

Multimodal Planning Studies



FIXED ROUTE TRANSIT and PEDESTRIAN ACCESSIBILITY STUDY



December 2013

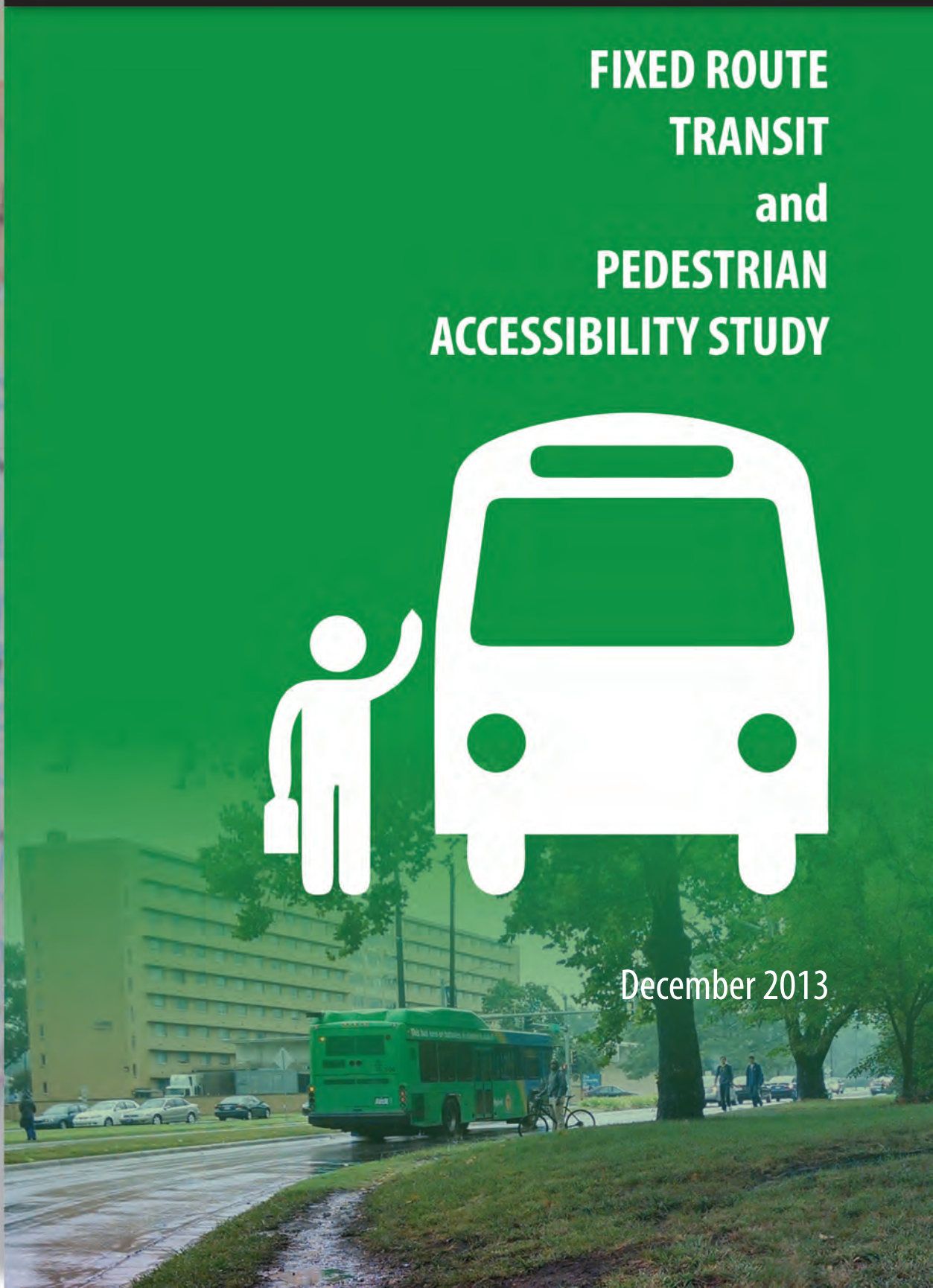


TABLE OF CONTENTS

Chapter 1: Introduction	5
Project Overview	5
Developing a Multimodal Transportation System	5
Fixed-Route Transit and Pedestrian Accessibility Study Goals	6
Transit Benefits	6
Chapter 2: Existing Conditions	7
Overview	7
Lawrence Area Transit Service	7
Transit-Pedestrian Accessibility Issues	9
Recent Studies Impacting Transit Systems and Transit Providers in Douglas County	10
Public Outreach	14
Synthesis of Public Outreach Campaign	16
Chapter 3: Evaluation Methodology	19
Overview	19
Phase 1 Analysis – System Wide Bus Stop Analysis	19
Phase 2 Analysis – Targeted Corridors	20
Phase 3 Analysis – Multimodal Planning Studies Coordination	21
Chapter 4: System-Wide Bus Stop Analysis	23
Overview	23

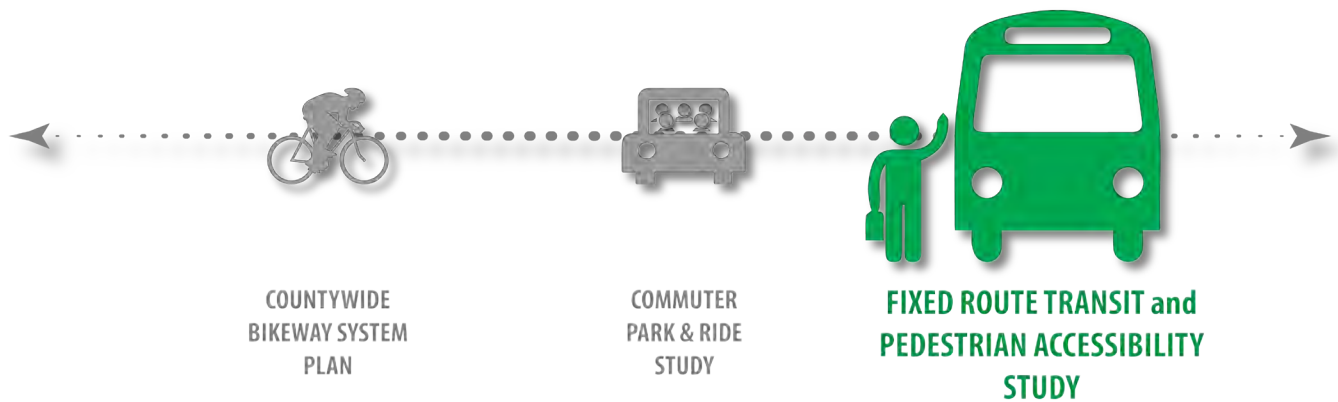




System Wide Variables	23
Bus Stop Scoring	26
Heat Map	27
Chapter 5: Targeted Corridors	29
Overview	29
23rd Street Corridor (Iowa Street to Louisiana Street)	30
6th Street Corridor (Rockledge Road to Massachusetts Street)	34
19th Street Corridor (Iowa Street to Alabama Street)	38
Naismith Drive Corridor (19th Street to 24th Street)	41
Chapter 6: Recommendations and Implementation	43
Overview	43
Target Corridors Recommendations	43
23rd Street Corridor (Iowa Street to Louisiana Street)	44
6th Street Corridor (Rockledge Road to Massachusetts Street)	47
19th Street Corridor (Iowa Street to Alabama Street)	51
Naismith Drive Corridor (19th Street to 24th Street)	55
Spot Improvements	58
Policy Recommendations	62
Chapter 7: Conclusion	69
Appendix A: WikiMap Map Comments	71



Maine Street southbound bus stop north of 6th Street





Chapter 1

INTRODUCTION

Project Overview

In 2013, the Lawrence-Douglas County Metropolitan Planning Organization (L-DC MPO) completed the Multimodal Planning Studies. The goal of this planning effort was to identify and prioritize transportation needs for commuters, pedestrians, cyclists, and transit riders for the next five to ten years, and to develop a range of short and long-term improvements to support a more multimodal region.

The Multimodal Planning Studies consist of the following:

- ▶ Commuter Park & Ride Study
- ▶ Fixed-Route Transit and Pedestrian Accessibility Study
- ▶ Countywide Bikeway System Plan

This report documents the evaluation process and recommendations included in the Fixed-Route Transit-Pedestrian Accessibility Study.

Developing a Multimodal Transportation System

Multimodal refers to a wide range of mobility options – vehicular traffic, public transportation, walking, bicycling, and ridesharing (carpooling and vanpooling). To some degree, this planning effort addresses opportunities to enhance all of these modes, but the primary focus of the Multimodal Planning Studies is to improve walking, bicycling, and transit riding conditions, as well as to develop ridesharing facilities within Lawrence and Douglas County.

Developing a truly multimodal transportation system is consistent with the Complete Streets Policy adopted by the Lawrence City Commission on March 27, 2012 and the Complete Streets Resolution approved by the MPO on September 15, 2011. In addition to supporting this policy, a multimodal transportation system has several benefits including reducing travel costs, promoting an active and healthy lifestyle, expanding mobility options for all users, and providing environmental benefits by reducing traffic congestion and helping to improve air quality within the region. The desire to develop a multimodal transportation system is also consistent with the L-DC MPO's Transportation 2040 (T2040) Metropolitan Transportation Plan (MTP). T2040 also serves as the Lawrence and Douglas County transportation chapter of the joint Comprehensive Plan which is currently called Horizon 2020.

Fixed-Route Transit and Pedestrian Accessibility Study Goals

Each element of the Multimodal Planning Studies has its own set of issues, project goals, and evaluation methodology. However, this planning effort recognizes that a number of issues from the individual studies will overlap and impact the selection and prioritization of regional infrastructure improvements. Efforts to incorporate projects from all three studies make sense in terms of coordinated planning and leveraging financial resources.

For example, developing park & ride lots will require close coordination with the transit and pedestrian accessibility study, as the project team will be looking for opportunities to expand current transit routes to the lots to provide seamless connections between modes. Along these same lines, the project team will also be looking for opportunities to connect countywide bicycle facilities to park & ride lots and to major transit stops to further promote a well-connected, multimodal transportation network.

The Fixed-Route Transit and Pedestrian Accessibility Study goals include identifying:

- ▶ Obstacles transit riders face in accessing the fixed-route system;
- ▶ Locations where improvements to the pedestrian environment can be made to improve and/or enable people to access fixed-route transit services;
- ▶ Issues with streets and / or sidewalks that prevent people from accessing the fixed-route system and force them to rely on paratransit;
- ▶ Possible locations for bus turnouts that could make the bus boarding and exiting process more convenient and enhance traffic operations.

Transit Benefits

Air Quality Improvements

From a transportation system management perspective, a well-used and efficiently run transit system facilitates a reduction in single-occupant vehicles, which makes for fewer cars on the road overall.

Besides saving money on fuel, maintenance, tolls, and other driving costs, passengers of transit generate less carbon emissions, as well as other air pollutants such as particulate matter, nitrous oxide, and volatile organic compounds (VOCs). Overall air pollution is significantly lowered if each person in a group takes transit to their destination than if they all drive their own vehicle individually.

Traffic Congestion Reduction

Fewer cars on the road caused by more people riding transit also leads to reduced traffic congestion. Decreased traffic volumes on arterial and collector streets not only improves travel times for motorists, but also for transit vehicles and the passengers transit serves.

Not coincidentally, traffic congestion also leads to greater air pollution since people operate their vehicles for greater amounts of time. As such, increasing transit ridership is an important means of positively impacting the entire transportation system of a metropolitan area or corridor of communities.





Chapter 2

EXISTING CONDITIONS

Overview

This section of the report summarizes the existing transit service and pedestrian accessibility issues within Lawrence. It includes a summary of the public outreach activities conducted to obtain input from transit riders, non-transit riders, paratransit riders, and the general public regarding obstacles riders face in accessing fixed-route transit service.

Lawrence Area Transit Service

In the Lawrence-Douglas County Region, public transit is divided into several types of bus services, which include commuter / regional, complementary paratransit, urban fixed-route, flexible, and peak.

Transit services are operated by the City of Lawrence (the T) and Kansas University's KU on Wheels (KUOW). Besides the core fixed-route bus services, both Lawrence Transit and the University of Kansas (KU) provide paratransit service; Lawrence Transit's is called T-Lift, while the KU Service is called Jaylift and limits service to students and faculty. Figure 2-1 displays the transit service area.

Although each organization provides an independent operation, the two systems function as a coordinated transit system to provide comprehensive coverage to KU students and the general public. This joint venture has helped both providers to reduce operations and maintenance costs, while endowing the public with seamless service arrangements. Moreover, fare media is integrated, as are schedules and maps.

Coordination efforts are largely the result of implementing recommendations of the 2006 *Coordinated Public Transportation Development Plan*, the 2010 *Lawrence Route and Schedule Design for Coordinated Transportation Report*, and several other studies and plans that have been completed over the last few years. These coordination efforts have paid off and attributed to a growing public consensus that transit service has noticeably improved.

There are also several smaller public and private agencies that provide limited, specialized, and demand-responsive transportation services for the at-risk population in the region. These agencies may also provide trips to the general public in areas that fall outside of the T and KUOW service areas. Among all of these providers, T and KUOW received 97% of the transit ridership in the Lawrence region, with the T at approximately 870,000 (regular Fixed-Route and T-Lift combined) and KUOW at approximately 2 million. Table 2-1 summarizes transit ridership.



K-10 Connector stop at 19th and Naismith

Figure 2-1: Existing Fixed-Route Transit Service in Lawrence

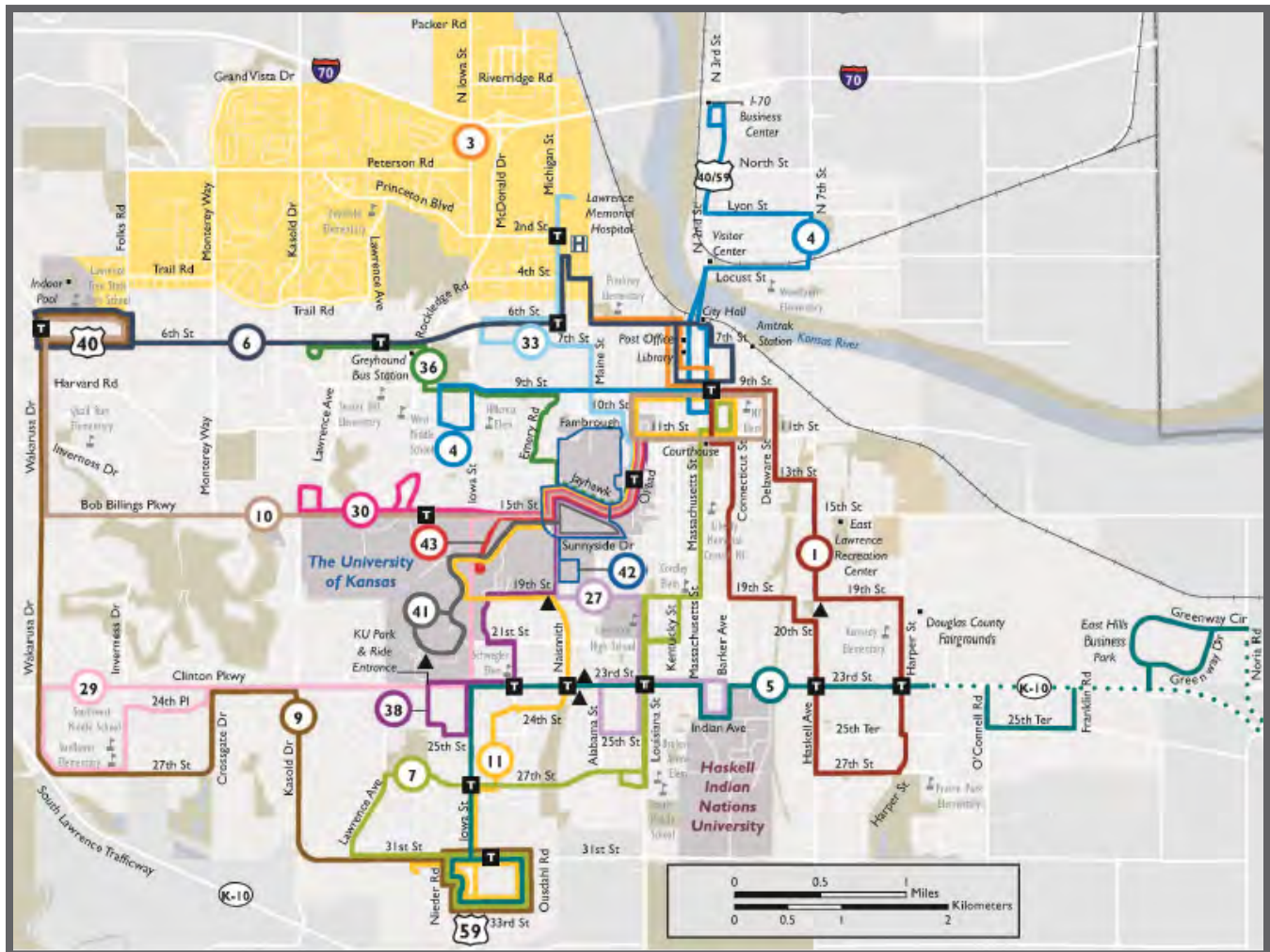


Table 2-1: Transportation Providers Annual Ridership

Transit Operator	2009 Annual Ridership	2010 Annual Ridership	2011 Annual Ridership	2012 Annual Ridership
Bert Nash	1,896	2,345	3,108	3,853
Cottonwood, Inc.	5,157	5,211	3,803	3,181
Douglas County Senior Services, Inc.	Appx.4000	4,687	5,488	7,885
Independence, Inc.	Appx. 10,800	9,833	9,626	10,371
Johnson County Transit K-10 Connector	119,110	128,385	149,703	161,927
KU on Wheels Fixed-Route	1,748,299	2,230,437	2,059,844	1,881,000
KU on Wheels JayLift	4,126	2,232	3,185	4,011
Lawrence - Douglas County Housing Authority Babcock Bus	2,136	2,105	2,288	3,766
Lawrence - Douglas County Housing Authority Residential Services	-	289	338	562
Lawrence Transit Fixed-Route	499,017	620,592	705,561	814,792
Lawrence Transit T-Lift	50,169	50,164	54,065	53,630





Transit-Pedestrian Accessibility Issues

All transit riders are pedestrians (or bicyclists) at some point of their trip. Some individuals may walk several blocks to access fixed-route transit service, while others walk a block or two. Regardless of the length of the trip, transit riders rely heavily on a continuous, connected, accessible, and maintained sidewalk network to complete the front and back end of their travel. These factors are often more essential for individuals with disabilities who may have mobility limitations that make accessing the fixed-route system even more difficult.

A number of factors impact pedestrian travel. The following is an overview of some of the general issues observed within the Lawrence Area. More detailed discussion of these issues is included in Chapter 4 when specific infrastructure issues are identified (recommended improvements are included in Chapter 5).

- ▶ **Missing Sidewalk Segments:** Several major and minor arterials feature disjointed sidewalk networks with missing sidewalk segments, lack significant stretches of sidewalks, and / or feature sidewalks present on only one side of the roadway. Another concern is the lack of sidewalks connecting transit stops with residential neighborhoods.
- ▶ **Sidewalks in Disrepair:** In some cases, sidewalks may be present but the overall condition makes the sidewalk difficult to maneuver, especially for individuals that have mobility limitations. Some older residential areas of Lawrence include brick sidewalks which add to the unique character of the neighborhood but make pedestrian travel difficult. Sidewalks in several locations are cracked or have shifting of one inch or more which could lead to tripping and falls.
- ▶ **Topography:** Locations throughout the Lawrence Area, the KU Campus in particular, are extremely hilly making pedestrian travel difficult. This is especially a concern for individuals with mobility limitations.
- ▶ **Sidewalk Obstacles:** Several of the observed corridors included obstacles that would make pedestrian travel difficult. Common obstacles included utility poles, overgrown vegetation, and landscaping infringing on the sidewalk.
- ▶ **Bus Stops Lacking Concrete Pads:** Many bus stops in the Lawrence Area have grass waiting and boarding areas and often have no connection from adjacent sidewalks to boarding areas. This condition creates an accessibility issue for individuals with mobility needs. Poor weather conditions also make waiting for the bus uncomfortable and accessing the bus difficult for all pedestrians. In fact, some bus stop locations have worn dirt patches which become mud puddles after it rains.
- ▶ **Mid-Block Crossings:** Several mid-block crossings were observed along major travel corridors, including some roadways that were five lanes wide with high volumes and travel speeds. Some of the contributing factors included mid-block bus stops which require individuals to walk to controlled intersection crossings that could be up to four blocks or a half mile away.
- ▶ **Connectivity to Origins-Destinations:** The transit system contains several stop locations where riders have no direct access to the final destination. In some cases, users must travel long distances through surface parking lots. Such connections create potential driver-pedestrian conflict points that could be reduced with better site development requirements.
- ▶ **Inaccessible Curb Ramps:** Many locations throughout the area, in particular the older residential areas, have intersection curb ramps that are not ADA accessible, or had no curb ramps. Some intersections have severe grades that would make it difficult for individuals with mobility limitations and wheelchair users to access. Some of these locations would be difficult for able bodied pedestrians to access in icy/snowy conditions. Some intersection crossings were observed to have curb ramps that led directly to catch basins on the other side of the street.

