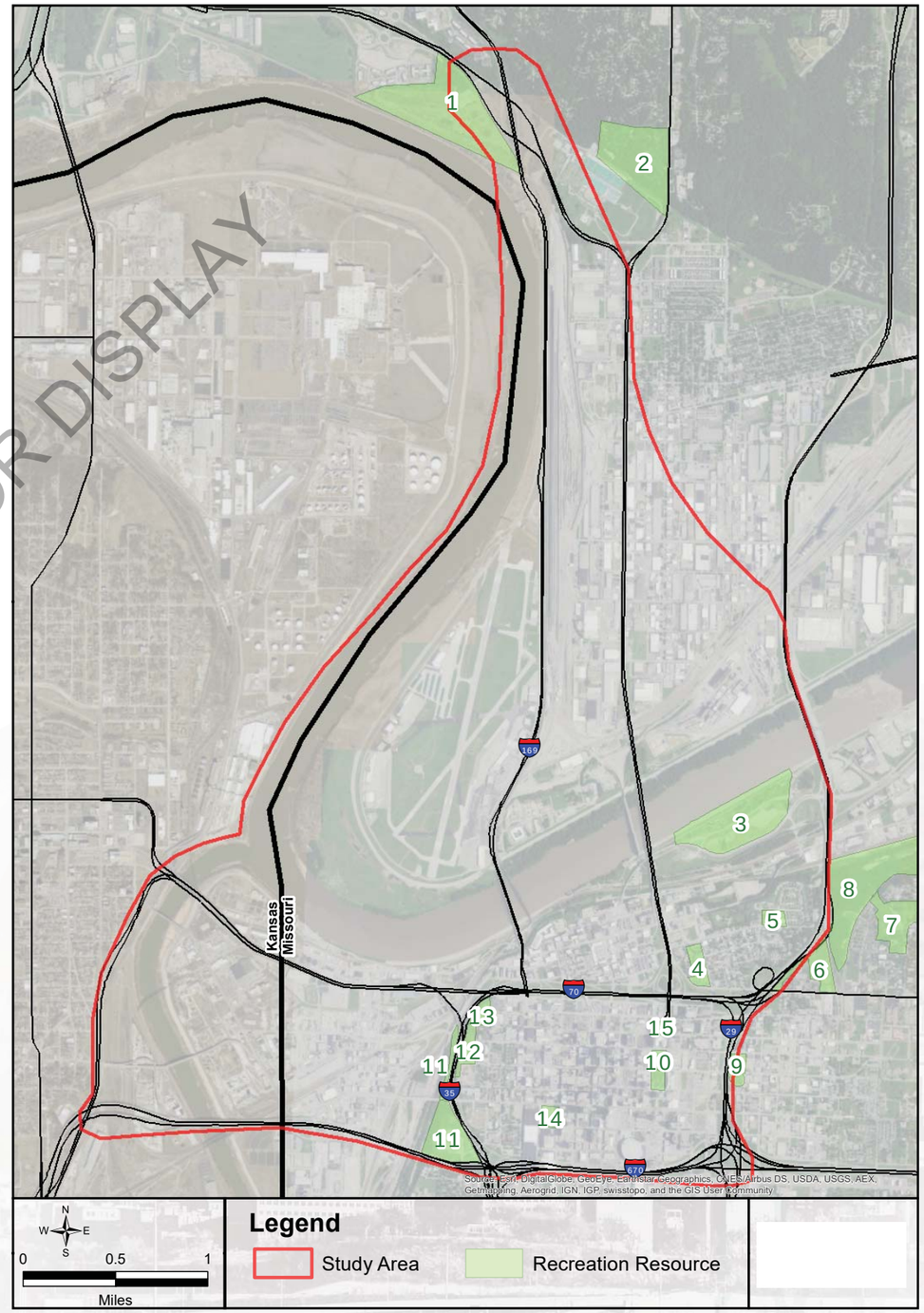
- **Section 4(f), Parks** — Section 4(f) is part of the Department of Transportation Act of 1966 (DOT) designed to preserve the natural beauty of the countryside, public park and recreation lands, wildlife, and waterfowl refuges. A Section 4(f) eligible property can be either public or privately owned. Federally funded DOT actions cannot impact Section 4(f) eligible sites unless there is no "feasible and prudent" alternative - a higher standard of justification than "preferred" alternative.
- **Section 4(f), Historical Resources** — Section 4(f) also applies to the "use" of a historic property when the project effects are so severe as to cause character-defining features of the property (attributes making it eligible for NHRP listing) to be diminished to a point where the property is no longer eligible for listing. In a direct use, the property is destroyed – an adverse effect under Section 106. A constructive use occurs when the setting of the property is so altered it loses significance – also an adverse effect under Section 106.
- **Section 6(f)** — Section 6(f) is part of the Land and Water Conservation Fund (LWCF) Act of 1965, designed to provide restrictions for public recreation facilities funded with LWCF money. The LWCF Act provides funds for the acquisition and development of public outdoor recreation facilities that could include community, county and state parks, trails, fairgrounds, conservation areas, boat ramps, shooting ranges, etc. Facilities that are LWCF funded must be maintained for outdoor recreation in perpetuity. Impacts to 6(f) lands require mitigation that includes replacement lands of at least equal value and recreation utility. Based on a review of the National Park Service database, there are no Section 6(f) properties in the Study Area.

Study Area Resources

The project team used GIS data to identify details and characteristics of existing parks and recreational resources in the Study Area. The team obtained additional inventory details about the resources, such as ownership, size, and amenities, by accessing individual municipalities' websites in January 2017. Research centered on using the most current version of online information available. The information has not been confirmed with the jurisdictions and may change as the project progresses through the planning phases.

Figure 3.14 identifies where each park is within the Study Area or within close proximity or adjacent to the Study Area. More detailed descriptions of each park has been provided in Table 3.8 on the following page.

Figure 3.14 - Location of Parks and Recreational Areas



The Study Area contains numerous parks and recreational facilities. Existing regulations require a higher standard of care when a proposed transportation improvement impacts an existing park.

Table 3.8 - Existing Parks or Recreational Resources

No.	Resource Name	Location	Description
1	Waterwell Park	SW of US 169 and MO Hwy 9 interchange	Established in 1990 with over 66 acres of land. Park includes athletic complex, including 5 baseball fields and a playground.
2	Waterworks Park	NE 32nd St and N. Oak Trafficway	Park began in 1931 as space for employees of water treatment plan. During WWII park was closed for security purposes. The KCMO Parks Department acquired the land in 1965 which contains a disc golf course and memorial.
3	Richard Berkley Riverfront Park	South bank of the Missouri River between the Christopher S. Bond Bridge and the Heart of America Bridge	The park was dedicated in 1998 with 17 acres of land. The area was once a landfill and former site of a sand and gravel company.
4	Columbus Square Park	Missouri Ave and Holmes St in Columbus Park Neighborhood	The 4.18 acre park was acquired in 1909 and includes bocce courts, a gazebo and play area. A new master plan for the park was completed in 2014.
5	Garrison Square Park and Community Center	E. 5th St and Troost Ave	The park was established in 1908 and is 3.09 acres, which includes a soccer field and sprayground. The Community Center is over 100 years old and a historic landmark. The Community Center offers a variety of sports, activities and events.
6	Belvidere Park	Independence Ave and Lydia Ave	The park was established in 1967. It is 15.46 acres and includes soccer fields.
7	Maple Park	Maple Boulevard and Lexington Avenue	Maple Park, established in 1946, is 15.52 acres and has one soccer field.
8	Kessler Park	From Paseo to Belmont Blvd on the North Bluffs	Kessler Park was acquired in 1895 and is 303.51 acres. The park was renamed after George Kessler who was behind the plans for the early park system in Kansas City. The park is home to several memorials and public art as well as the Colonnade. The park also has a disc golf course and 5-mile trail.
9	Margaret Kemp Park and Trail	10th St and Harrison St	Established in 1967, the park is 2.94 acres. The Margaret Kemp Park Trail is within the park and is 0.23 miles long.
10	Illus Davis Park	North of KCMO City Hall between 9th and 10th Streets	The 5.2 acre park was acquired in 2001 and includes the Illus Davis fountain. The park was named for a former City Councilman who served two terms as mayor.
11	Mulkey Square Park	W. 13th St and Summit St	The park was acquired in 1904 and is 8.87 acres with one baseball diamond
12	Ermine Case Jr. Park	9th St to 10th St along Jefferson St	Acquired in 1944 the park is 1.67 acres and adjacent to West Terrace Park
13	West Terrace Park	W. 8th St and Jefferson	West Terrace is one of the oldest parks in the KCMO parks system. It was acquired in 1900 and is 30.56. There are several memorials within the park.
14	Barney Allis Plaza	12th St. and Wyandotte	Formerly a park located in downtown Kansas City that was recently purchased by the Kansas City Explorers, Kansas City's World Tennis Team.
15	Admiral Plaza	8th St. between Oak St. and Locust St.	A park in the northeast corner of the downtown loop near Columbus Square and City Center Square.

NOISE

The 1972 Federal-aid Highway Act required FHWA to develop a noise standard for new Federal-aid highway projects. FHWA Noise Standards give highway agencies flexibility in conforming to national requirements. Both MoDOT and KDOT have noise policies on highway traffic and construction noise. MoDOT's Engineering Policy Guide at 127.13 and KDOT's Noise Policy describes their respective implementation of the requirements of FHWA's Noise Standard at 23 Code of Federal Regulations (CFR) Part 772. These policies were developed by the state DOT's and approved by FHWA.