Recent Studies Impacting Transit Systems and Transit Providers in Douglas County

5-County Regional Transportation Study (KDOT)

This study was a joint effort led by the Kansas Department of Transportation (KDOT), the Mid-America Regional Council, and the Lawrence-Douglas County Metropolitan Planning Organization. The main focus was on quantifying the changing transportation needs in the area composed of Douglas, Johnson, Leavenworth, Miami, and Wyandotte Counties, which is the fastest growing region in the State of Kansas, then developing a strategy for prioritizing and addressing those needs.

The driving force behind growth can be chiefly attributed to approximately twenty larger-scale land developments, which are heavily concentrated in the southwestern Kansas City Metropolitan Area, with about half clustered in the Overland Park community.

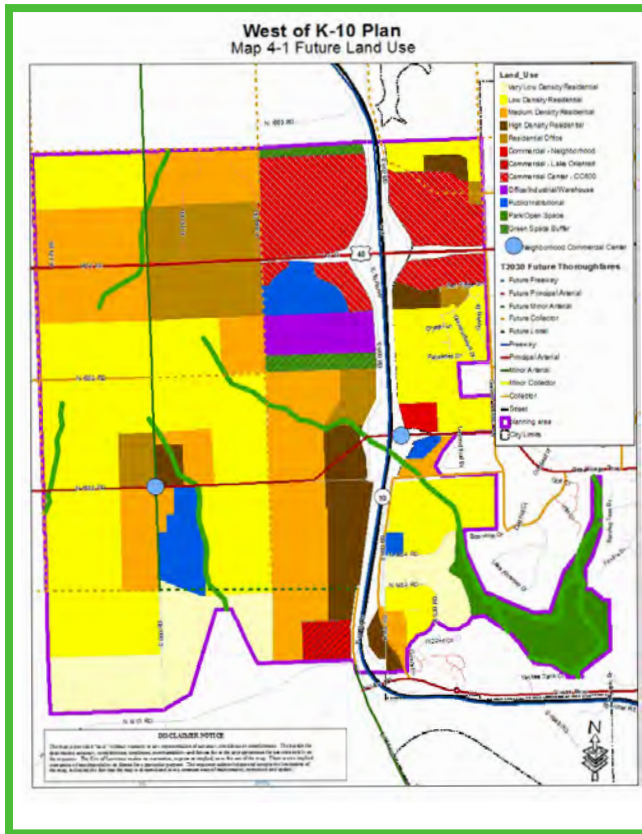
The study was divided into two phases; the first centered on projecting future needs and gaining public involvement perspective, while the second tackled developing solutions and a strategic plan.

Phase 1 findings identified both deficiencies and opportunities within seven east-west corridors and six north-south corridors. Other recommendations included a regional vision that addresses the movement of people and freight, financial efficiency, environment protection, improved public health, and the development of an integrated multi-modal system.

Phase 2 analyzed the specific goals, deficiencies, and opportunities and then developed a matrix which summarized the findings and conclusions for the various desired outcomes, which were categorized into safety, regional prosperity, efficient use of financial resources, choice, environment, public health, social equity, and livability.



Excerpt from 5-County Regional Transportation Study (KDOT)



Excerpt from the West of K-10 Plan (Lawrence-Douglas County Planning and Development Services)

West of K-10 Plan

Focusing on managing and encouraging dense urban growth in the area west of K-10 in the northwest vicinity of Lawrence, KS, this study was an amendment to the Horizon 2020 Comprehensive Plan produced in conjunction with several Lawrence and Douglas County agencies. In 2009 the area was characterized primarily by single family, agricultural, and vacant parcels adjacent to the K-10 and US-40 highways, as well as several rural / county roads. The goal of the study was to find ways to foster a mix of neighborhood uses, housing types, traditional neighborhood design, large employment uses, and an integration of parks and open space. This is to be facilitated partially by increasing connectivity between neighborhoods, increasing the visibility of corridors, forging neighborhood identity, and linking trail systems to the regional network.

The future land use plan calls for various new urbanism approaches such as short blocks, pedestrian-oriented design, and viewsheds of both Lawrence and the rural eastern landscape of Douglas County. Additional recommendations included the use of gateways, thoroughfares, shortened setbacks, and increasing the overall identity of the emerging community.

Transportation improvements involve the expansion of shared use paths along 6th Street, extension of the Bob Billings Parkway / 15th Street (as well as the construction of bikeways along this road), and classifying E 902 Road as a collector street. Most significantly, the study calls for a grade-separated interchange at K-10 and E 1500 Road / Bob Billings Parkway, in conjunction with a financing plan approved by the City of Lawrence, Douglas County, and KDOT. This new interchange along K-10 is now designed and scheduled for construction in the near future. This area plan is a critical guide to the approval of any urban density development west of K-10.

Rock Chalk Development

The Rock Chalk development is located in proximity to the US-40 and K-10 interchange. This interchange area has been previously discussed as an ideal location to construct a future park & ride facility and for the eventual extension of local transit service as the area develops. As such, the development of the Rock Chalk facility should consider the potential linkages to future transit routes into this area.

This \$25 million development project aims to build a large-scale outdoor and indoor recreation facility primarily for the use of the University of Kansas. The facility would include track and field, soccer and softball stadiums, and an 181,000-square-foot building with eight gyms and other amenities. The site for this KU development is located in the northeastern corner of the K-10 and 6th Street / US-40 junction. These KU athletic facilities are being built on a 90-acre site called Rock Chalk Park. An additional 72 acres adjacent to the park is owned by the City of Lawrence and is designated for a future Lawrence recreation complex.



Concept Site Design for the Rock Chalk Development

FIXED-ROUTE TRANSIT & PEDESTRIAN ACCESSIBILITY STUDY



I-70 Corridor Study (regional transit service)

I-70 is the major east-west roadway corridor that links Lawrence, Topeka, and Metropolitan Kansas City together and intersects with several other expressways and freeways. It serves as a toll road for a segment between Kansas City and Topeka, with varying number of lanes. KDOT owns and operates the I-70 roadway east of the 18th Street Expressway, while KTA manages this roadway west of that point to Topeka where the Kansas Turnpike turns south toward Wichita and I-70 heads west as a toll-free interstate.



I-70 is receiving state funding support for two major projects, including real-time traffic information and an interchange improvement with K-7. In regard to I-70 improvements near Lawrence, there are planned interchange upgrades with K-10 following a roadway widening to 6 lanes east of that interchange leading to Metropolitan Kansas City.

This study recommended initiation of future transit service along I-70 between Topeka, Lawrence, and both Kansas Cities, in the form of an intercity commuter bus service. This study will be completed in early 2014. Any future I-70 service will need to be coordinated with local transit routes in Lawrence.

Excerpt from I-70 Corridor Study (KDOT)

Public Outreach

The public outreach effort for this study utilized several tools to engage members of the community:

- ▶ Steering Committee
- ▶ WikiMaps Online Mapping Website
- ▶ Public Open Houses
- ▶ Mobile Meetings
- ▶ Online Survey
- ▶ Project Website

Steering Committee

A Steering Committee was formed by the Lawrence-Douglas County Metropolitan Planning Organization to provide input on and guide the development of this plan. The Steering Committee met regularly over the course of the plan's development to discuss transit and pedestrian issues, provide local knowledge, and review the technical analysis and recommendations. The Steering Committee included transit officials, a public works representative, and representatives from agencies serving seniors and individuals with disabilities as identified in Table 2-2.

Table 2-2: Fixed-Route Transit & Pedestrian Accessibility Study Steering Committee

Steering Committee Member	Agency
Bob Nugent	Lawrence Transit
Cory Davis	KDOT Public Transit Planner
Danny Kaiser	KU on Wheels
Dot Nary	Switzer Fellow / Research Associate, Research & Training Center on Independent Living
Jamie Lloyd Simpson	KU Accessibility & ADA Education
Marian Hukle	Public Transit Advisory Committee (PTAC) Chair / Vice Chair
Tammy Bennett	Lawrence Public Works
Tina Roberts	Douglas County Senior Services / Regional Transit Advisory Committee (RTAC)

Online Mapping

An online interactive "WikiMap" was available early in the planning process to gather public input about fixed-route transit and pedestrian facilities in the Lawrence Area. WikiMaps allows users to draw specific types of points or lines on a map and then enter comments on those points or lines. The WikiMap was available from April 10 through July 17, 2013 for all three Multimodal Planning Studies. The majority of responses were related to the Countywide Bikeway System Plan.

Open House Events

Two open house events were held, the first on Wednesday, June 5, 2013 from 4:30 to 7:30 p.m. at the Lawrence Visitor Center / Union Pacific Depot (402 N. 2nd Street) in northern Lawrence, and the second on Wednesday, October 9th, 2013 from 4:30 to 7:30 p.m. at the Indoor Aquatic Center in western Lawrence.

The June event was designed as an opportunity for people to receive general information on this transit / pedestrian study and to view poster boards with some of the ongoing findings at that time. Presentations were also given on the Commuter Park & Ride lots and the Countywide Bikeway System Plan that were the other two parts of the Multimodal Planning Studies Project. The October event provided more extensive information that included existing conditions assessment and preliminary recommendations for each of the three multimodal studies.

Mobile Meetings

Mobile meetings were held following each public open house. The mobile meetings included the same general information presented at the open houses, but the project team conducted informal meetings with the public throughout Douglas County. The purpose of the meetings included:

- ▶ Building awareness about the Multimodal Planning Studies effort and increasing understanding of its objectives / goals in the region



FIXED-ROUTE TRANSIT & PEDESTRIAN ACCESSIBILITY STUDY



- ▶ Sharing initial feedback gathered for the Multimodal Studies thus far
- ▶ Gathering comments on existing conditions and concerns connected to the transportation system, such as obstacles to carpooling, riding the bus and riding a bicycle for trips to work, school, and other practical trips in the region
- ▶ Gathering comments on recommended improvements

The following list provides the location and dates of each of the seven mobile meetings that were conducted. In total, 350 individuals commented about all aspects of the Multimodal Planning Studies:

- ▶ Family Fun Night in Laws Field, Eudora (7-12)
- ▶ Downtown Lawrence Farmers' Market (7-13)
- ▶ Douglas County Fair Grounds - Family Day (8-2)
- ▶ Baldwin City Art Walk (8-16)
- ▶ Downtown Lawrence Farmers' Market (10-19)
- ▶ Baker University Football Game (10-19)
- ▶ Eudora High School Football Game (10-25)

Online Survey

The online survey contained 32 multiple choice and fill-in-the-blank / box questions and was active from April 10 to July 17, 2013. Anyone could access the website and complete the survey, which received 113 respondents. Although some questions were skipped by respondents, the vast majority were answered for each question (roughly 90 or more).

Questions addressed the issues present in each of the three studies. Questions pertaining to the Fixed-Route Transit and Pedestrian Accessibility Study yielded the following information:

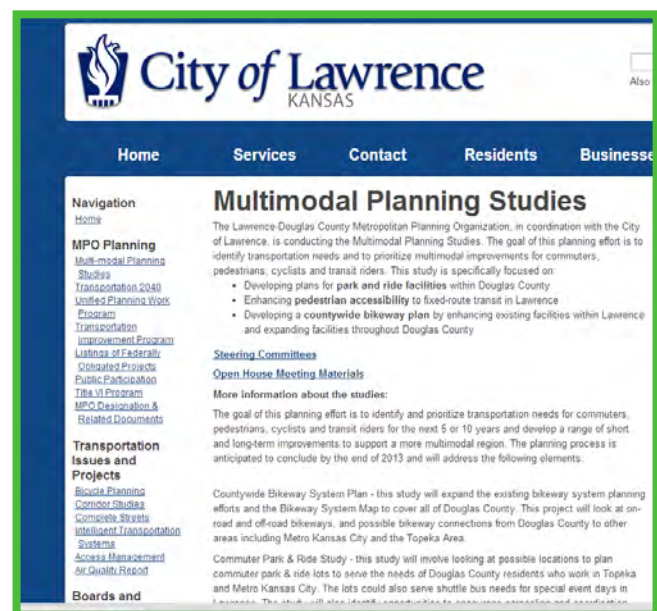
- ▶ Very few respondents use public transit, with only 38% stating they use it more than a few times per year and 46% stating they never use it.

Of the 15% who do use transit on a regular basis, only 2 people selected "more than 5 times per week", as well as 2 responses for "2-3 times per week" and "4-5 times per month", with 8 respondents (9% of the 89 who answered the question) taking it 1-4 times per month.

- ▶ One out of 20 respondents have a physical or health condition that makes accessing a bus or bus stop difficult.
- ▶ Respondents ranked 23rd Street (east of Iowa) the highest in terms of needing pedestrian improvements to enhance connections to transit, followed by 6th Street (both east and west of Iowa ranked equally), and Massachusetts Street.
- ▶ Of the three Multimodal Planning Study elements, transit and pedestrian connectivity ranked 2nd or in the middle according to the number of respondents, and also received 2nd highest support for potentially using a dedicated funding source to implement recommendations.

Project Website

Throughout the life of the project, a dedicated website was available for members of the public to find general information about each of the multimodal studies, information regarding the open house events, and contact information for questions. The website was hosted through the official City of Lawrence government website via www.lawrenceks.org/mpo/study.



Multimodal Planning Studies Project Website

Synthesis of Public Outreach Campaign

In addition to the outreach efforts affecting all three studies, the project team used a range of public outreach techniques to help identify obstacles and issues transit riders face in accessing the fixed-route system, or prevent people from accessing the fixed-route system at all. These outreach efforts included receiving comments from regular transit riders, paratransit riders, non-riders, and bus drivers to better understand the current transit operations within the community. Comments were received using the following techniques:

- 🚌 Independence, Inc. Focus Group Meeting
- 🚌 Bert Nash Caseworker Focus Group Meeting
- 🚌 Cottonwood, Inc., Consumer Committee Focus Group Meeting
- 🚌 Vehicle "Ride Along" Survey of Riders and Bus Operators (Douglas County Senior Services)
- 🚌 Bus Driver Outreach (involved operators of the Lawrence Transit T-Lift service)

Notes were taken at each meeting / survey. After reviewing and organizing these notes / comments, the project team identified common features and issues, then grouped them into categories. In total, five main categories were developed. Each category provides an overview of relevant issues, as well as a list highlighting the most frequent and / or important subject matter voiced by participants in these public outreach efforts. This information has been a crucial component for developing the Fixed-Route Transit & Pedestrian Accessibility Study recommendations, which are discussed in Chapters 3 and 4. For complete and detailed comments and notes, please visit the L-DC MPO website.

Transit-Pedestrian Accessibility

One of the most urgent needs facing existing transit riders is infrastructure. Given the varied elevation levels that characterize the geography of Lawrence and the surrounding area, it is of great importance that pedestrians have safe and convenient sidewalk connections to transit stops. The lack of sidewalk connections and the state of existing connections were two of the most frequently received types of comments from the public.

Moreover, the large number of comments that detail specific sidewalk locations provided valuable information in which the project team was able to illustrate geographically. These were key components to generating the combined "Heat Map" in Chapter 4 (see Figure 4-5).

Following are other prominent issues related to transit-pedestrian accessibility, many of which are the same or similar to those listed on page 9 of this report:

- ➔ **Missing Sidewalk Segments:** Include missing links to residential areas, sidewalks only on one side of the roadway, and sidewalks missing entirely from high-traffic arterials.
- ➔ **Sidewalks in Disrepair:** Cracks, shifted sections, worn or deteriorating brick paths, etc.
- ➔ **Sidewalk Obstacles:** Utility poles, overgrown vegetation, other objects that force pedestrians to walk around them.

- ➔ **Bus Stops Lacking Concrete Pads:** Many stop locations are simply a sign on a grassy area; most lack a paved connection to the sidewalk, while some are even prone to flooding and other unsafe conditions.
- ➔ **Mid-Block Crossings:** There are many informal locations where pedestrians choose to traverse multi-lane, high-traffic roadways, in order to avoid walking ¼ to ½ miles to cross at controlled intersections.
- ➔ **Connectivity to Origins-Destinations:** Often times transit riders must walk long distances through large parking lots without dedicated paths; this makes for unsafe conditions where vehicle-pedestrian points of contact occur.
- ➔ **Inaccessible Curb Ramps:** Many intersection locations feature either no curb ramps from the sidewalk, or curb ramps that lead directly into drainage catch basins. Where ramps are missing, there are often times large grade differences, creating a more difficult journey for both able-bodied and people with mobility needs.
- ➔ **Snow Removal:** More timely removal of snow from stop locations and better coordination among agencies and businesses is needed to keep transit accessible during the winter months.





Operations & Service Planning

Both the fixed-route system and paratransit services could be more responsive to passenger needs in the following ways:

- **Open-ended Paratransit Return Trips:** Currently, scheduling in advance is often difficult since the purpose for many of these trips relates to medical appointments or other activities where an end time is unknown.
- **Later Service Hours:** Participants indicated a demand for service past 10:00 PM, as well as on holidays and Sundays.
- **More Frequent Service:** People are generally dissatisfied with having to wait 30 minutes or longer for a bus, especially if they just missed the previous one.
- **Zone-Based Paratransit:** Bus / van operators feel that the current system is inefficient as they may have to drive all over town; instead, a zone- or quadrant-based system would make more sense, reduce costs for the agency, and provide faster service for passengers.

Information Technology & Marketing

Both able-bodied and people with sensory and mobility issues would benefit from enhanced information systems to convey service information. Additionally, information on the transit system and service options should be made available through various electronic and traditional means:

- **Automated Audio System:** This would provide current / next stop location information and transfer options over a speaker system onboard bus vehicles.
- **Clearly Marked Stops:** There exists a need for larger, clearer signage to direct people to bus stops and inform them on what route(s) serve that stop. Also, not all stops are currently listed / shown on the schedules / maps.
- **Construction Work Updates:** Knowing where road construction is happening and how it will impact transit service is important to helping passengers arrive at their destinations on time.
- **Email Service Updates:** Important information pertaining to weather, construction, and other incidents that impact travel should be distributed electronically when possible.
- **Advertising Space:** This could help increase funding and provide additional service.
- **Better Advanced Registration:** While paratransit riders understand the need for advanced registration, the 1-week limit undermines the demand-response nature of the service (T-Lift only; Senior Wheels program only requires 48 hours).

Priority Stop Locations

Although there was a large variety of specific locations mentioned, participants in the public outreach process generally indicated a preference of transit serving more shopping, apartment complexes, and senior centers. More significant infrastructure and capital improvements are needed at major stop and transfer locations to facilitate quick boarding and alighting of higher volumes of passengers.

- **Bus Pull Outs:** Auxiliary lane space should be added next to existing traffic lanes at prominent and / or high-traffic areas and intersections so that buses can board passengers safely without blocking traffic.
- **Concrete Pads:** Although this is a general recommendation for all bus stops (eventually), it is imperative that the highest-used stops have adequate facilities.

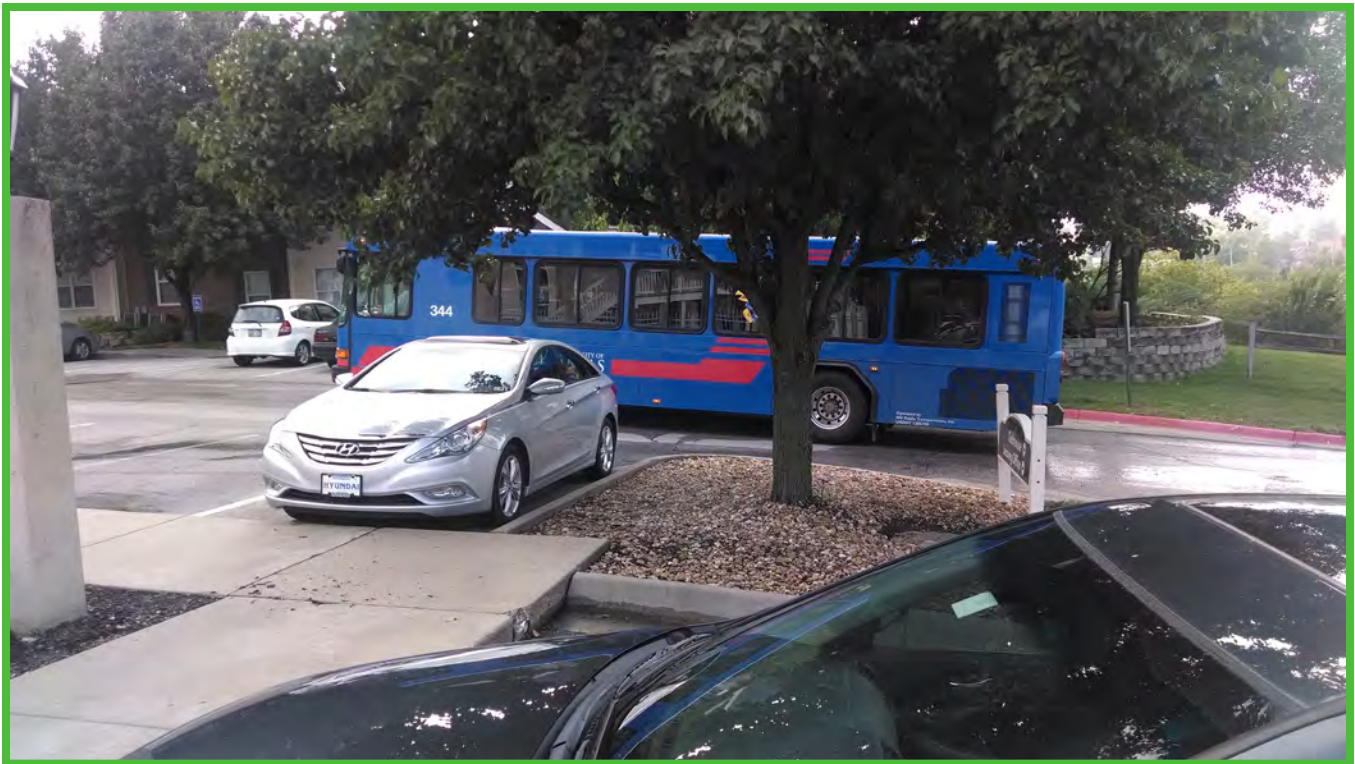
Vehicle & Facility Design Standards

Beyond experiencing difficulty in accessing bus stops, riders also complained of unpleasant waiting conditions at the locations. For example, shelters are lacking along roadways with heavy traffic where street furniture such as benches are desired.

The bus vehicles themselves may also present issues which may prevent some passengers from using public transit. The lack of storage space for personal parcels, such as groceries, means that drivers must enforce bag limits on passengers who have no other way to bring their purchases home.

The variety of bus stop and crossing configurations is cause for considering the development of design standards which address the issues faced by pedestrian-oriented transit users, including safety, lighting, seating, weather protection (shelters), signage, route / schedule information, curb design, and sidewalk connections. A similar approach should also be considered for the interior design of buses.





Operation of a KU Fixed-Route Bus



Chapter 3

EVALUATION | METHODOLOGY

Overview

The project team conducted a three phase evaluation process to assess the fixed-route and pedestrian accessibility conditions within Lawrence. The purpose of this evaluation was to generally identify areas most in need of pedestrian improvements and identify a select number of corridors for a more detailed evaluation. The evaluation methodology is summarized in the following sections of this document.

Phase 1 Analysis – System Wide Bus Stop Analysis

The Phase 1 Analysis evaluated the existing bus stops within Lawrence. Given the extensive service area, the project team relied on existing GIS data to assess variables that directly impact pedestrian accessibility to the fixed-route transit service. A ¼-mile radius around each bus stop was used to determine if a variable fell within the general service area of a particular bus stop. If it did, the variable received a score according to the threshold values that were established for this study (a separate technical memorandum that outlines the evaluation thresholds can be accessed at <http://lawrenceks.org/mpo/study>).

Each bus stop could potentially receive a total of 90 points with the highest scoring stops indicating locations with potentially high pedestrian-transit usage and / or many pedestrian accessibility issues.

Three general categories of variables were established for the analysis:

- ▶ **Infrastructure and Existing Conditions:**
These variables highlight locations where roadway and traffic conditions could impact pedestrian accessibility. For example, roadways with higher traffic volumes, wide cross sections, and higher travel speeds are less accommodating to pedestrians.
- ▶ **Multimodal Connectivity to Major Destinations:**
These variables consider the proximity of major destinations to a bus stop. The higher the number of destinations that fall within the bus stop service area, the more likely there will be a higher level of pedestrian activity.
- ▶ **Potential High Transit Ridership Demand:**
These variables consider individuals who are more likely to use fixed-route transit service. These include individuals with low to moderate income, individuals with disabilities, older adults and students.



Naismith South of 19th Street

Phase 2 Analysis – Targeted Corridors

In Phase 2, the project team identified a select number of targeted corridors for detailed evaluation (four corridors were identified for this analysis based on the results of the Phase 1 analysis). The Phase 2 analysis also included the identification of spot improvements to address significant transit-pedestrian accessibility concerns.

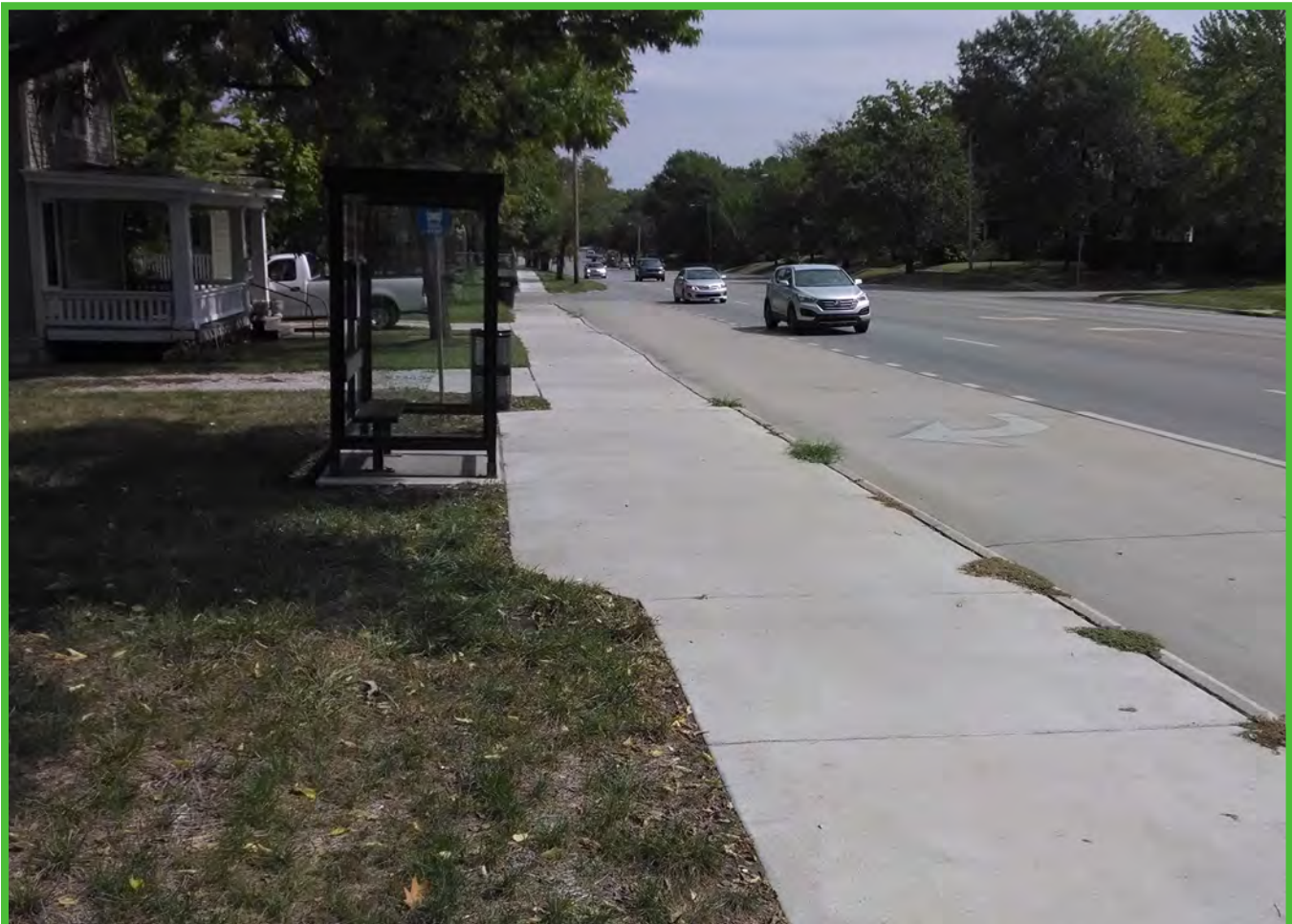
As the initial step of Phase 2, the project team reviewed aerial photos to identify four corridors which contained the highest concentrations of potential transit-pedestrian accessibility issues. This information was then reviewed through fieldwork which involved project team members walking these four corridors to verify the initial analysis and to identify additional pedestrian accessibility concerns. The project team documented these existing conditions which, along with detailed information on the four corridors, are summarized in Chapter 5. Recommended improvements for the targeted corridors are included in Chapter 6.

It is important to note that the selection of four targeted corridors does not suggest that these are the only corridors with transit-pedestrian accessibility issues within Lawrence. Given the large transit service area, the four corridors that were selected include examples of pedestrian accessibility issues and deficiencies that were found to be present throughout the transit service area. Several of the recommendations included in Chapter 6 for the targeted corridors can also be applied to other corridors and spot locations. Chapter 6 also includes general policy recommendations aimed at improving the overall transit-pedestrian accessibility conditions in Lawrence.



Phase 3 Analysis – Multimodal Planning Studies Coordination

The Phase 3 Analysis coordinates the potential transit-pedestrian accessibility improvements with the Countywide Bikeway System Plan and the Commuter Park & Ride Study. This coordination effort was completed at a conceptual level to highlight opportunities that might exist to combine improvements from all three elements of the Multimodal Planning Studies. Potential coordination opportunities are included as part of the recommendations for the targeted corridors and overall recommendations in Chapter 6.



North Side of 6th Street East of Maine Street



Example of a Typical Bus Stop Location Along 6th Street



Chapter 4

SYSTEM-WIDE BUS STOP ANALYSIS

Overview

This section summarizes the Phase 1 evaluation which analyzed the transit-pedestrian accessibility situation at all bus stops within Lawrence. Given the large service area, the analysis utilized GIS data to identify potential areas for more detailed analysis (see discussion of the targeted corridors in Chapter 5). A ¼-mile radius around each bus stop was used to identify pedestrian accessibility conditions within the general transit stop service area. Each bus stop was scored and then used to develop a system wide “heat map.” The heat map is a graphical representation of the data that helps identify the potential demand of pedestrians accessing fixed-route transit services. The following describes the evaluation process and results.

System Wide Variables

Fourteen system wide variables were analyzed to help determine potential areas for further analysis. A large number of variables were taken directly from existing GIS data sets while others were developed with the assistance of the Fixed-Route Transit and Pedestrian Accessibility Steering Committee members.

Figures 4-1 through 4-3 highlight locations in Lawrence that tend to have greater usage of fixed-route transit services. These figures identify areas of student housing, common destinations for older adults, and common destination for individuals with disabilities.



Figure 4-1: Student Housing

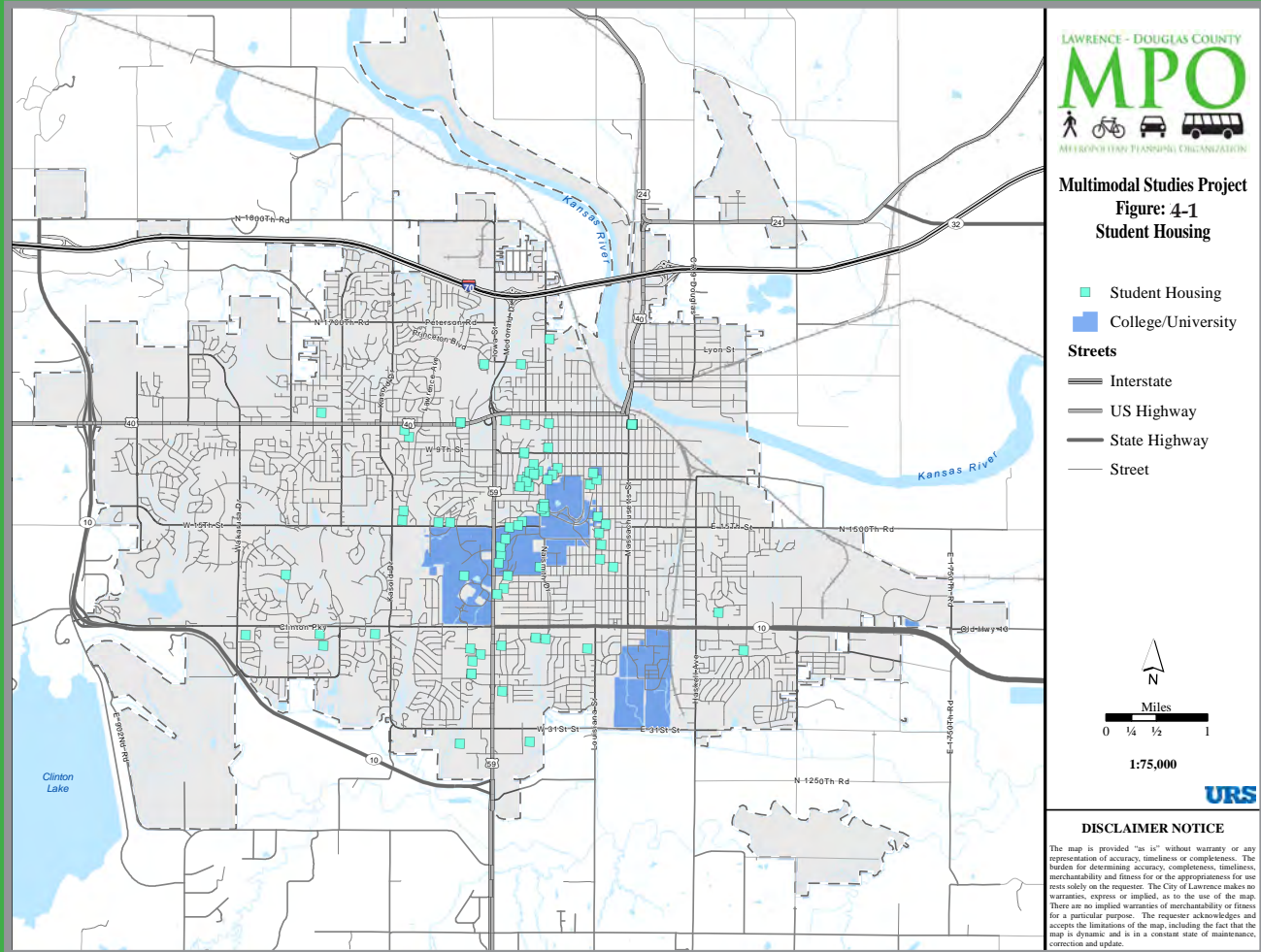
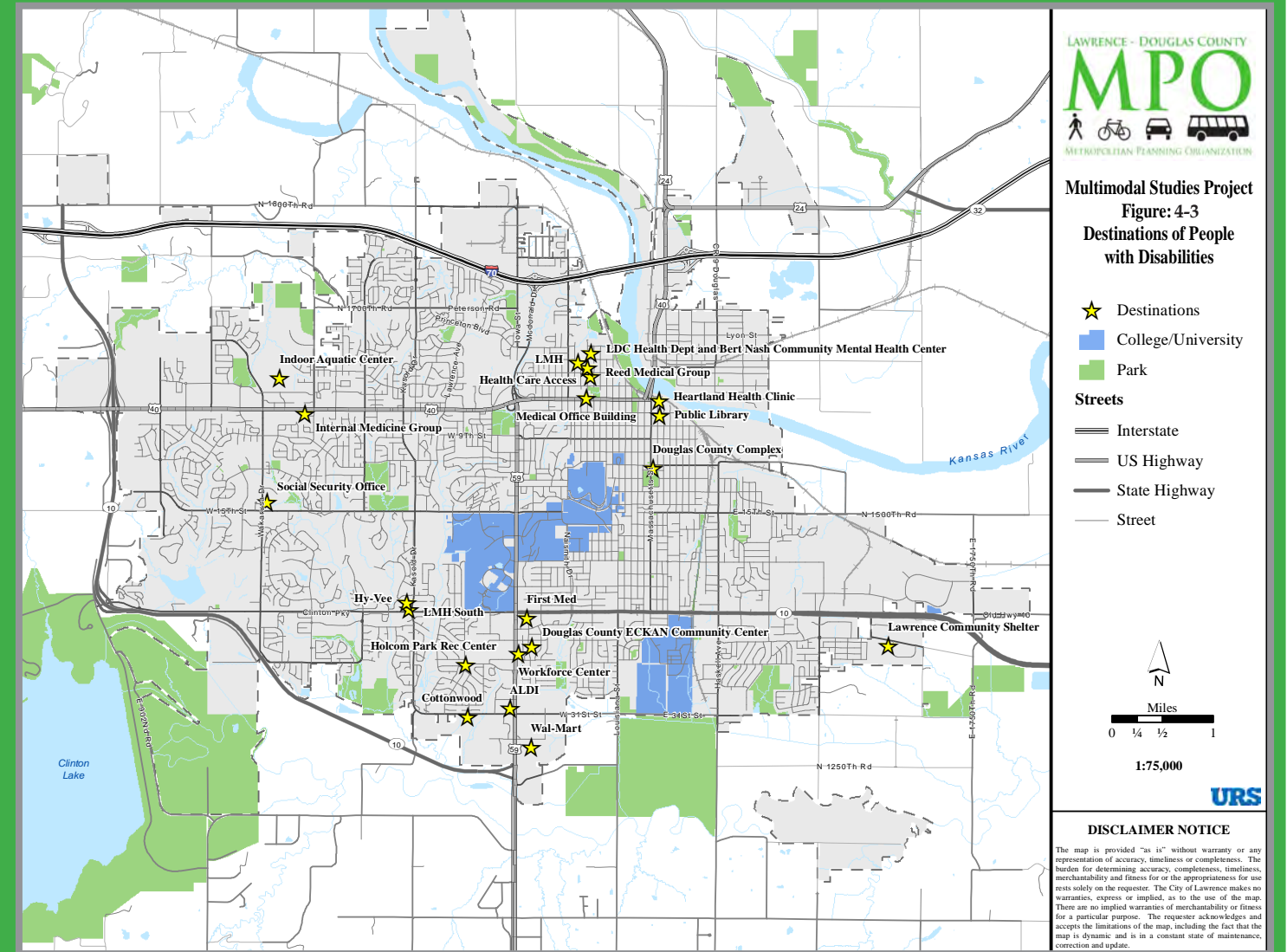
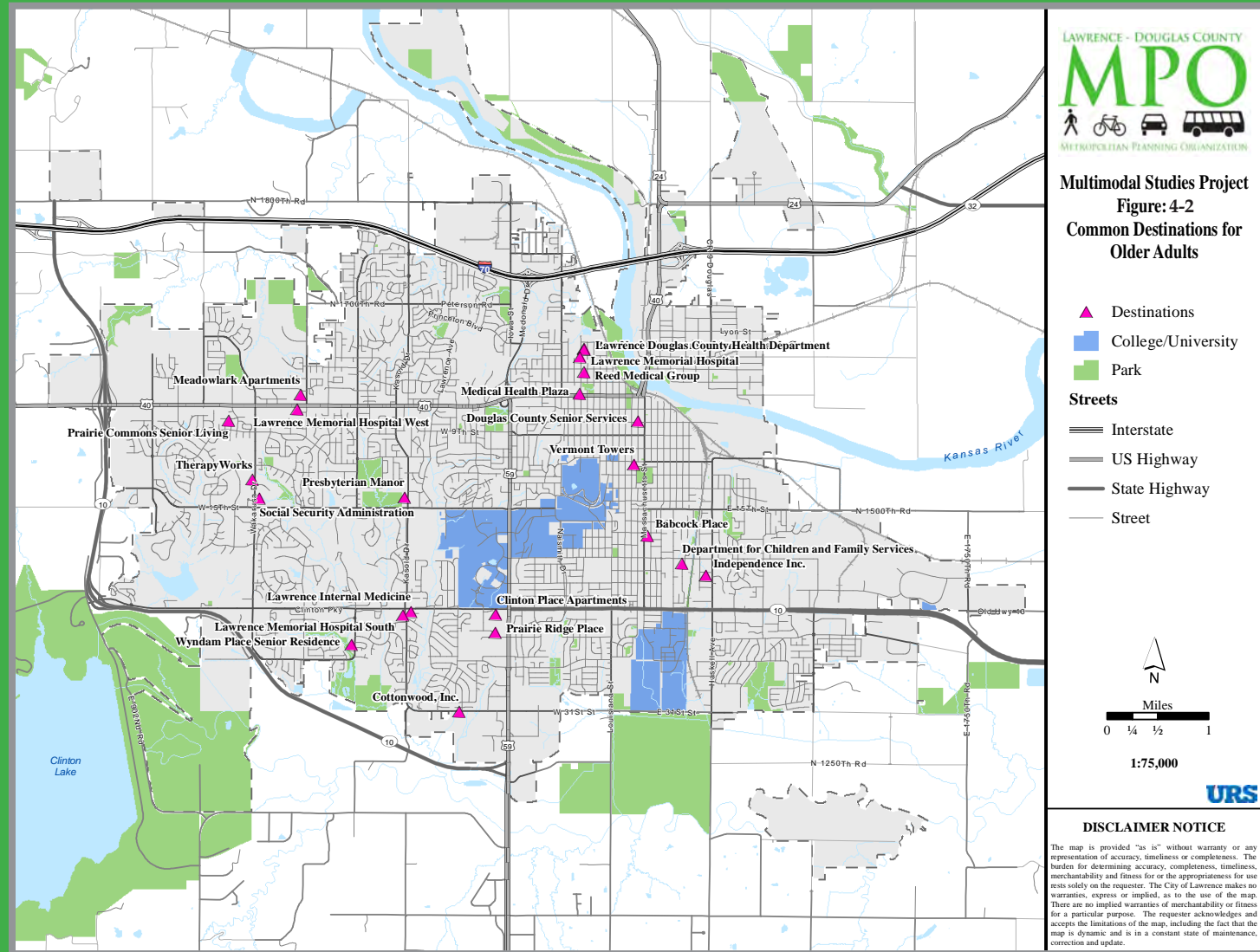




Figure 4-2 and 4-3: Common Destinations for Older Adults (left), and Self-Identified Destinations for People with Disabilities (right)



Bus Stop Scoring

As described in Chapter 3, each bus stop received a score depending on threshold values that were established (a separate technical memorandum outlines the evaluation thresholds) for each variable. Each bus stop could potentially receive a total of 90 points with the highest score observed at the bus stop located on 23rd Street, just east of Iowa (69 points). Additional stops along 23rd Street, and south along Iowa between 23rd and 27th Streets, also scored in the low to mid 60's. Areas along 6th Street, in the general vicinity of 6th and Maine, also scored in the mid 60's. This area is near several medical facilities that are frequented by older adults and individuals with disabilities (as previously shown in Figures 4-2 and 4-3).