The primary sources of highway traffic noise are the tire-pavement interface, engine noise, and exhaust noise. In very general terms, the lower the threshold of highway noise impact is roughly the point at which interference with normal human speech is appreciable. FHWA defines projects into three types: Type I, Type II, and Type III. Below are criteria associated with each project type.

Type I Project:

1. The construction of a highway on new location; or,
2. The physical alteration of an existing highway where it is either:
   - Substantial Horizontal Alteration. A project halves (reduces) the distance between the traffic noise and the closest receptor between the existing condition to the future build condition; or,
   - Substantial Vertical Alteration. A project that removes shielding (vegetation does not constitute shielding as it typically does not provide substantial noise reduction), as it thereby exposes the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and receptor; or,
3. The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a High Occupancy Vehicle (HOV) lane, High Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
4. The addition of an auxiliary lane, except when the auxiliary lane is a turn lane; or,
5. The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
6. Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
7. The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.
8. If any portion of a project evaluated under NEPA is determined to be Type I per 23 CFR 772.5, then the entire project area as defined in the environmental document is a Type I project.

Type II & III Projects:

Usually referred to as a retrofit project, a Type II project is a proposed Federal or Federal-aid highway project for noise abatement on an existing highway. Type II projects are not mandatory and are at the state's discretion. Projects of this type are proposed solely at the option of a State DOT, and specific requirements for the project are determined by the individual State DOT. Federal participation in the funding of such projects is limited to those that propose abatement measures along lands that were developed prior to construction of the original highway. MoDOT does not participate in the Type II noise program.

A project that does not meet the criteria for Type I or Type II is designated as a Type III project. Type III projects do not require noise analysis or consideration of noise abatement. Examples of Type III projects include bridge rehabilitations or replacements, roadway pavement reconstruction, roadway resurfacing, intersection improvements, shoulder additions, and turning lanes.

Sensitive Noise Receptors

Highway noise within the Study Area is typical of that found in an urban environment. At the time that the I-29/35 Draft Environmental Impact Statement was completed in 2006 existing noise levels near the northeast corner of the Downtown Loop ranged from 61 decibels (dB) to 68 dB. For Type I highway improvements existing noise levels are measured and then modeled to predict what future noise levels would be with the Type I improvements. Various noise thresholds have been set for different types of noise sensitive land uses or activities. If the modeled results exceed those thresholds then a cost/benefit analysis is performed to determine if sound barriers such as noise walls are warranted.

Sensitive noise receptors within the Study Area include lands on which serenity and quiet are of extraordinary significance and serve an important need and where the preservation of those qualities is essential if the lands continue to serve their intended purpose. An example may include a cemetery. Other noise sensitive receptors within the Study Area include picnic areas, recreation areas, playgrounds, parks, residences, motels, hotels, schools, churches, and libraries.

AIR QUALITY

Under the Clean Air Act (CAA), the federal government established the National Ambient Air Quality Standards (NAAQS), to protect public health, safety and welfare from known or anticipated effects of six pollutants: sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, ozone, and lead. The State of Missouri established additional criteria for hydrogen sulfide and sulfuric acid. Transportation can contribute to four of the six NAAQS pollutants: ozone, carbon monoxide, particulate matter, and nitrogen dioxide. Conformity (or compliance) with the NAAQS, as required by the CAA, ensures that federally-funded or approved transportation plans, programs, and projects conform to the air quality objectives established in State Implementation Plans (SIPs). MoDOT is responsible for implementing the conformity regulation in non-attainment and maintenance areas.

Existing Conformance

In May 2005, the Environmental Protection Agency (EPA) redesignated the Kansas City metropolitan area an attainment area under a new eight-hour ozone standard, indicating that the region complies with federal clean air standards. The Kansas City region is currently designated as an attainment area for air quality. Therefore, the conformity requirements of 40 CFR Part 93 do not apply to this project. No further action is required.

Project Requirements

The Broadway Bridge project was added to the Kansas City Metropolitan Area Long-Range Transportation Plan (LRTP), Transportation Outlook 2040, in 2015. An air quality analysis was conducted by MARC for the projects listed in the LRTP. This analysis indicated that regional mobile source emissions of volatile organic compounds and nitrogen oxides remain below the levels budgeted in the regional SIP, while accounting for the roadway capacity projects listed in the LRTP as being operational by 2040.

Future bridge replacement activities must be completed in accordance with the Kansas City Department of Health Air Quality Division's Asbestos regulations. The bridge must be inspected for asbestos by a certified asbestos inspector. If a regulated amount of asbestos is found, then it will have to be abated before demolition occurs.

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