Figure 4-4 displays the overall results of the bus stop scoring. Figure 4-5 displays a "heat map" analysis of the system wide transit-pedestrian accessibility results. The heat map graphically displays the concentration of areas that are likely to have higher levels of pedestrian activity and potential fixed-route transit riders.

Figure 4-4: Results of Bus Stop Scoring

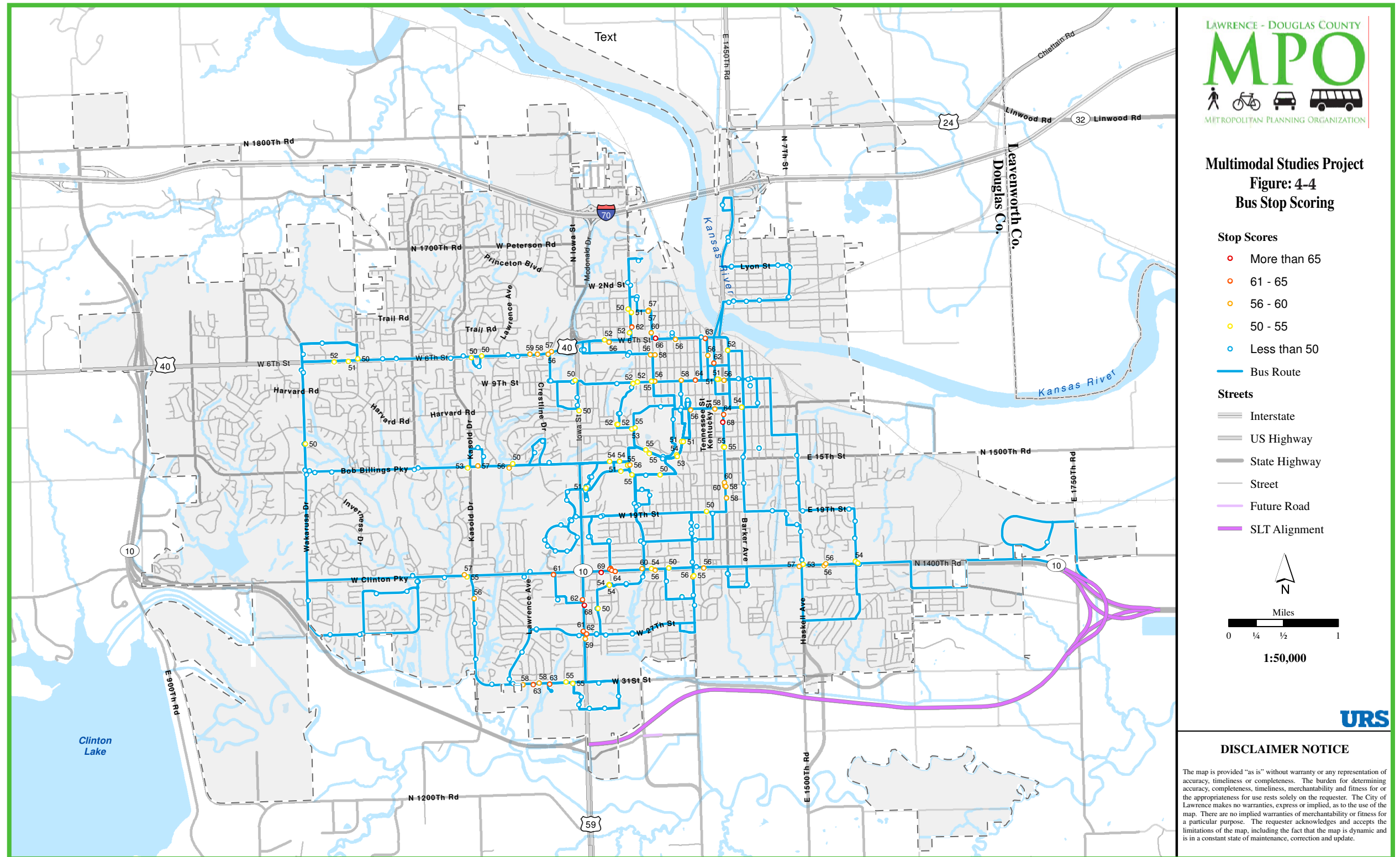
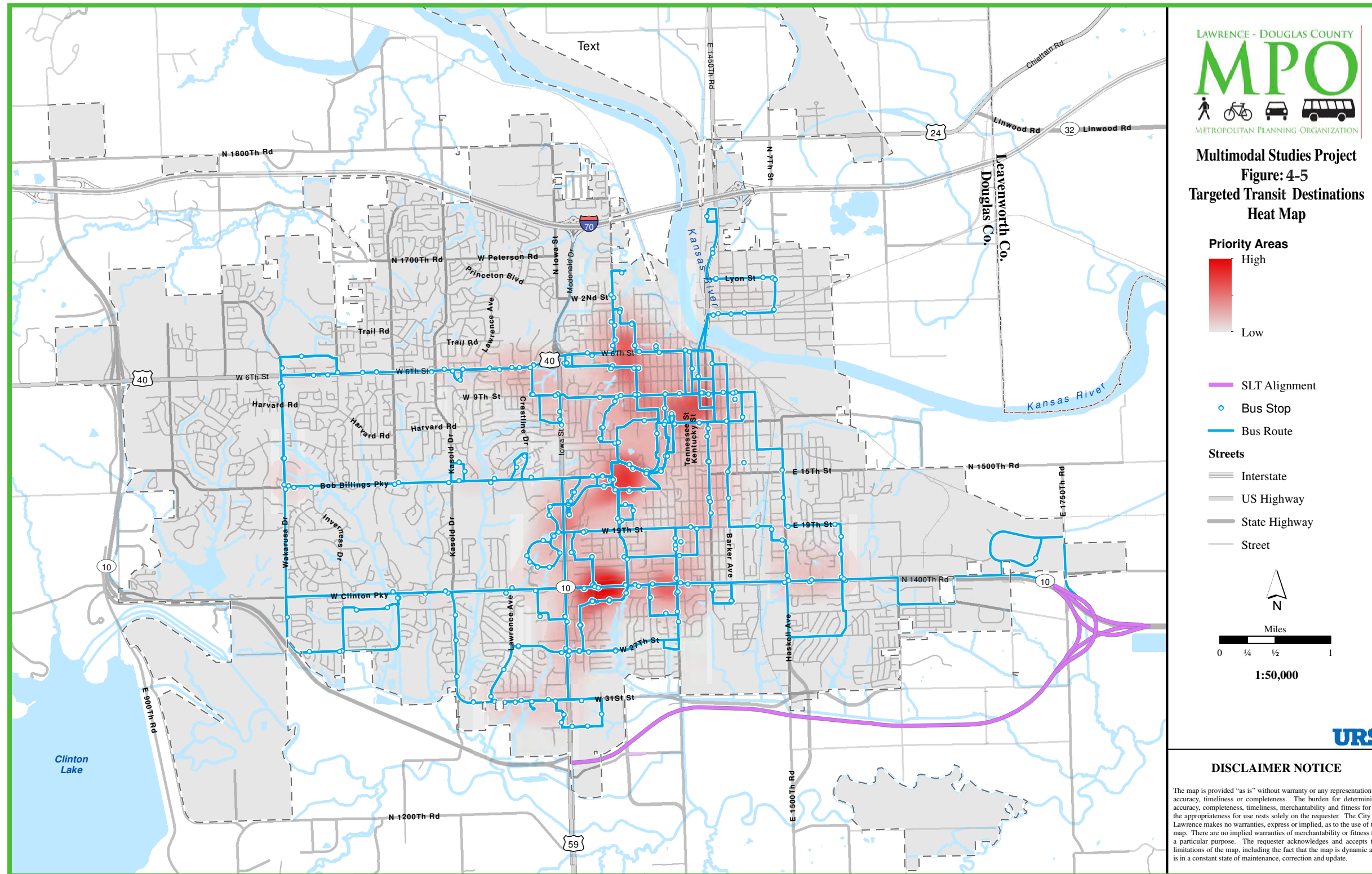




Figure 4-5: Targeted Transit Destinations Heat Map







Heat Map

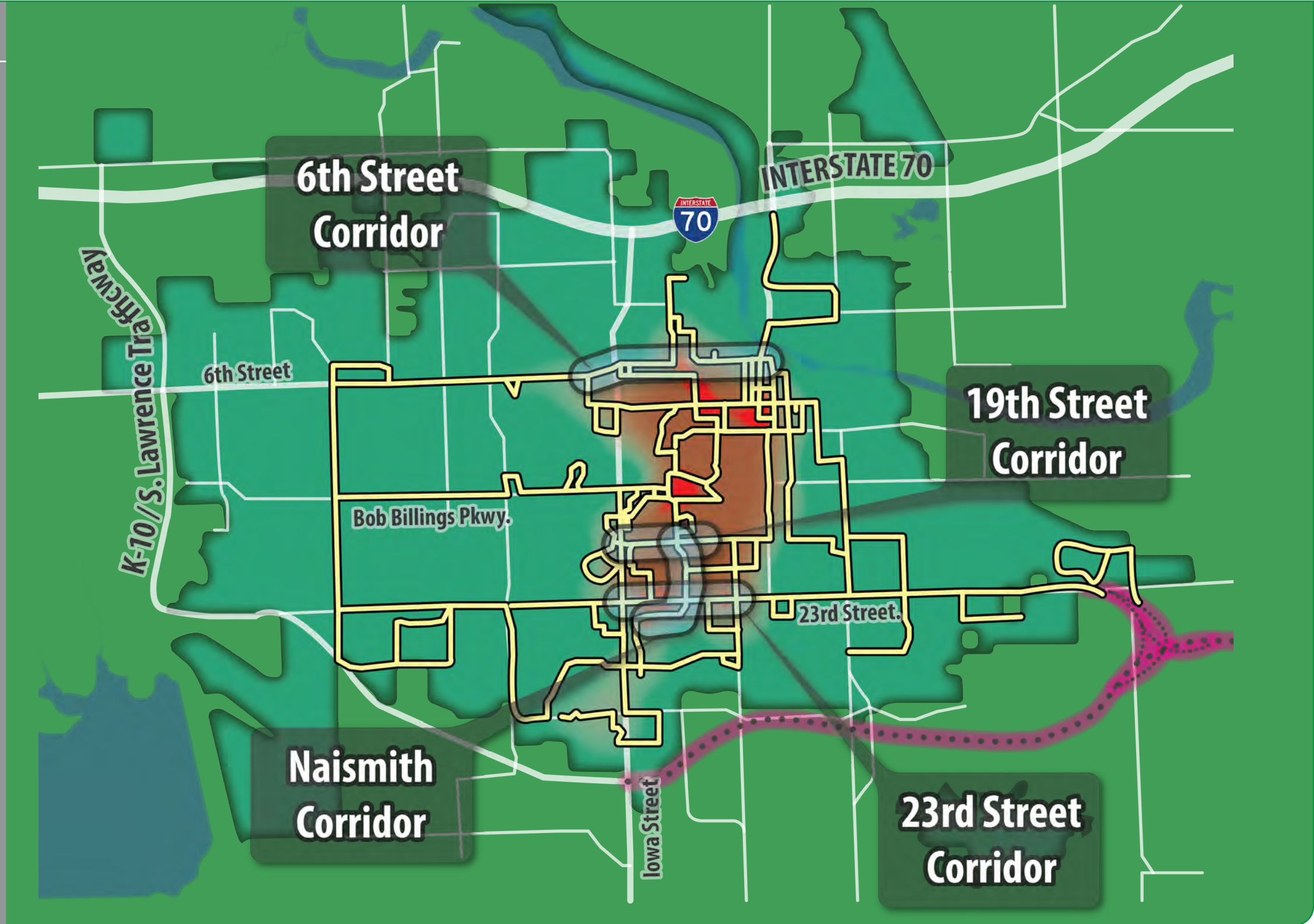
The main takeaway from the heat map is that generally speaking the area east of Iowa Street has the greatest transit-pedestrian demand. While this is not surprising, given the location of Downtown, KU Campus, and concentration of medical related facilities, the heat map does help to define pockets of potential transit users and the identification of corridors for further analysis. By comparison, the bus stops west of Iowa Street scored lower and the heat map reflects a less dense development pattern and bus stops that are located further distances from a transit riders' final destination.

The online survey results, and additional public outreach, also support the heat map results. Specifically, the 23rd Street Corridor and 6th Street Corridor were frequently identified as corridors that had transit-pedestrian accessibility issues. Another general comment received from the public was to concentrate improvements in areas east of Iowa where transit ridership is higher. Specific transit-pedestrian accessibility issues are discussed in more detail in Chapter 5.

Figure 5-1: Targeted Corridors

LEGEND

-  Bus Routes
-  Heat Map Area
-  Municipal Boundaries
-  Planned K-10 Extension





Chapter 5

TARGETED CORRIDORS

Overview

This section outlines the Phase 2 evaluation results for the targeted corridors. Four targeted corridors were evaluated in greater detail to identify specific transit-pedestrian accessibility issues. Chapter 6 includes recommended improvements for the targeted corridors and general recommendations aimed at enhancing overall transit-pedestrian accessibility throughout Lawrence.

Generally speaking, areas east of Iowa Street were identified as having the greatest need for improvements to enhance transit-pedestrian accessibility. This was supported through the development of the “heat map” and reinforced through public comments. Areas west of Iowa Street generally consist of newer developments that include newer sidewalks, and / or sidepaths (shared use paths adjacent to a road) along arterial roadways and near most bus stops.

Figure 5-1 displays the location of the targeted corridors. These corridors were selected since they include good examples of various transit-pedestrian accessibility issues that are frequently observed throughout Lawrence. A brief summary of each corridor is provided along with graphics highlighting specific pedestrian accessibility issues and deficiencies. Chapter 6 includes specific recommendations for the targeted corridors.



Wakarusa sidewalk being installed as part of roadway improvements

23rd Street Corridor (Iowa Street to Louisiana Street)

The 23rd Street Corridor, east of Iowa Street, was identified through both public comments and the online survey as being the area most in need of infrastructure improvements to enhance pedestrian access to transit. 23rd Street is a five-lane principal arterial that carries between 28,000 and 29,000 vehicles per day (VPD) in the targeted area. These 2010 traffic volumes place this roadway segment in the top five roadway segments in Lawrence. The 2010 PM peak hour intersection volumes at the intersection of 23rd and Iowa total 5,630, almost 1,500 vehicles higher than any other intersection in Lawrence during the PM peak hour. Approximately half of the targeted corridor segment, near the intersection of Iowa, is classified as level of service (LOS) grade "D" according to the T2040 Plan.

The targeted corridor segment has several access points which create potential safety conflicts and traffic operational issues – all of which negatively impact fixed-route transit ridership and pedestrian accessibility. In fact, according to crash data in T2040 (see Figure 5-2), this roadway segment has one of the highest occurrences of crashes throughout Lawrence. Adding to the complex nature of this corridor is the proximity to several locations that often have higher transit ridership (see Chapter 4 for additional details). Figure 5-3 displays transit-pedestrian accessibility issues along 23rd Street, between Iowa Street and Louisiana Street.

Figure 5-2:
 Common Crash
 Locations in
 Lawrence
 (2011-2012)

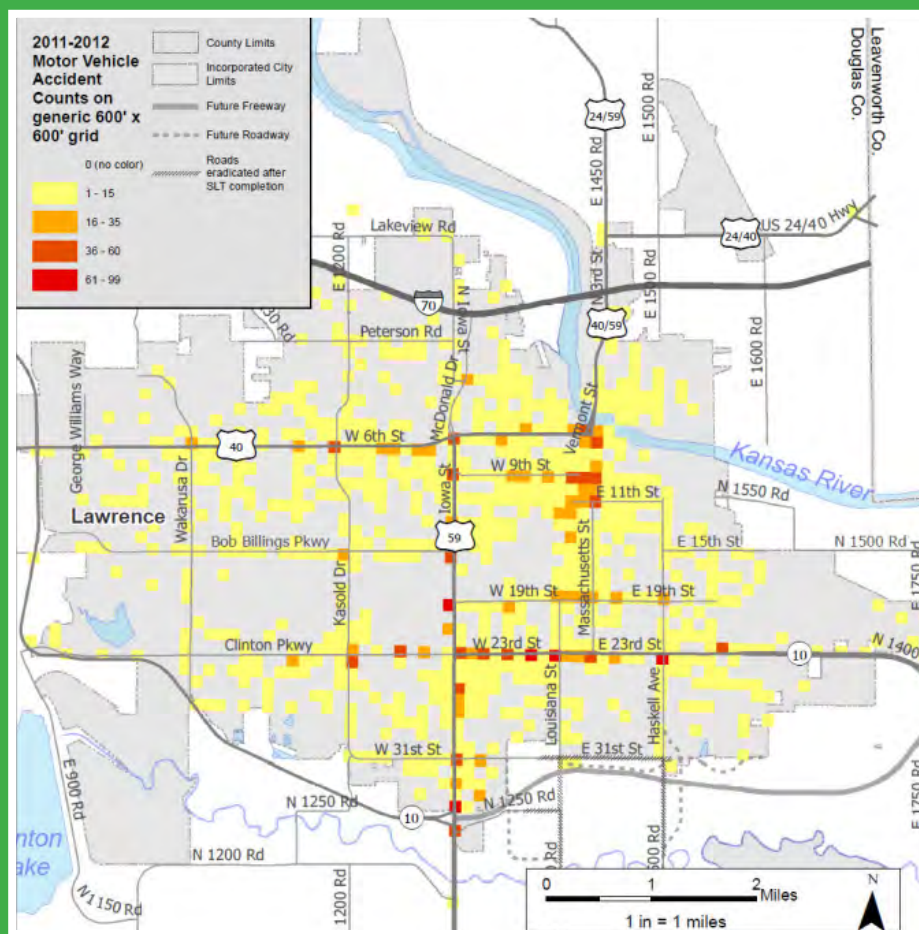
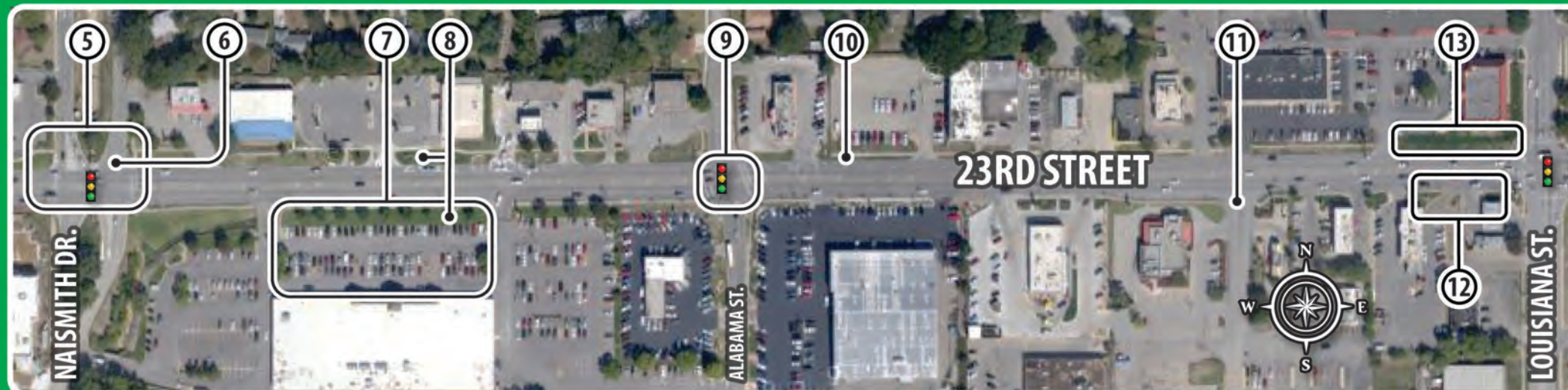
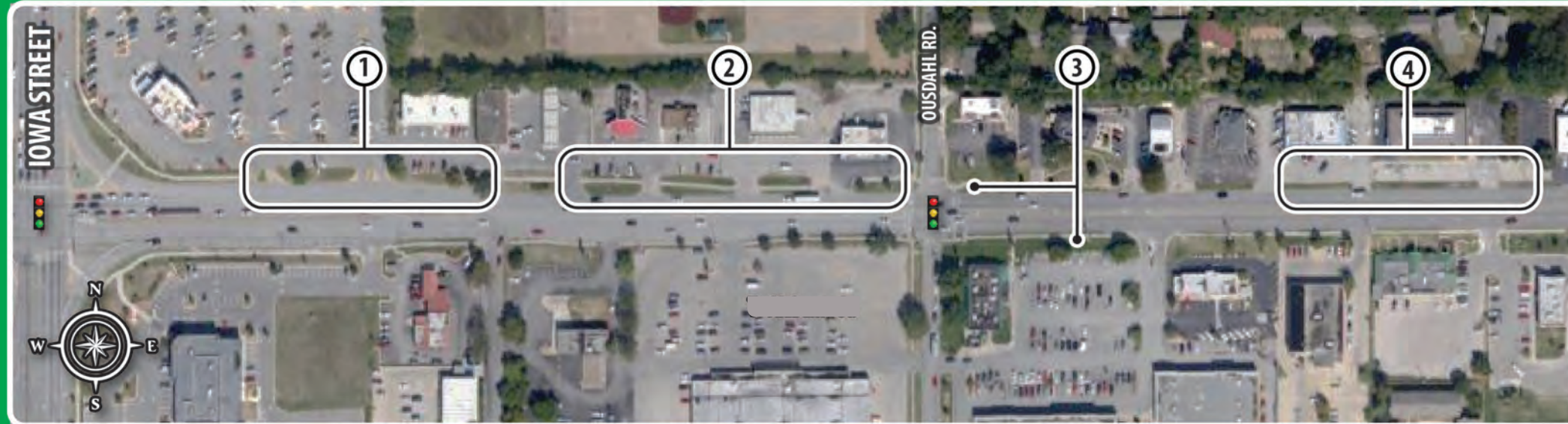




Figure 5-3: 23rd Street Transit-Pedestrian Accessibility Issues

- ① Gaps in the sidewalk network.
- ② Several access points; potential vehicle / pedestrian conflicts.
- ③ Bus stops with no amenities.
- ④ Gap in sidewalk network; sidewalks located near store front and not adjacent to the street.
- ⑤ NE / NW corners have odd configuration; difficult for pedestrians to navigate.
- ⑥ Missing crosswalk paint.
- ⑦ Poor access to commercial area; direct access to store requires pedestrians to walk across 30' of grass.



- ⑧ Pedestrians / transit users crossing mid-block unprotected.
- ⑨ Poor crosswalk striping at some crossings.
- ⑩ Bus stop with no amenities.
- ⑪ Raised median / sign supports in path of sidewalk. Also, curb ramps in disrepair.
- ⑫ Wide driveway access and sidewalk with poor slope.
- ⑬ Missing sidewalk segment.

Figure 5-4: Examples of Key Sidewalk Segments along 23rd Street



Generally speaking, this targeted corridor segment provides several examples of issues that make transit-pedestrian access difficult. The corridor segment includes sidewalk gaps along key stretches of the roadway. Figure 5-4 displays examples of the missing sidewalk segments, including a key segment that was recently replaced near the intersection of 23rd Street and Alabama Street. In some cases, sidewalks may be present but are located directly near the store front and not adjacent to the roadway. While this design may be compliant with site development requirements requiring sidewalks, a sidewalk adjacent to a store front does not facilitate pedestrian access to transit and in fact creates an obstacle that makes riding fixed-route transit more difficult.

The eastbound bus stop in front of Dillon's grocery store is a location that includes several transit-pedestrian accessibility issues that exist throughout Lawrence. First, the stop is located mid-block and a number of pedestrians were observed crossing 23rd Street from this location rather than walking to a nearby intersection with marked crosswalks.

Second, the bus stop is located directly in front of Dillon's front door but there is a 30-foot stretch of grass that makes pedestrian access difficult – especially for individuals with mobility limitations (see Figures 5-5 and 5-6).

Third, in addition to being a local stop, this particular stop is also a K-10 Connector route stop. If the K-10 bus has a long dwell time, it can occasionally conflict with local transit service making boarding and alighting difficult. Ultimately, this makes it difficult for pedestrians boarding the bus, but it also negatively impacts traffic operations within the corridor.

Finally, the actual bus stop design provides a good example of what other stops throughout the area should be included. For example, this particular stop has a wide concrete boarding area that makes it easy for pedestrians to access the bus from the sidewalk/waiting area. During fieldwork, this concrete section between the roadway and sidewalk was measured at 16 feet wide (see Figure 5-7). Having this width allows bus drivers to easily pull up to the stop and passengers to board and alight the bus. The extra width also provides a larger area for accessing the bus during bad weather, especially important if large amounts of snow that could easily narrow or close the boarding location accumulate in the corridor.



Figure 5-5: Examples of Pedestrian Connectivity Issues between Bus Stop and Development

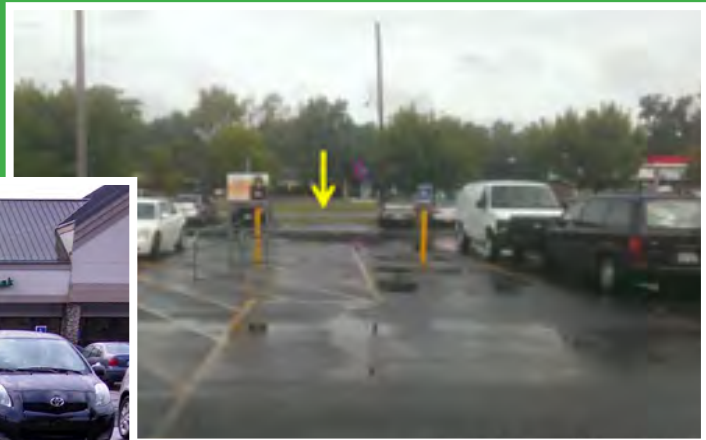


Figure 5-6: Examples of Pedestrian Connectivity Issues between Bus Stops and Development

Below: A lack of connectivity between a bus stop and the development entrance is depicted in front of Dillon's on 23rd Street.



No Sidewalk for Direct Route to Store Entrance



Above: 23rd at Dillon's (at store entrance)

Figure 5-7: Example of Wide Concrete Boarding Area



16' of Concrete

6th Street Corridor (Rockledge Road to Massachusetts Street)

The 6th Street Corridor, primarily east of Iowa Street, was identified through both the public comments and the online survey as another corridor in need of improvements to enhance pedestrian access to transit. 6th Street is a five-lane principal arterial (Figure 5-8) that carries between 25,100 and 27,100 vehicles per day placing it in the top ten in terms of highest traffic volume roadways in Lawrence. The majority of the targeted corridor is classified as congested according to T2040. Unlike 23rd Street, this corridor does not have significant access management issues; additionally, sidewalks are generally present on both sides of the road for the entire study corridor. The 6th Street Corridor is also within close proximity to several local and collector road corridors that were identified as potential generators of transit riders – primarily medical facilities located north of 6th Street near Maine Street. Figure 5-9 displays transit-pedestrian accessibility issues along 6th Street, between Rockledge Road and Massachusetts Street.

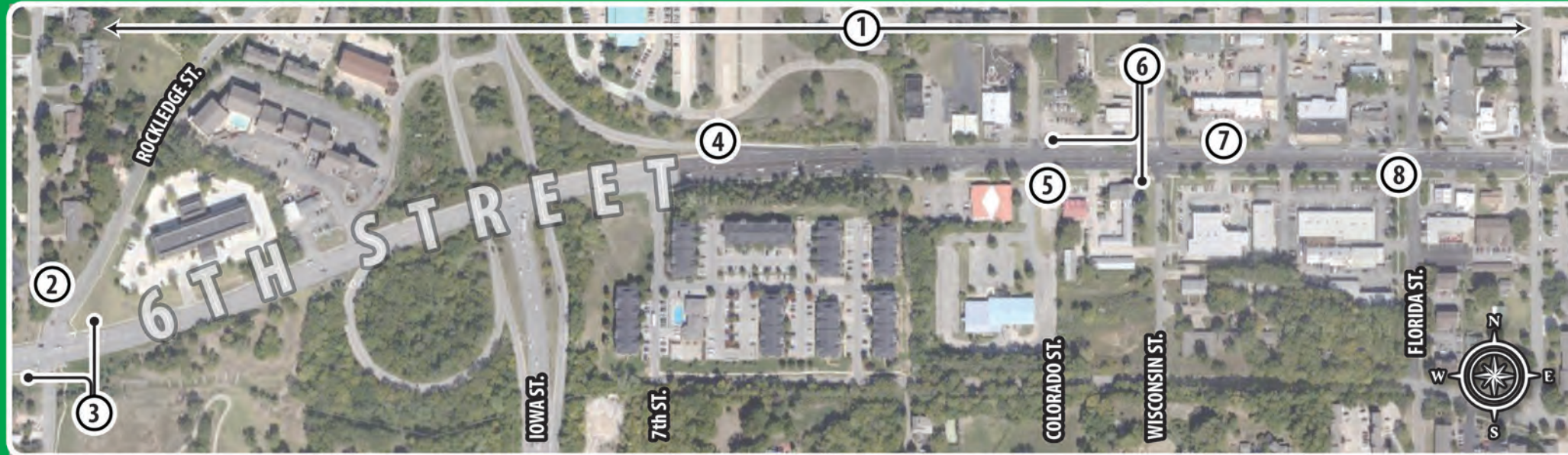
Figure 5-8: 6th Street (looking west at Kentucky Street)





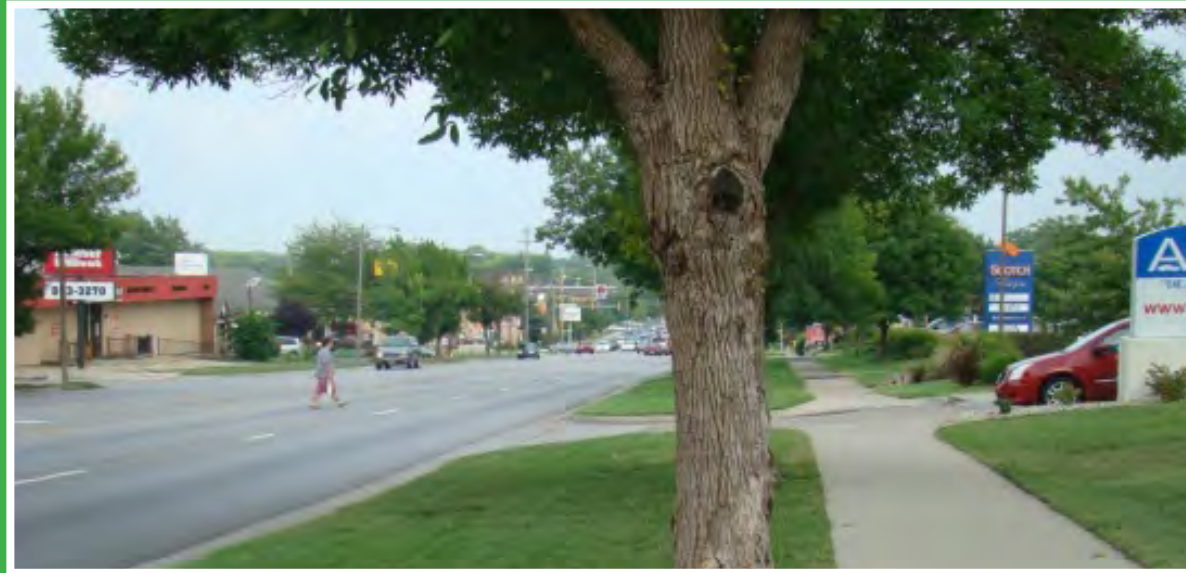
Figure 5-9: 6th Street Transit-Pedestrian Accessibility Issues

- ① ¾-miles with no north-south marked pedestrian crossings; frequent mid-block crossings by pedestrian and bicyclists.
- ② Curb ramps and pedestrian push buttons need improvement.
- ③ Bus stops with no amenities.
- ④ Missing crosswalk paint on high speed crossing.
- ⑤ Access management concern and segment of sidewalk in disrepair and steep slope.
- ⑥ Bus stops with no amenities.
- ⑦ Sidewalk in disrepair.
- ⑧ Connecting walkway on south but not north side.
- ⑨ Good example of sidewalk connection to commercial building.
- ⑩ Severe grade at curb ramp (southwest corner).
- ⑪ Sidewalk deficiencies - site presently in redevelopment.
- ⑫ Bus stop on Maine Street – currently no amenities (bus stop was recently relocated).

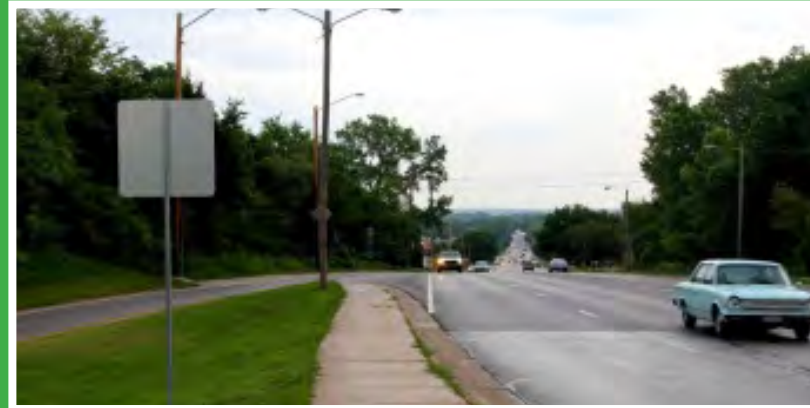


- ⑬ Accessibility issue at curb ramp needs improvement (southeast corner).
- ⑭ Missing crosswalk paint; priority crossing near school.
- ⑮ Bus stops with no amenities.
- ⑯ Accessibility issue at curb ramp needs improvement (northwest corner).
- ⑰ Curb ramps in severe disrepair and steep grades; heavy traffic and priority crossing near park grades.
- ⑱ Bus stops with no amenities.
- ⑲ No north-south crosswalks to Robinson Park.

Figure 5-10: 6th Street Transit-Pedestrian Accessibility Issues



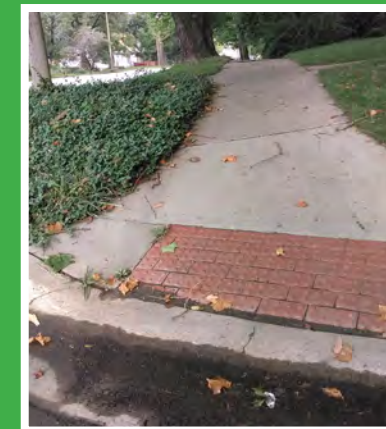
Mid-block crossings were frequently observed along the corridor.



A high speed pedestrian crossing on 6th near the ramp to northbound McDonald Drive heading to I-70.



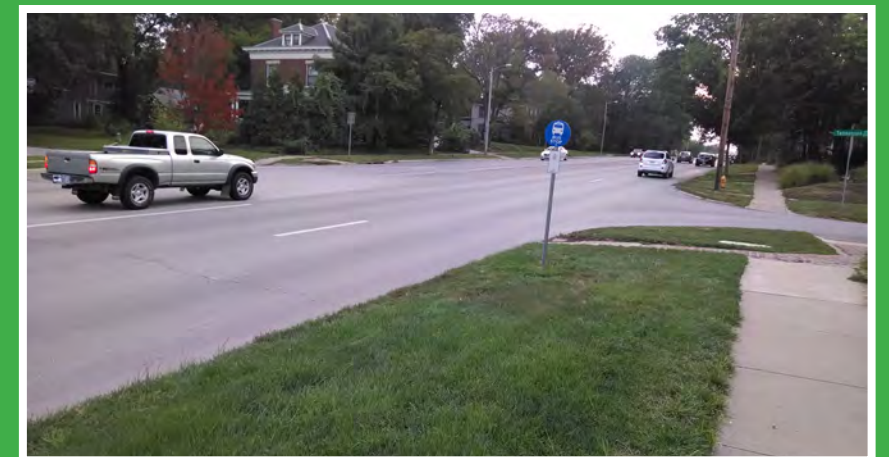
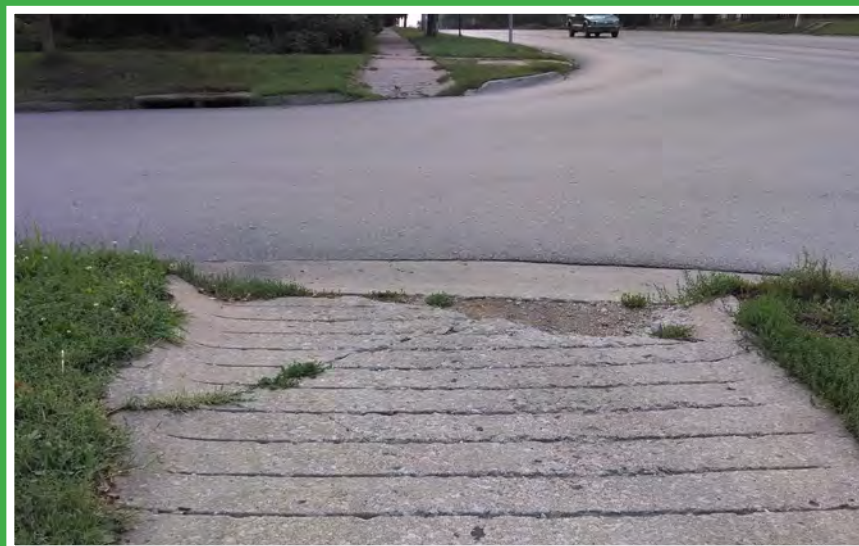
Steep slopes on some sidewalk segments, and poor drainage, make pedestrian travel difficult.



Sidewalks in disrepair, and brick sidewalks connecting to the corridor, make pedestrian accessibility difficult.



Typical bus stops along 6th Street do not have concrete pads or other amenities.



FIXED-ROUTE TRANSIT & PEDESTRIAN ACCESSIBILITY STUDY



Generally speaking, the inability to safely cross 6th Street was frequently identified as a concern. This comment was received through the online mapping, and through comments received at both public open houses. A number of mid-block crossings of 6th Street were also observed by the project team during fieldwork. A ¾-mile stretch along 6th Street, between Rockledge Road and Michigan Street, has no marked pedestrian crossings and between Rockledge and just east of Iowa Street, the south side of the road has no sidewalk. This stretch includes bus stops near the intersections of Colorado Street and Wisconsin Street. The remaining stretch of 6th Street into Downtown, near Massachusetts Street, was also identified as having the same crossing issues. This lack of pedestrian crossings directly impacts transit riders as many riders will end up crossing the road on the front end, or back end, of their trip.

Another issue along 6th Street is that the sidewalks are frequently used by bicyclists, causing potential conflicts with pedestrians. Given the overall traffic volumes and the steep grade of the roadway near Iowa Street, many bicyclists choose to avoid this corridor, or choose to ride on the sidewalk. The issue of bicycling along the 6th Street Corridor was also addressed in the Multimodal Planning Studies - Countywide Bikeway System Plan which looked at the 6th Street and Iowa Street intersection as a special study area. This is a very difficult area to travel through as a non-motorized user since crossing in front of fast-moving vehicle traffic can be intimidating for bicyclists and pedestrians alike.

The area of 6th Street, between Tennessee Street and Kentucky Street, is another concern as it is a primary location for non-motorized users and transit riders. The eastbound bus stop, located near Kentucky, can result in buses delaying traffic operations (and long traffic backups can delay the bus from reaching the bus stop). The proximity to the parks located both north and south of 6th Street makes this a high priority spot location for improving accessibility issues.



South side of 6th Street west of Mississippi Street

19th Street Corridor (Iowa Street to Alabama Street)

The 19th Street Corridor, between Iowa Street and Alabama Street, was selected because it has potential to play a role in KU master planning and sits on an important neighborhood campus border. 19th Street is a two-lane minor arterial that provides an important east-west connection near the KU campus. While this corridor was not identified as frequently through public comments, as compared to the other three corridors, it was selected by the project team since it represents a significant connection near KU and demonstrates the importance of providing connections from bus stops into residential neighborhoods. The existing sidewalk on the south side of 19th Street also serves as an example of how the presence of a sidewalk does not guarantee that it will adequately accommodate pedestrians or individuals with mobility limitations. Figure 5-13 displays the transit-pedestrian accessibility issues identified in the 19th Street targeted corridor.

The most notable issue identified was the lack of a sidewalk on the north side of 19th Street; however, there is discussion that this property will be redeveloped by KU and improvements will include the construction of a sidewalk or sidepath (shared use path adjacent to a roadway). The existing transit stops (both east and west) near Anna Drive are also important to address. North of Anna Drive is a connection to KU student housing and there are no sidewalks that extend from 19th Street to the residential area. This stretch also has a slight incline which during bad weather can make it difficult to access (see Figure 5-11). Figure 5-12 displays examples of obstacles along the south side of 19th Street that make pedestrian access along this corridor difficult.

Figure 5-11: 19th Street – Pedestrian Crossing and Transit Waiting Area



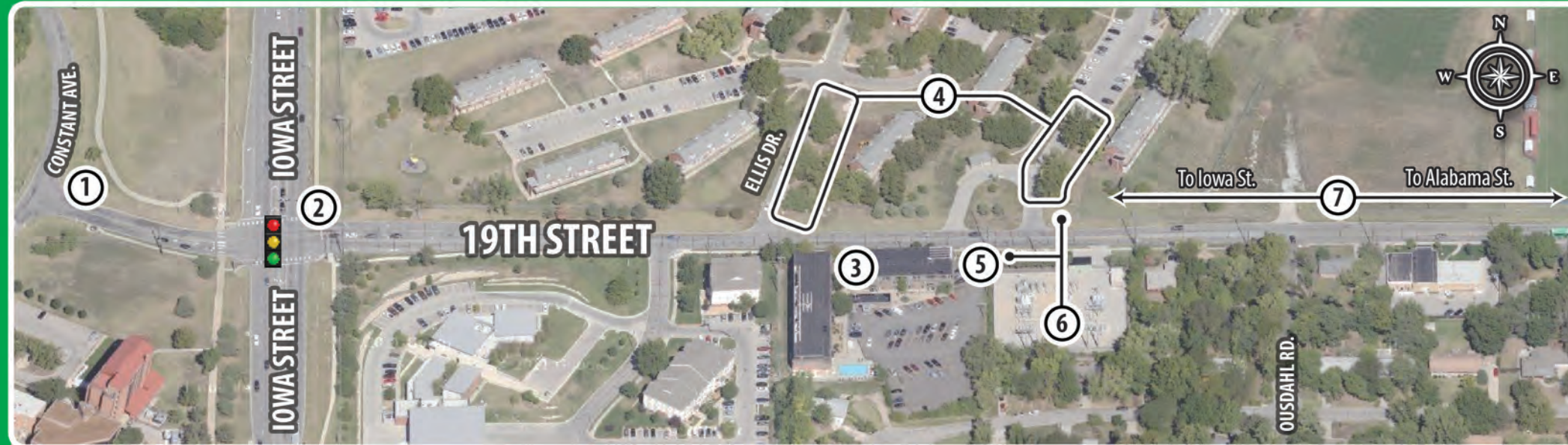
Figure 5-12: 19th Street – Sidewalk Obstacles





Figure 5-13: 19th Street Transit-Pedestrian Accessibility Issues

- 1 Bus stop with no amenities; no connection to nearby sidewalk.
- 2 Ped push button inaccessible - on back of pole.
- 3 50% of sidewalk in disrepair - Ellis to Ousdahl; obstacles in sidewalk and overgrown landscaping.
- 4 No sidewalk connection to student housing.
- 5 No crosswalk between bus stops (East of Anna).
- 6 Bus stops with no amenities; steep slope on north side.
- 7 No sidewalk on north side of 19th (Iowa to Alabama).



- 8 Multiple sidewalk segments need replacement; some obstacles in sidewalk path.
- 9 Bus stop with no amenities; no sidewalk connection.
- 10 Missing crosswalk paint (included in Naismith Drive improvements).
- 11 Inaccessible pedestrian push buttons (included in Naismith Drive improvements).
- 12 Sidewalk ends 8' north of 19th Street.
- 13 Problem with untrimmed trees (~4' off sidewalk).
- 14 Possible location for a marked crossing

Figures 5-14 through 5-17: Naismith Drive (see sub-headings for more information)



Figure 5-14:
 (Bottom- and Top-left)
 Naismith Drive - No sidewalks on
 East Side of the Roadway.

Figure 5-15: (Above) Naismith Drive – K-10 Bus Stop just South of 19th Street.

Figure 5-16:
 (Below) Naismith Drive – Curb Ramp Accessibility Issues.

Figure 5-17:
 (Above and Below) Naismith Drive – No Sidewalks South of 23rd Street.





Naismith Drive Corridor (19th Street to 24th Street)

The Naismith Drive Corridor, between 19th Street and 24th Street, was selected as a targeted study corridor as it represents several significant transit-pedestrian accessibility issues. North of 23rd Street, Naismith Drive is a four-lane divided major collector and south of 23rd Street, the corridor is a two-lane collector that ties into an east-west connection at 24th Street. This corridor does not currently have any roadway capacity issues according to T2040. Figures 5-14 through 5-19 display the transit-pedestrian accessibility issues present within the corridor.

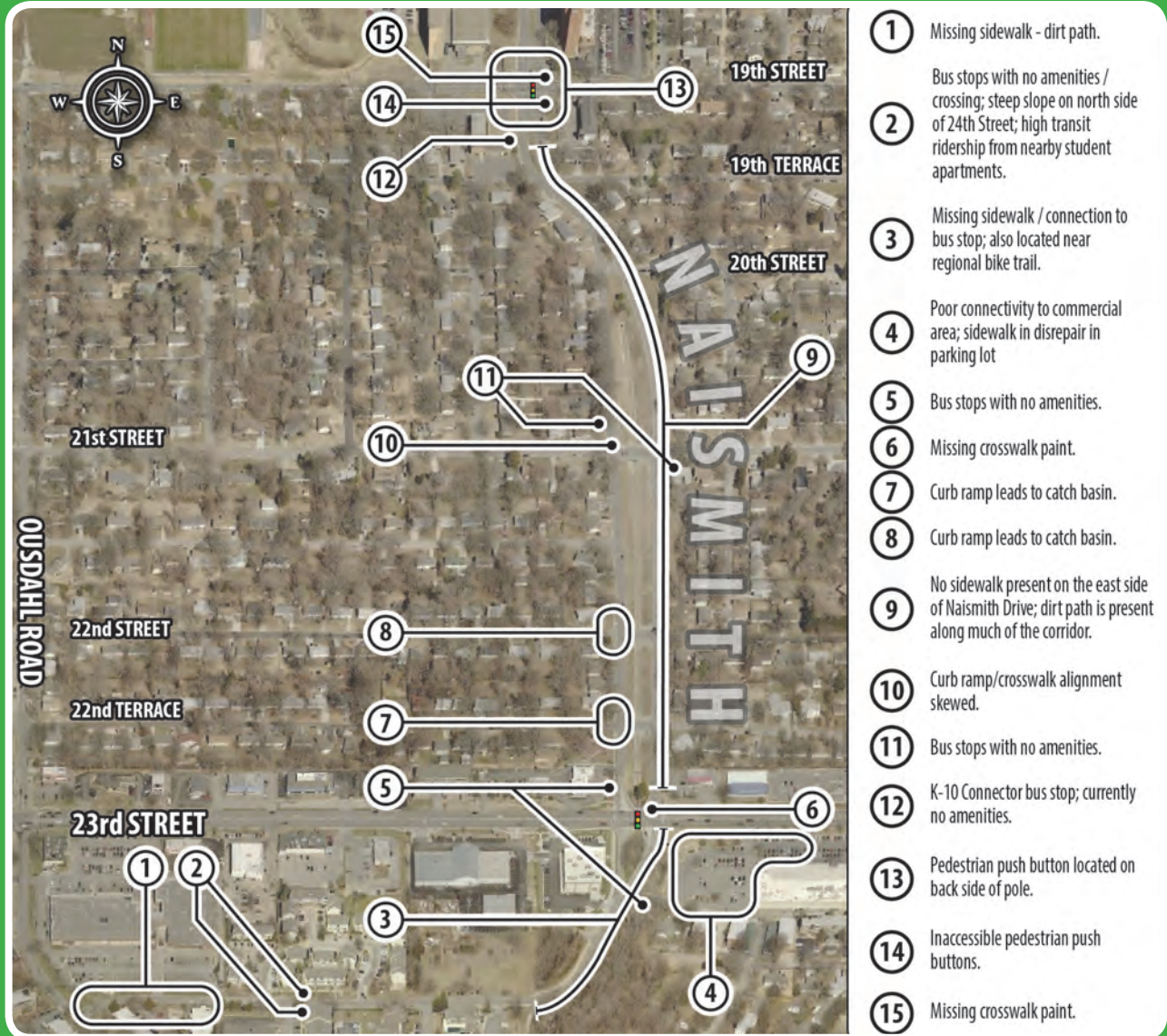
The most significant transit-pedestrian accessibility issue along this targeted corridor is that the entire east side of Naismith Drive does not have sidewalks (see Figure 5-17). Bus stops are present at 19th Street and near 21st Street but do not include any concrete pads for shelters or waiting areas (see Figure 5-15). The east-west pedestrian crossings also have some access issues that make pedestrian travel difficult. Most notably, some of the crosswalk alignments and paths direct pedestrians into catch basins (see Figure 5-16).

Similar transit-pedestrian accessibility issues exist south of 23rd Street. Figure 5-18 shows missing sidewalk segments on the eastside of Naismith drive. These segments connect to a heavily used transit stop just south of the Dillon's parking lot and 23rd Street.

Figure 5-18: Naismith Drive – Bus Stop with No Concrete Pad.



Figures 5-19: Naismith Drive Transit-Pedestrian Accessibility Issues





Chapter 6

RECOMMENDATIONS AND IMPLEMENTATION

Overview

This section outlines recommendations to improve pedestrian accessibility to fixed-route transit service within the Lawrence Area. It is important to note that while this study focuses on improving transit-pedestrian accessibility, the improvements will also benefit non-transit riders resulting in a safer, more user friendly, and accessible pedestrian environment.

The recommendations are divided into two categories. The first, Target Corridors Recommendations, include detailed solutions that address issues identified in the corridors identified in Chapter 5. The second category, Policy Recommendations, include more general, system-wide, and /or programmatic recommendations that could be applied throughout the Lawrence Area to enhance pedestrian access to fixed-route transit service. Overall, the recommendations focus on identifying opportunities to improve the following:

- ▶ Bus stop boardings / alightings (i.e., improving or adding concrete pads, replacing or adding bus shelters, improving or including improvements to make stops ADA accessible);
- ▶ Connections to/from bus stops (i.e., replacing/ repairing existing sidewalks, constructing sidewalks where none currently exist);
- ▶ Street crossings near bus stops (i.e., improvements that enhance the crossing of streets; could include center refuge areas, enhanced curb cuts that are ADA accessible, reducing the crossing distance).

Target Corridors Recommendations

The primary objective of this study was to identify opportunities to enhance transit-pedestrian accessibility throughout the entire Lawrence Area. While four targeted corridors were identified, many of the recommendations could be applied to other corridors or spot locations. The recommended improvements for the targeted corridors represent specific physical infrastructure improvements that could be made to directly improve pedestrian access to fixed-route transit.

In addition, the City could also make policy changes that would promote new developments to include better and safer pedestrian accommodations and improved connectivity between bus stops and commercial developments. The following pages summarize the recommendations for the targeted corridors.

23rd Street Corridor (Iowa Street to Louisiana Street)

The 23rd Street Corridor was identified as the corridor in greatest need of pedestrian improvements to improve access to fixed-route transit. Some improvements have already occurred within this corridor to improve pedestrian accessibility and other plans are in place to continue improving pedestrian accessibility next year. In the summer of 2013, the City of Lawrence replaced some key missing sidewalk segments that were in proximity to existing bus stops. Beginning in the Spring of 2014, the reconstruction of the intersection at US-59 and K-10 (23rd and Iowa) will widen the roadway to add dual left-turn lanes for east and westbound traffic. Highway Safety Improvement Program (HSIP) funds are being used to remove free flow right-turn lanes on the northeast and southeast quadrants of the intersection. These improvements will further enhance pedestrian movements within the intersection area and along the 23rd Street Corridor. That intersection improvement project is estimated to cost \$2.9 million.

A mid- to long-range improvement that will impact transit-pedestrian access is the construction of the South Lawrence Trafficway (SLT). Once completed, the K-10 designation will shift from 23rd Street to the newly constructed SLT. This relocation could open up 23rd Street redevelopment opportunities and include enhanced pedestrian improvements like improved mid-block and intersection crossings. These improvements could be made in conjunction with enhanced access management mentioned in the T2040 Plan.

Figure 6-1 displays the recommended transit-pedestrian accessibility improvements within the 23rd Street Corridor. Table 6-1 provides general planning level cost estimates for the identified improvements along the corridor. These priority improvements focus on completing a continuous network of sidewalks on both sides of the road. Mid-block bus stop crossings should be explored further to determine if pedestrian access and safety could be improved if the stops were relocated closer to a signalized intersection with marked crosswalks.

Table 6-1. Cost Estimates for the 23rd Street Corridor

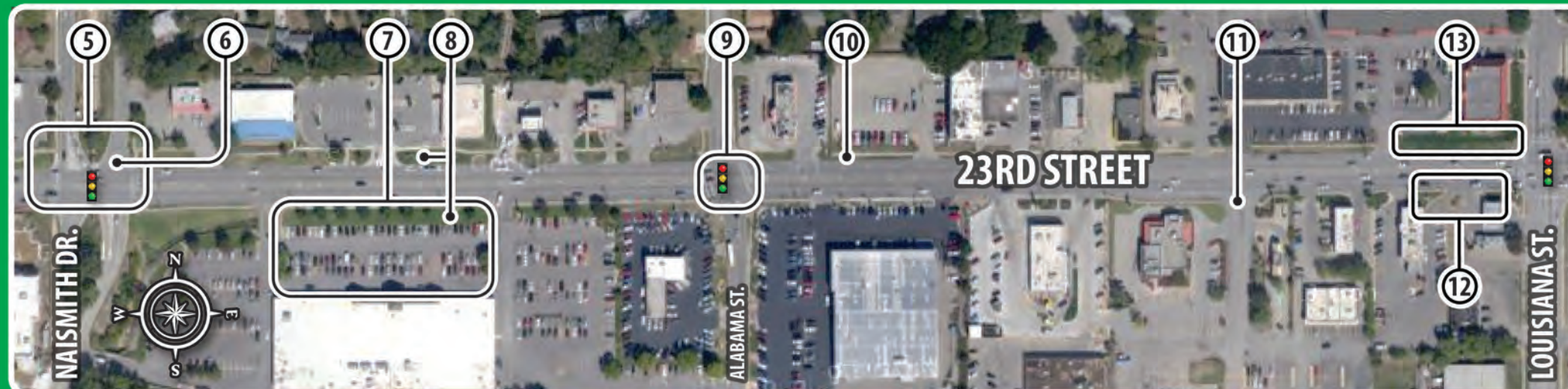
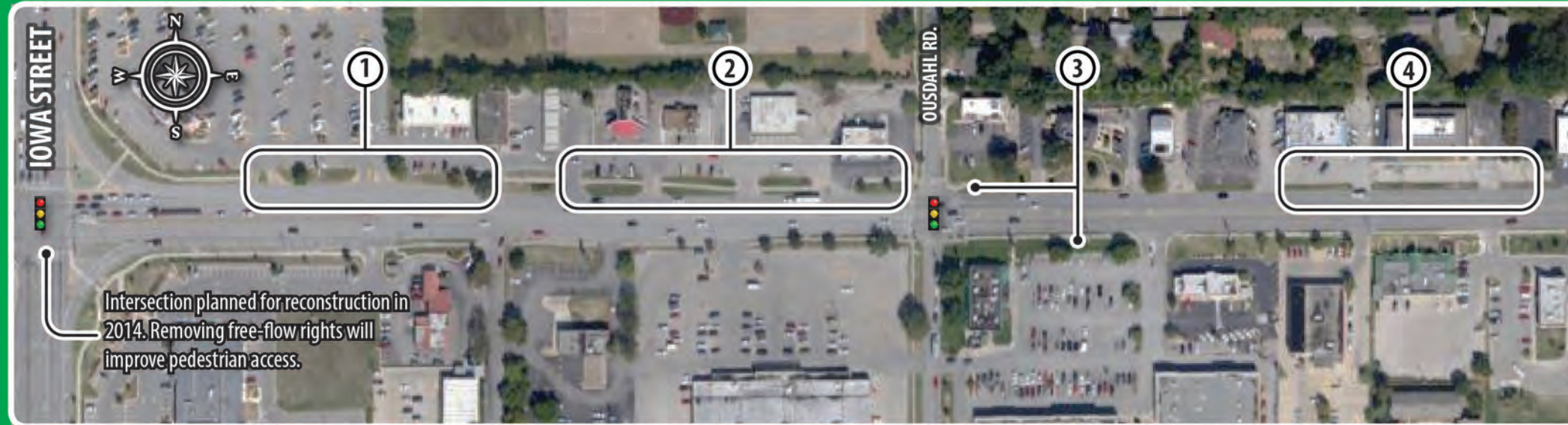
#	LOCATION	RECOMMENDATION	NOTES	COST
1	North side East of Iowa	Install sidewalk and connect corridor	Varies	-
2	North side West of Ousdahl	Implement access management strategies	Needs more investigation	-
3	East of Ousdahl Intersection	Provide bus stop amenities	Concrete pad for stop(s)	\$ 500
4	North side East of Ousdahl	Install sidewalk in location consistent with other sidewalks	Approximately 400'	\$ 2,500
5	Naismith Intersection	Reconstruct connections to curb ramps; improve configuration	-	\$ 1,000
6	Naismith Intersection	Repaint crosswalk	Primarily on north side of 23rd	\$ 300
7	South side East of Naismith	Provide better access from bus stop to commercial area	Parking lot - requires Dillon's help	\$ 1,200
8	East of Naismith	Control or prohibit mid-block crossings with safety features	Needs more investigation	-
9	Alabama Intersection	Repaint crosswalks	North and south sides	\$ 600
10	North side East of Alabama	Provide bus stop amenities	Concrete pad for stop	\$ 300
11	South side West of Louisiana	Reconstruct SW corner curb ramp; remove raised median	Between sign columns	-
12	South side West of Louisiana	Implement access management strategies; improve slope	Needs more investigation	-
13	North side West of Louisiana	Install sidewalk and connect to NW corner	Approximately 210'	\$ 1,350





Figure 6-1: 23rd Street Recommended Transit-Pedestrian Accessibility Improvements

- 1 Construct missing sidewalk segments.
- 2 Review potential access management strategies to improve pedestrian safety and enhanced connectivity.
- 3 Identify appropriate bus stop amenities to include at these stops.
- 4 Construct sidewalk adjacent to roadway to provide a continuous sidewalk connection that would be utilized by fixed-route transit riders.
- 5 Reconstruct sidewalk connections to provide direct connections to curb ramps – improve sidewalk configuration.
- 6 Repaint crosswalk.
- 7 Provide direct access from bus stop to commercial building entrances.



- 8 Explore potential mid-block crossing to provide safer crossing between bus stops, or consider alternative improvement to direct pedestrians to cross at Naismith or Alabama. Explore possibility of relocating bus stop closer to a signalized intersection with marked cross walks.
- 9 Repaint crosswalks; explore possibility of better aligning marked pedestrian crosswalks.
- 10 Identify appropriate bus stop amenities to include at this stop.
- 11 Reconstruct SW corner curb ramp and remove all or parts of raised median to enhance pedestrian movement.
- 12 Implement access management strategies and improve sidewalk cross slope to provide for enhanced pedestrian movements.
- 13 Install sidewalk that connects to the NW corner of the intersection at Louisiana Street.

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FIXED-ROUTE TRANSIT & PEDESTRIAN ACCESSIBILITY STUDY



6th Street Corridor (Rockledge Road to Massachusetts Street)

6th Street is a major east-west travel corridor through Lawrence. It has very high traffic volumes and is classified as “congested” according to T2040, with more traffic forecasted. As such, two main considerations can impact transit-pedestrian accessibility within the corridor. First, crossing 6th Street is a significant concern of area residents. The high traffic volumes and speeds make this a very difficult roadway to traverse. However, there is a clear demand for pedestrian crossings along this roadway, specifically to access bus stops on both sides. The second concern is the corridor’s increasing traffic congestion. This significantly delays transit operations, while long bus dwell times can further negatively impact traffic conditions. As such, certain locations along the corridor could be evaluated for possible bus turnouts. One such location could involve relocating the eastbound bus stop near Kentucky Street one block east near Vermont. This would be coordinated with recommended bikeway improvements in the area and enhance street multimodal connections at that site. Figure 6-2 displays the recommended 6th Street transit-pedestrian accessibility improvements. Table 6-2 provides general planning level cost estimates for the identified improvements along the 6th Street Corridor.

Table 6-2. Cost Estimates for the 6th Street Corridor

#	LOCATION	RECOMMENDATION	NOTES	COST
1	Rockledge to Michigan	Provide marked and/or pedestrian actuated crossing	Base site on ped. volume	-
2	Rockledge intersection	Upgrade curb ramps and accessibility to push buttons	ADA compliant issue	\$ 10,000
3	Rockledge intersection	Provide typical bus stop amenities	Concrete pads / shelters	\$ 11,000
4	North ramp to McDonald	Paint highly visible crosswalk		\$ 300
5	South side at Colorado	Close access from 6th, provide access from Colorado. Repair sidewalk and improve alignment	Requires demo; any utility work is additional cost	\$ 8,000
6	West of Wisconsin	Provide typical bus stop amenities	Concrete pads / shelters	\$ 11,000
7	North side east of Wisconsin	Replace sidewalk currently in disrepair	~250' narrow, broken	\$ 7,500
8	SW corner at Florida	Provide North side connection or remove South side courtesy walk	Removal if no crosswalk	\$ 750
9	South side East of Arkansas	Good example of sidewalk connection to commerce		
10	SW corner at Missouri	Reconstruct sidewalk / curb ramp to mitigate grade issue		\$ 300
11	South side West of Maine	Sidewalk reconstruction in tandem with redevelopment	Need flatter sidewalk	-
12	West side Maine, N. of 6th	Provide typical bus stop amenities	Concrete pads / shelters	\$ 5,500
13	SE corner at Maine	Reconstruct curb ramp to improve accessibility	Retain flow line	\$ 2,000
14	North side at Mississippi	Paint new crosswalk		\$ 300
15	Near Indiana intersection	Provide typical bus stop amenities	Investigate school access	\$ 11,000
16	NW corner at Indiana	Reconstruct NW corner ramp; improve N/S crossing	Cost reflects ramp only	\$ 2,000
17	South side at Tennessee	Replace ramps; reconstruct sidewalk / improve accessibility	Curb ramps in disrepair	\$ 3,200
18	North side East of Tennessee	Bus stops with no amenities / Provide typical amenities	Concrete pads / shelters	\$ 5,500
	South side East of Tennessee	Move bus stop in coordination with bikeway improvements	Shelter is additional cost	\$ 5,000
19	Vermont / Massachusetts	Investigate improved access to Robinson Park alternatives	Need crosswalk locations	-

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Figure 6-2: 6th Street Recommended Transit-Pedestrian Accessibility Improvements

- 1 Provide marked and/or pedestrian actuated crossing(s) between Rockledge Road and Michigan Street.
- 2 Upgrade curb ramps and improve accessibility to pedestrian push buttons.
- 3 Provide typical bus stop amenities
- 4 Paint highly visible crosswalk; consider potential signage to highlight pedestrian crossing.
- 5 Close driveway access from 6th Street and provide access from Colorado Street. Repair sidewalk, improve alignment.
- 6 Provide typical bus stop amenities.
- 7 Replace sidewalk that is currently in disrepair.
- 8 Provide north side connection (accessible courtesy walk).
- 9 Good example of sidewalk connection to commercial area.
- 10 Reconstruct sidewalk and curb ramp to mitigate grade issue.
- 11 Incorporate sidewalk reconstruction with redevelopment to create flatter, more consistent sidewalk connection.



- 12 Provide typical bus stop amenities.
- 13 Reconstruct curb ramp to make more accessible/navigable
- 14 Paint new crosswalk
- 15 Provide typical bus stop amenities
- 16 Reconstruct NW corner curb ramp to 6th Street – potential location for N/S painted and/or controlled crossing.
- 17 Replace curb ramps and reconstruct sidewalk to make more accessible/navigable.
- 18 Provide typical bus stop amenities; Explore moving bus stop (bus pull out) in conjunction with bikeway improvements at the Vermont Intersection.
- 19 Investigate alternatives to provide improved accessibility to Robinson Park area (coordinate with Bikeway Plan).

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19th Street Corridor (Iowa Street to Alabama Street)

The 19th Street Corridor provides perhaps the greatest opportunity to make significant improvements to enhance transit-pedestrian accessibility. With the KU master plan process winding down, there could be opportunities to significantly improve pedestrian access on the north side of 19th Street. Potential redevelopment in the area could provide opportunities to better connect student housing to the corridor and improve the overall transit-pedestrian access along 19th Street.

Figure 6-3 displays the recommended transit-pedestrian accessibility improvements within the 19th Street Corridor. Table 6-3 provides general planning level cost estimates for the identified improvements along the corridor.

Table 6-3: Cost Estimates for the 19th Street Corridor

#	LOCATION	RECOMMENDATION	NOTES	COST
1	NW corner at Constant	Provide typical bus stop amenities	Concrete pad only	\$ 500
2	NW corner at Iowa	Reposition pedestrian push button near sidewalk (180°)		\$ 60
3	South side Ellis to Ousdahl	Replace sidewalk currently in disrepair	Assume 300' replacement	\$ 8,000
4	North side of Ellis / Anna	Install sidewalk from 19th to student housing	Requires coordination with KU (~600')	\$ 15,000
5	Near Anna intersection	Install painted crosswalk between stops with appropriate signs, would also require curb cuts and pedestrian ramps	Curb ramps, painted crosswalk, and signs	\$ 3,500
6	Near Anna intersection	Provide typical bus stop amenities	Concrete pads / shelters	\$ 5,800
7	North side Iowa to Alabama	Install sidewalk on north side of 19th	~3,500'	\$ 87,500
	North side east of Iowa	Retaining wall likely necessary with sidewalk installation	Assumes 300' modular block wall	\$ 60,000
8	South side west of Naismith	Replace sidewalk that is in disrepair	Assume 150' replacement	\$ 4,000
9	North side west of Naismith	Provide typical bus stop amenities	Concrete pads / shelters	\$ 5,500
10	Naismith intersection	Repaint crosswalk	Primarily north, east sides	\$ 700
11	Naismith intersection	Upgrade curb ramp / push button accessibility	Add concrete pad	\$ 4,000
12	NW corner at Arkansas	Connect sidewalk to future 19th Street sidewalk		\$ 600
13	South side east of Arkansas	Maintain overhead clearance for pedestrians	Inform dwelling owners	-
14	East of Alabama	Install painted crosswalk near school w/ appropriate signs	Requires curb cuts / ramps to the crossing	\$ 3,750

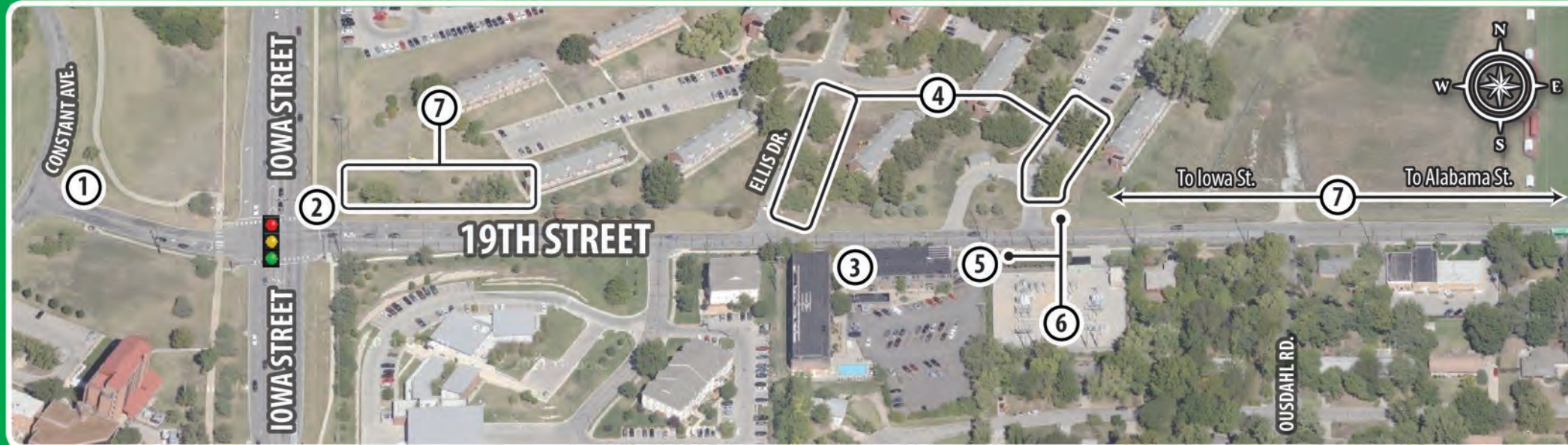
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Figure 6-3: 19th Street Recommended Transit-Pedestrian Accessibility Improvements

- 1 Provide typical bus stop amenities and sidewalk connection.
- 2 Reposition pedestrian push button.
- 3 Replace sidewalk that is in disrepair.
- 4 Install sidewalk from 19th to student housing.
- 5 Install painted crosswalk between bus stops; consider possible pedestrian crossing signs.
- 6 Provide typical bus stop amenities; improve waiting area on north side of 19th Street.
- 7 Install sidewalk on north side of 19th Street; coordinate with KU Master Plan. As part of implementing this facility, a 300' retaining wall will likely need to be constructed.



- 8 Replace sidewalk that is in disrepair.
- 9 Provide typical bus stop amenities.
- 10 Repaint crosswalk.
- 11 Upgrade curb ramp/push button accessibility.
- 12 Connect sidewalk to future 19th Street sidewalk.
- 13 Trim trees to provide adequate overhead clearance for pedestrians.
- 14 Install painted crosswalk near school; consider pedestrian crossing signage.

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Naismith Drive Corridor (19th Street to 24th Street)

The Naismith Drive Corridor represents perhaps the most significant transit-pedestrian accessibility needs in Lawrence. This corridor connects major destinations including KU and the 23rd Street Corridor. The entire east side of the Naismith Drive Corridor does not have a sidewalk, even though this side is frequently used by pedestrians. There are also bus stops in this corridor that would benefit from the addition of sidewalks and improved east-west accessible connections across Naismith Drive.

Table 6-4 provides general planning level cost estimates for the identified improvements along the Naismith Drive Corridor. There is an immediate need to improve the pedestrian environment south of 23rd Street. This is a heavily used stop that connects to student housing along 24th Street. The area also connects to a regional trail which further supports the need to improve the pedestrian access in the area. Examples of before-and-after conditions along Naismith are displayed in Figure 6-4. Figure 6-5 displays the recommended transit-pedestrian accessibility improvements within the Naismith Drive Corridor.

The intersection at 19th Street is in particular need of improvement given the local and regional transit connections. Overall, this intersection would benefit from sidewalks and improved intersection crossings. Enhanced transit waiting areas would also be a significant improvement to further support transit-pedestrian accessibility at that location.

Table 6-4. Cost Estimates for the Naismith Drive Corridor

#	LOCATION	RECOMMENDATION	NOTES	COST
1	24th East of Ousdahl	Install sidewalk	350'	\$ 2,000
2	24th West of Naismith	Install painted crosswalk between bus stops; concrete pads	Curb cuts and ped. ramps	\$ 9,000
3	East side South of 23rd	Provide crosswalk between sidewalk and bus stop	Ramps, crosswalks, signs	\$ 3,500
	East side South of 23rd	Install 475' sidewalk from bus stop south to path	Clear brush, install fence	\$ 20,000
	East side South of 23rd	Install 250' sidewalk from bus stop north to 23rd Street		\$ -
4	East side South of 23rd	Improve connectivity to commercial area; sidewalk repairs	Improve traffic circulation	\$ -
5	West side North of 23rd	Provide bus stop amenities; move stop near #3 changes	Concrete pad only	\$ 500
5	East side South of 23rd	Provide concrete pad and possibly shelter		\$ 5,400
6	North side of 23rd intersection	Repaint crosswalk primarily north side of 23rd		\$ 300
7	West side at 22nd Terrace	Reconstruct curb ramps to improve alignment		\$ 5,000
8	West side at 22nd Street	Reconstruct curb ramps to improve alignment		\$ 5,000
9	East side - 23rd to 19th	Install sidewalk and access to bus stops	~2,500' and ~15 ramps	\$ 100,000
10	West side at 21st	Reconstruct NE curb ramp to improve alignment		\$ 3,000
11	21st Street Intersection	Provide bus stop amenities	Concrete pads	\$ 800
12	West side South of 19th	Provide bus stop amenities	Concrete pad / shelter	\$ 5,400
13	SE corner 19th Intersection	Relocate pad push button		\$ 60
14	19th Street Intersection	Upgrade curb ramp / push button accessibility	Add concrete near signal	\$ 4,000
15	19th Street Intersection	Repaint crosswalk	Primarily north / east sides	\$ 700

Figures 6-4: Examples of Before-and-After Conditions along Naismith Drive.

Naismith Street – Looking south toward 24th Street



Naismith Street – Looking south from the current bus stop near 23rd Street (by the driveway to Dillon's)



Naismith Street – Looking north at the bus stop just south of 19th Street





Figure 6-5: Naismith Drive Recommended Transit-Pedestrian Accessibility Improvements



Spot Improvements

In addition to the targeted corridors, spot improvements were also identified at the following locations:

- ▶ 33rd Street - near Walmart/Kohl's
- ▶ Iowa and 9th Street
- ▶ 6th and Kentucky – eastbound bus stop

The following sections summarize the existing pedestrian-transit accessibility issues and potential improvements for each of these locations.

33rd Street - Near Walmart / Kohl's

The bus stop on 33rd Street, near Walmart and Kohl's, is one the most frequently used transit stop locations in Lawrence (Figure 6-6). During fieldwork, this location was frequently observed to have over ten riders waiting and in one instance nearly twenty riders were observed. There are several factors that make this particular location a potential candidate for enhanced transit-pedestrian accessibility improvements. These include the following:

- ▶ **Frequent pedestrian crossings from the Walmart to the bus stop.** A number of pedestrian crossings were observed at this particular location. In many cases, pedestrians push their shopping carts from Walmart across the street to the bus stop. While ADA accessible ramps are present, there currently is no marked crosswalk. Travel speeds along 33rd Street also appear to be higher than posted speed limits making pedestrian crossings difficult. It was also observed that eastbound and westbound vehicles would not yield to pedestrians waiting in the crosswalk area (again, no crosswalk is currently painted).

- ▶ **Small bus shelter/waiting area.** The current bus shelter was observed to accommodate approximately two passengers (this space was especially limited given the number of packages that riders frequently carried with them). Several passengers were observed waiting in the vicinity of the bus stop including areas along the sidewalk and under nearby trees in the grass portion of the Kohl's property. A number of shopping carts were left near the bus shelter creating obstacles for waiting passengers. It should also be noted that fieldwork was conducted during the summer months when passengers could use the grass areas to wait. It is anticipated that this waiting area would become even more congested and difficult to access during winter months when riders would not be able to use the grass area to wait.
- ▶ **No concrete pad connecting the sidewalk and street.** There is currently an approximately three foot area between the sidewalk and roadway that requires passengers to cross the grass, or muddy area after rain/snow, to board the bus. While the buses are equipped with ramps that will cover this area, it does make it difficult for individuals with mobility issues to navigate the area around the shelter given the tight space and high number of boardings / alightings.
- ▶ **Bus layover and traffic conflicts.** This bus stop is at the end of the route and as a result buses will sometimes layover for a few minutes before beginning the return trip. Also, given the high utilization of this stop, the boarding/alighting process can take some time. When stopped at this location, a bus will block the westbound through-right travel lane causing westbound through and right-turning vehicles to use the westbound left-turn lane (into Walmart). During fieldwork, several potential traffic conflicts were observed as some westbound motorists traveling around the bus were not anticipating left-turning vehicles into Walmart.





Potential Improvements

Given the previous factors, this location would be an ideal candidate for a bus pullout and enhanced waiting area. Additional study would be needed to further evaluate the traffic impacts and the bus stop location might need to be relocated farther away from the driveway access. A larger shelter would also be appropriate and accommodations for cart returns could also be considered. If enhancements are being made in this location, accommodations for potential bicycle parking accommodations should also be considered. As a short-term improvement, the crosswalk could be painted and pedestrian crossing signs installed to enhance pedestrian safety and accessibility in the area.

Figure 6-6: 33rd Street east of Iowa (between Walmart and Kohl's)



- ▶ Heavily used bus stop
- ▶ Carts often left scattered
- ▶ Shelter provides room for at most two riders; a larger shelter would be useful
- ▶ Muddy area where bus boarding occurs; bus stop needs a concrete pad
- ▶ Stopped bus blocks through and right turning traffic; construct bus pull-out space
- ▶ Many riders and pedestrians use this crossing; a marked crosswalk would be beneficial





Iowa and 9th Street

The intersection at Iowa Street and 9th Street is in proximity to the Route 4 bus stop on Iowa Street (located on the west side of Iowa Street, just south of 9th Street). This stop is currently difficult to access as the primary path to cross Iowa Street is the intersection at 9th Street (Figure 6-7). With the exception of the southwest quadrant, the remaining segments of this intersection do not have sidewalks. In the case of the southeast quadrant, the gas station has landscaping along Iowa that causes pedestrians to walk through the gas station lot. Similar landscaping obstacles exist along 9th Street near the gas station. During fieldwork, some pedestrians were observed walking through the landscaping adjacent to the roadway and along the uncontrolled gas station driveway. The intersections themselves are not ADA compliant, and traffic signals and other utilities are present in the immediate vicinity of where a sidewalk connection would be located.

Potential Improvements

There is an immediate need to improve pedestrian conditions within the vicinity of the Iowa Street and 9th Street Intersection. These improvements would enhance connections to the fixed-route transit services, and are also warranted in terms of improving overall pedestrian safety and connectivity. Initial improvements should focus on the intersection and improving the crosswalks which would be followed by the construction of sidewalks along Iowa Street and 9th Street.



6th and Kentucky – eastbound bus stop

Currently the eastbound Route 6 bus stop is located on 6th Street just west of Kentucky Street. This stop is located next to Watson Park (Figure 6-8). There are no bus stop amenities and the bus boardings/alightings can cause traffic backups to occur as one of the two through travel lanes is blocked. Individuals who need to cross 6th Street to access this bus stop must first cross Kentucky (3-lanes) and then cross 6th Street (4-lanes of traffic, but the roadway width is essentially 5-lanes with no center median refuge). Traffic congestion on 6th Street is already at a high level during peak-travel periods, and future year congestion conditions are expected to worsen.

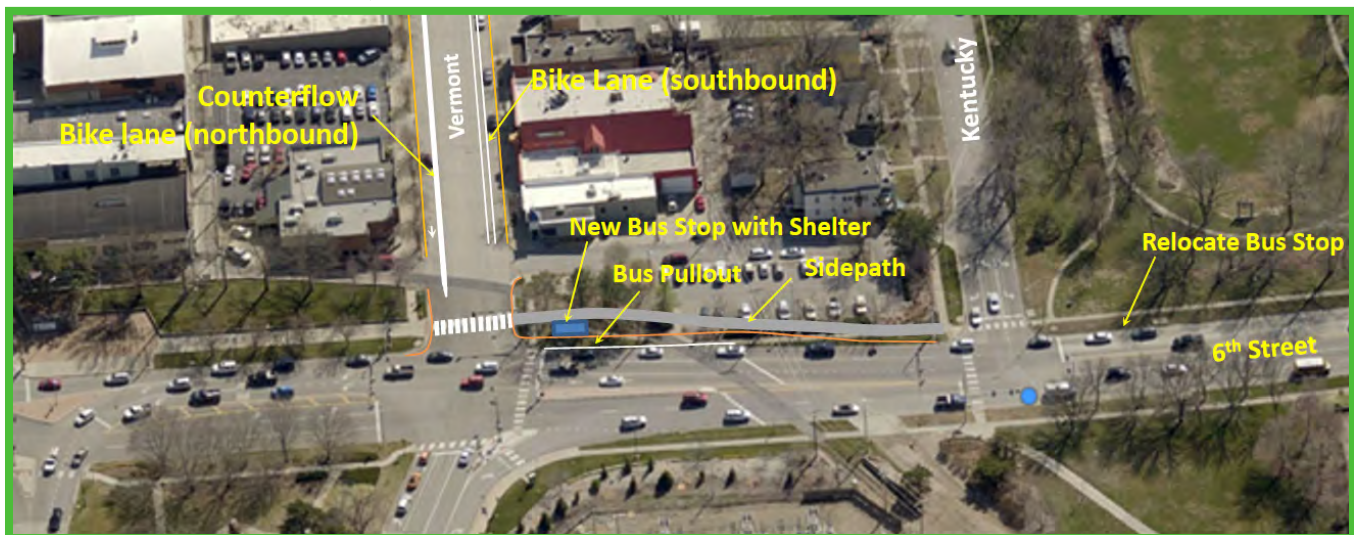
Potential Improvements

In reviewing this particular bus stop, the project team felt that this particular bus stop could be potentially relocated to the east closer to Vermont Street. This could potentially:

- ▶ Allow for an improved/enhanced bus stop waiting area;
- ▶ Be constructed with a right-turn lane to enhance overall traffic flow along 6th Street;
- ▶ Be coordinated with possible bikeway improvements to support enhanced multimodal connections;
- ▶ Enhance the 6th Street crossing for pedestrians.

It should be noted that this improvement is presented as a concept only. Detailed traffic engineering studies would be needed to determine the overall impact of this improvement on vehicular traffic, transit operations, pedestrians, and bicyclists. However, this concept does highlight the potential need to find ways to better accommodate transit operations within corridors that continue to see increasing levels of vehicular traffic. The City Public Works Department, along with the Lawrence Transit staff, may also want to explore traffic signal technology improvements that would allow transit vehicles to operate more efficiently along congested travel corridors and prioritize the movement of buses.

Figure 6-8: Example of Potential Coordinated Transit and Bikeway Improvements (6th Street from Kentucky to Massachusetts Street)



Policy Recommendations

1. Arterial Roadways Should Include Sidewalks on Both Sides of the Street

As a general policy, all arterial roadways within Lawrence should include sidewalks on both sides of the street. Collector roadways, which connect major transit corridors together, should also include sidewalks on both sides of the street. Providing sidewalks on both sides will significantly improve pedestrian access and enhance fixed-route transit access.

2. Enhance Existing Crosswalks and Identify New Crossing Locations

Major corridors, such as 23rd Street and 6th Street, have several mid-block crossings and wide cross sections that make pedestrian crossings difficult and uncomfortable. Traffic studies should be conducted along these corridors to identify opportunities to enhance existing pedestrian crossings. These studies should also evaluate the potential to install new crossings, which can include well-designed mid-block crossings. Roadway median refuges should be considered to provide pedestrians a safe haven to wait at while crossing. Pedestrian crossing signs could also be installed to facilitate safer crossings. Figure 6-9 provides examples of enhanced pedestrian crossings.

3. Strengthen the Site Development Review Process

Developing areas of Lawrence that may not currently be served by fixed-route service provide the greatest opportunity to incorporate transit-friendly accommodations to enhance pedestrian access. The City of Lawrence should review their current site plan development process and strengthen policies that require enhanced transit-pedestrian accessibility and connectivity. The site development review process should also take into account other multimodal accommodations including bicyclists.

Site review processes for the installation and operation of bus stops and stations are a critical component of designing a safe, attractive, and pedestrian-friendly environment. A site review process is simply a collection of rules and policies that provide detailed instructions on how to locate, position, build, and connect bus stop facilities in conjunction with sidewalks, curbs, roadways, intersections, medians, and other infrastructure components.

These policies address two major issues regarding the use of public transportation. First, mandating a review process for all bus stop locations in a transit system fosters reliability for passengers in that no matter where they travel to in the transit system, they can expect to be able to board / alight buses in the same way. Second, this common bus stop experience is particularly important for people with sensory and mobility limitations.

4. Adopt Typical Bus Stop Standards

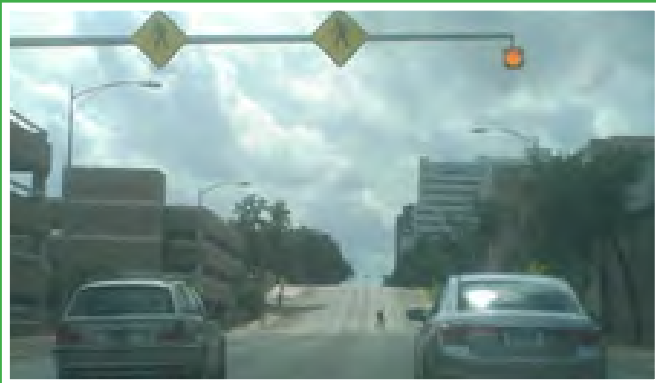
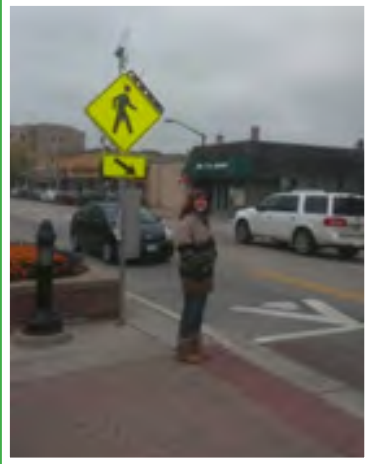
The Lawrence Transit System and KU on Wheels should consider adopting unified bus stop standards that would identify a target for the minimum level of bus stop amenities. The standards could be developed to reflect different levels of transit usage at different stops.

The difference between unified bus stop standards and a site review process is that the former provides optional “upgrades” that are influenced by passenger demand over time, while the latter applies to all stop locations regardless of passenger demand. Bus stop amenities can include but are not limited to: the size of concrete pads, the size of shelters, quantity of bench seating, advertising space, signage, and implementation with other street furniture (garbage cans, light posts, planters, etc.).



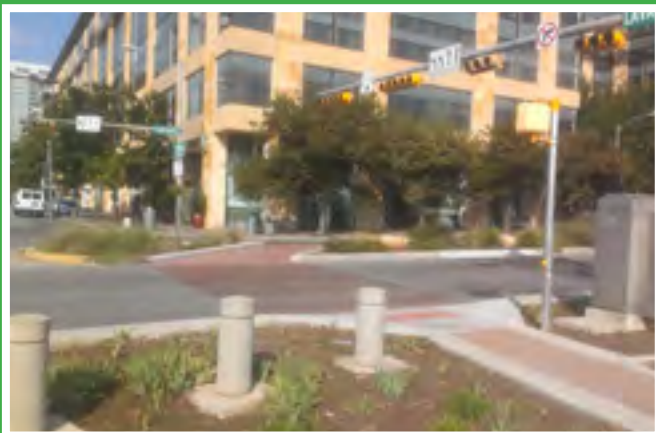


Figure 6-9: Examples of Sidewalk Enhancements



(Above) This pedestrian crosswalk includes a slightly raised crossing to enhance accessibility. There is also a pedestrian button that activates a flashing pedestrian sign to alert motorists.

(Left and Below) The flashing pedestrian lights alert motorists of a mid-block crossing ahead. This crossing is along a relatively high volume one-way street.



5. Identify Locations for Bus Turnouts

The T2040 Plan shows future year traffic volumes and roadway congestion increasing on several of the major Lawrence roadway corridors. While bus turnouts may not be necessary in the near-term future, they could become important to enhancing overall traffic flow in the long-term. The potential downside to identifying bus turnouts too early is that in developing areas, such as the west side of Lawrence, the bus stops could change and it would not necessarily be desirable to identify permanent bus turnouts.

Many transit agencies, and bus drivers, do not care for turnouts as it can potentially make it more difficult to reenter the traffic flow. However, some locations make sense, including terminal stop locations where the bus may sit for several minutes before completing the return trip. Also, new technology at traffic signals can be used to provide buses the opportunity to avoid traffic congestion and reenter the traffic flow in a timely fashion.



6th Street underpass near Pickney School

6. Evaluate Relocating Mid-Block Stops Closer to Marked Pedestrian Crosswalks

The City and KU transit staffs should evaluate the possibility of relocating some mid-block bus stops closer to marked pedestrian crosswalks. As part of this evaluation, the near side versus far side stops should be evaluated.

Near-side locations are positioned along the right side of the roadway just before it forms an intersection with another perpendicular or diagonally-crossing roadway. Typically, near-side stop locations require buses to stand in right-hand turn lanes, or else block forward-moving traffic until boarding / alighting operations are complete.

Far-side locations are positioned along the right side of the roadway just after it forms an intersection with another perpendicular or diagonally-crossing roadway. Far-side stop locations may feature a bus pull-in / pull-out lane but may also simply sit adjacent to the right-most moving-traffic lane. If the latter, far-side stop locations may also block forward-moving traffic until boarding / alighting operations are complete.

Near-side locations have an advantage compared to far-side stops in that they may have shorter dwell times if a bus is required to stop at the traffic light. For example, a bus pulls up to a near-side location while a light is red and thus is not blocking traffic behind it from crossing the intersection (as opposed to when the light is green and the bus does block traffic). Passengers may also have the advantage of boarding / alighting at a red light. For far-side locations, a bus may get stopped at a light on the near side of an intersection, then have to stop again once it crosses to board / alight passengers on the far side, thus increasing the length of the route's operating time. Near-side locations also nearly always have a built-in "no parking zone" advantage since the curbside space is typically reserved for right turn operations. This space provides an informal pull-in / pull-out space for buses without having to reduce existing street parking space.

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The counterpoint to this occasional time savings offered by near-side locations is the negative impact it has on traffic, particularly if the bus is standing in a right-turn lane. Additionally, buses may at times become ensnared with right turn only traffic and force passengers to wait until it can move up closer to the actual stop location. Far-side locations largely alleviate this issue since buses can simply bypass right-turn lanes at intersections, cross the intersection, and rarely have to wait for traffic to clear on the other side where the stop is located. Far-side stops also encourage pedestrians to cross behind bus vehicles as opposed to in front of them at near-side stops, and they allow buses extra distance to safely decelerate (the distance being the intersection itself).

Mid-block crossings provide an alternative to the more prevalent near- and far-side stops. The main advantage to mid-block crossings is the ability to avoid boarding / alighting at intersections altogether. Intersections feature a greater complexity of traffic movements, traffic congestion, and a variety of other variables which makes acceleration and deceleration of the bus vehicle difficult. Intersections also typically contain a higher density of pedestrians, creating a more congested and chaotic pedestrian environment surrounding stop locations. Mid-block crossings are ideal in this sense since they are removed from the cross traffic.

However, mid-block crossings have major drawbacks, including requiring buses to stop and start at locations where no other motorists are required nor often expect to have to stop, thus increasing the chance of rear-end collisions. There is also typically no curb-side space available for buses to pull in and out of, potentially leading to the removal of street parking. From the pedestrian perspective, mid-block crossings may require one to walk a longer distance to go around the next signalized or sign-enforced intersection. This encourages pedestrians to cross the street mid-block which in turn decreases pedestrian safety unless proper crossing infrastructure is installed to accommodate and sanction pedestrian crossings. This is a current issue Lawrence is dealing with, as described in the discussion of the corridors.



Ramp leading to the 6th Street underpass

Generally, both near- and far-side stop locations are preferable to mid-block stops since intersections are the safest and most convenient locations for pedestrians to access. Determining whether to make a stop near- or far-side is ultimately controlled by the specific geometry of a given intersection and the cost / effort involved in constructing each type.

The only circumstance in which far-side stop locations are always preferred is when a transit agency is able to utilize traffic-signal priority technology. This usually takes the form of a dedicated traffic signal for buses traveling in the right-most lane at an intersection approach; the bus is equipped with a transponder which overrides the signal timers at the intersection and causes all other traffic to stop (except right turns that do not conflict with bus operations). The bus is given a green light and crosses the intersection. After crossing, traffic signals return to normal. Far-side stops also endow the potential to install queue-jump lanes; quite simply, this is a bus pull-in / pull-out lane on the far side of an intersection equipped with a traffic signal light at the front of the pull-out zone. When the bus is ready to depart, the signal halts traffic on the near-side of the intersection so that the bus does not have to wait to pull out.

Although this type of technology is expensive and perhaps only a long-range goal for Lawrence, it should be considered when developing site review processes that govern the placement of near- vs. far-side stop locations, particularly at intersections where the geometry accommodates far-side stops. This will “preserve the envelope” for traffic signal priority and queue jump lane operations in the event that future traffic and passenger volumes warrant the use of such technology.

7. Review Sidewalk Replacement Policy

Providing well-maintained and connected sidewalks can significantly improve access from residential areas to area bus stops. In most cases, the requirement to improve sidewalks is the responsibility of the owners of adjacent property. The City should review the current sidewalk maintenance and replacement policies to determine if opportunities exist to revise and/or enhance those policies so that sidewalks are treated more like the adjoining roadway space used for vehicular traffic in the same roadway corridor.

8. Seek a Dedicated Funding Source

The City of Lawrence has typically funded sidewalk improvements through the use of Community Development Block Grant (CDBG) funds. That federal source of funding can only be used for certain purposes in certain areas of the city. Beyond that HUD source, no dedicated funding from more flexible local sources is available for sidewalk improvements. The City may want to explore a dedicated funding source that would be used to repair, replace, and construct new sidewalks. This should be conducted in coordination with recommendation #7 as part of reviewing the sidewalk replacement policy.

9. Incorporate Pedestrian Improvements into Larger Scale Roadway Projects

The City of Lawrence should take advantage of major roadway construction, or reconstruction, projects to include pedestrian accommodations. This also applies to non-motorized improvements. Roadway improvements that have bus stops should be closely reviewed to ensure that adequate pedestrian accommodations and site connectivity is provided. Improvements to fixed-route transit access should be prioritized if it enhances connections to other travel modes including regional bicycle facilities and commuter park & ride facilities.





10. Utilize ITS Applications to Enhance Transit Services

Intelligent Transportation Systems (ITS) applications could be utilized to improve overall transit operations. Improving the efficiency of the bus operations ultimately enhances the overall transit experience and increases the likelihood of attracting more riders. As stated earlier, ITS could also be used with far-side bus turnouts to allow buses to reenter the traffic flow and ultimately avoid some of the traffic congestion in major corridors.

11. Coordinate Bus Stop Improvements to Enhance Multimodal Connections

While this study specifically focuses on fixed-route transit and pedestrian accessibility, there are potential opportunities to coordinate bus stop improvements/enhancement with other multimodal connections. One such opportunity is to consider the development of bicycle storage facilities near transit stops. This is an issue that the MPO staff and local governments should study in more detail in the future, and was also raised as part of the Commuter Park & Ride Study and the ongoing Lawrence Transit Center Location Analysis.

The potential exists for some large transfer stops and/or major destinations to include bike lockers but currently most developers just install bicycle racks. Storage facilities for bikes in areas like Downtown Lawrence, around the hospital, and in major shopping areas near transit stops could encourage cycling and multimodal connections to public transportation. Someone living on the west side of Lawrence could conceivably ride a bike to a transit stop on that side of town and ride a bus Downtown or to other areas of Lawrence for work, shopping, or recreation. Implementing these types of improvements will encourage “mode shifts” to alternative transportation options (transit and bicycling) and will support the efforts of Lawrence officials to develop a truly multimodal transportation system.



Example of large scale bicycle parking in Boston. Variations of this bicycle storage could be incorporated throughout Lawrence to support the development of a truly multimodal transportation system.

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Chapter 7 CONCLUSION

The Lawrence-Douglas County Metropolitan Planning Organization conducted the Multimodal Planning Studies with the goal of prioritizing short-term and long-term regional transportation improvements to support the development of a more multimodal transportation system. The Multimodal Planning Studies consisted of a Commuter Park & Ride Study, a Fixed-Route Transit and Pedestrian Accessibility Study, and a Countywide Bikeway System Plan. While each study had its own set of issues, project goals, and evaluation methodology, the overall objective was to prioritize infrastructure improvements to enhance alternative transportation modes within Douglas County.

Developing a truly multimodal transportation system is consistent with the Complete Streets Policy adopted by the Lawrence City Commission on March 27, 2012. In addition to supporting this policy, a multimodal transportation system has several benefits including reducing travel costs, promoting an active and healthy lifestyle, expanding mobility options for all users, and providing environmental benefits by reducing traffic congestion and helping to improve air quality within the region.

The implementation of the sidewalk and transit stop improvement recommendations set forth in this Fixed-Route Transit & Pedestrian Accessibility Study will help the Lawrence-Douglas County Region develop a truly multimodal transportation system that will benefit all roadway users.

The local governments in the region along with KDOT and the various groups in the region that are concerned with pedestrian and / or transit issues need to work together now and in future years to make these transit-pedestrian improvements a priority in design, land use, and budget discussions. Some current rules and funding priorities will need to be changed to make the pedestrian and transit issues viewed more equitably with automobile traffic issues. However, that will need to be done to develop a truly multimodal transport system for the region. Budgeting for, planning for, and designing for the improvements recommended in this report is a good way to start that process of making our transport system more multimodal and providing more travel choices to the residents of Douglas County.

*Please visit the L-DC MPO website for
additional public comments and supporting materials:
www.lawrenceks.com/mpo/study*





APPENDIX A: WikiMap MAP COMMENTS



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MEMORANDUM

Date: August 6, 2013
To: Lawrence & Douglas County MPO Multimodal Studies Transit Access Steering Committee
From: Tom Huber & Kevin Luecke
Re: Transit Access WikiMap user input summary

This memo provides a brief overview of the user input from the transit access WikiMap interactive mapping tool for transit access in Lawrence and Douglas County. WikiMaps allows users to draw specific types of points or lines on a map and then enter comments on those points or lines if they choose to. Following is a breakdown of the entries received on the map:

- 22 lines
 - 3 routes to/from transit
 - 19 routes that needs improvement
- 31 points
 - 16 areas that need improvement
 - 15 difficult intersections/crossings
- 53 total entries from 17 unique users
- Comments collected from April 10 to July 17, 2013

All of comments were within the Lawrence city limits, although that was expected based on transit stop locations. Because of the limited number of comments, all of the comments are listed below. Comment numbers correspond to numbered points on the attached map.

Areas that need improvement

1. It would be nice to have a transit stop a bit further out - we would love to have a downtown bus from this area on the weekends.
2. Again, it would be nice to have a transit stop a bit further out
3. Sidewalk that goes down 9th street doesn't lead to stop light--instead jogs down the access driveway between the gas stations. A person trying to access the stop on the west side of Iowa would need to pass through the gas station to access the crossing.
4. Need sidewalks on this block--either side!
5. Sidewalk on north side of 9th street deadends at a point not safe to cross to the other side.
6. Another sidewalk dead end (24th and Naismith), requiring pedestrians to cross near a blind corner.
7. There is no sidewalk on the north side of 23rd Street, from Ohio to Massachusetts. It is impossible to safely cross over to the other side of 23rd street to access the sidewalk.
8. There are not contiguous sidewalks on both sides of Tennessee Street between 23 and 19th -- people commonly have to walk on Tennessee Street, which is VERY busy.
9. Much of the sidewalk on both sides of Massachusetts Street is damaged and needs to be repaired or replaced.
10. There is no contiguous sidewalk on the north side of 23rd, from Louisiana going west towards Alabama. People commonly jaywalk across 23rd Street to access a sidewalk.
11. This area is congested, uncomfortable for waiting. It needs more seating and trash bins.

12. Should put bus stop for KU busses on NE and SW corners of 11th and Mississippi; the closest location to get on is several blocks away and some individuals have physical limitations at this location that makes walking up hill and stairs to Corbin Stop nearly impossible, individual uses transit to access LMH services
13. Finish sidewalks along Princeton to connect with Iowa St.
14. Build sidewalks from Peterson Road to 6th Street
15. Very popular bus stop but often there is not enough seating for people who have clearly just finished shopping. Needs shade or bigger shelter.
16. Very wide, difficult for pedestrians

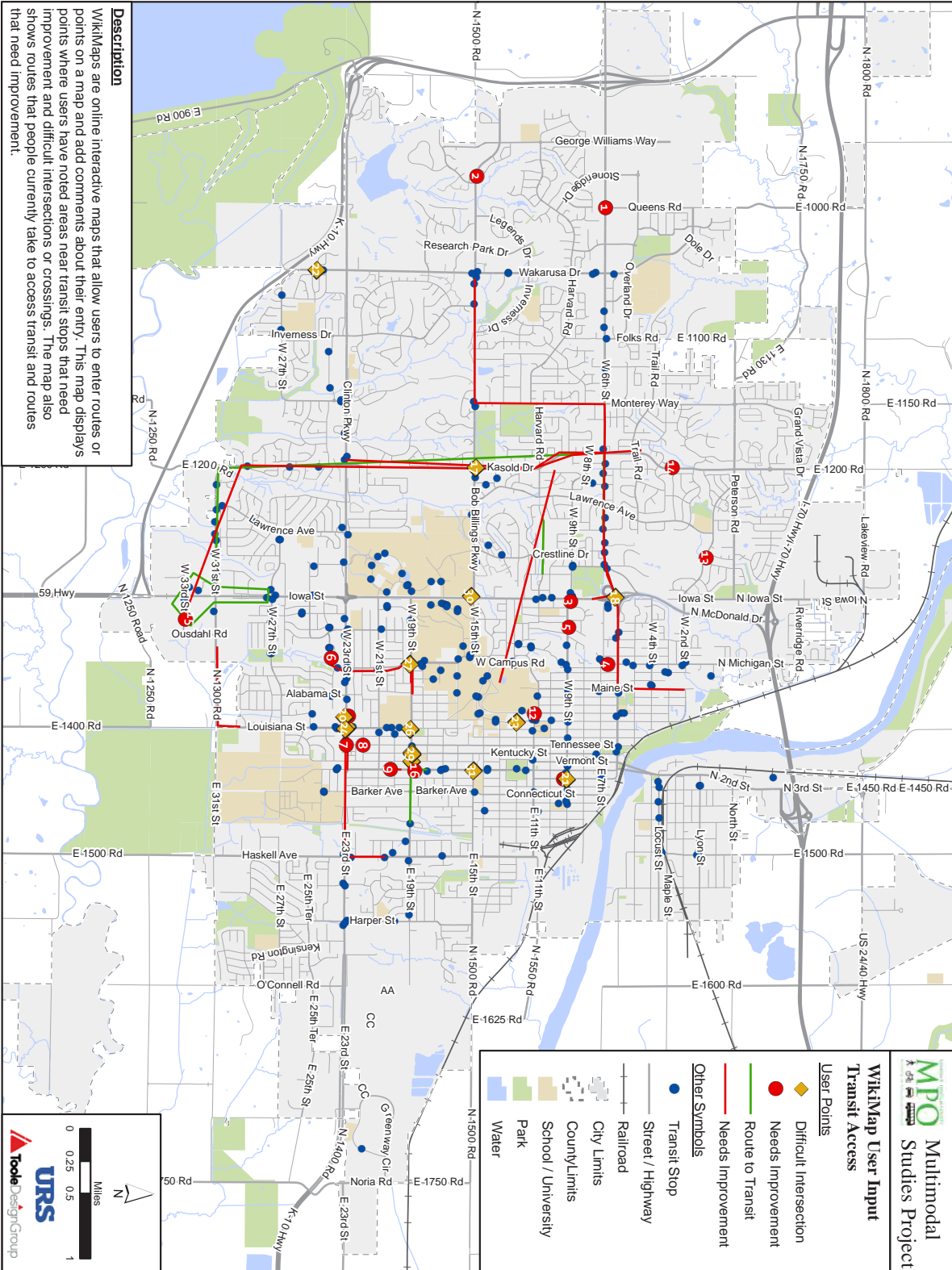
Difficult intersection/crossing

17. No sidewalk on SE corner of intersection.
18. The intersection requires some care. If a pedestrian is traveling along the south side of 6th Street, they will need to cross to the north side to continue down 6th. No crosswalk on the south side. A sidewalk has been added to the southeast corner of the intersection that allows access to Iowa, which is nice. Haven't checked the southwest corner--there's a park there, and it might not be considered important enough to add a sidewalk there.
19. Crossing 23rd Street or Louisiana at this intersection is dangerous. The flashing light lasts less than 20 seconds and right turn on red means cars are not looking for pedestrians.
20. There is a sign that blocks the sidewalk in the driveway between the Dunkin Donuts and the Carlos O'Kelleys. If you are in a wheelchair or on a bike, the sign is a hazard.
21. 4-way stop high traffic foot and auto many do not stop or follow rules of 4way would like to see traffic light here
22. No sidewalk cut on west side of Wakarusa opposite Stoneback Dr.
23. Low visibility no stop sign medium traffic speeding cars
24. Need better barrier between cars & pedestrians
25. Crosswalk needs restriping
26. Sidewalk is too close to roadway
27. Sidewalk is too close to roadway
28. [No comment]
29. [No comment]
30. Improving now with construction
31. Needs better crosswalk striping

The map that is attached and the specific comments that users provided will inform the final recommendations of the Transit and Accessibility Study. In particular, some recommendations will focus on improving routes that were noted as problematic, offering alternative routes to avoid problem areas, and recommending improvements for difficult intersections and street crossings. While not every WlkiMap comment will be addressed in the final report, areas that received multiple comments will receive particular scrutiny when forming the final recommendations.



FIXED-ROUTE TRANSIT & PEDESTRIAN ACCESSIBILITY STUDY



MPO Multimodal Studies Project